encryption key (e.g., by generating the encryption key, receiving it from the API server, etc.) and creates an encrypted chunk by encrypting the requested chunk with the encryption key. The encrypted chunk then can be provided to the MFDSP 150 for storage in the media file cache 720 and delivery to the client 510. If the same chunk is requested at a later point in time (and the chunk is not encrypted with an outdated encryption key) the MFDSP 150 can deliver the chunk from the media file cache 720, thereby forgoing the need to redirect the request to the DPL 740 to regenerate the chunk.

[0085] The determination of whether an encrypted chunk in the media file cache 720 of the MFDSP 150 has an outdated encryption key can be made in a variety of ways. For example, the DPL 740, upon receiving and/or generating the encryption key, can notify the MFDSP 150 of the update so that the MFDSP 150 can delete and/or overwrite any affected files. Alternatively, the DPL 740 can inform the index file generator 530 of an update in the encryption key. The index file generator 530 can adjust index files accordingly, indicating, for example, an encryption key version number in a URL of the index file. If the MFDSP 150 cannot match the URL to any cashed location in the media file cache 720, it will request an updated chunk from the DPL 740. Other techniques for indicating expired encryption keys, and other methods of encryption (e.g., RSA, symmetric key, etc.) also are contemplated.

[0086] **FIG. 7B** illustrates an alternative embodiment 700-2 of a system for indexing and encrypting dynamically-created chunks of a media for media streaming. Rather than utilize a MFDSP, this embodiment 700-2 includes a media caching server 770 within an application center 112 of the CHIMPS 110. The media caching server 770 can receive chunk requests from, and provide the corresponding chunks to, a client 510. It will be understood that such a media caching server(s) 770 or similar device(s) can be located anywhere within the CHIMPS 110 and/or in a system(s) communicatively linked to the CHIMPS 110.

[0087] **FIG. 8** is a simplified illustration of an embodiment 800 of a system for dynamic encryption integrated into a traditional system that may not have dynamic chunking and/or dynamic indexing capabilities. Here, an index file for streaming a media file can include a URL that directs a client 510 to a media server 811. The media server 811 can include a chunk encrypter 840 communicatively connected with an API server 730 of a media provider 130, as well as a media chunk storage 855 that stores media chunks for media

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file(s). After receiving a request for a media chunk from the client 510, the chunk encrypter 840 can retrieve the requested chunk from media chunk storage 855 and determine an encryption key using techniques such as those disclosed above (e.g., receive an encryption key from the API server 730, generate the encryption key, etc.). The chunk encrypter 840 then can create an encrypted media chunk by encrypting the requested media chunk with the encryption key, and provide the encrypted media chunk to the client.

[0088] The embodiment 800 shown in FIG. 8 is provided as an example and is not limiting. As with other illustrations provided herein, the embodiment 800 can be altered in numerous ways without departing from the spirit and scope of this disclosure. For example, the media chunks may be stored at a location and/or system remote from the media server 811. Moreover, encrypted chunks may be cached by one or more caching server(s) that may be communicatively linked between the client 510 and the chunk encrypter 840. Other such variations are contemplated.

[0089] **FIG. 9A** illustrates a simplified flowchart of a method 900-1 for dynamically encrypting chunks of media for media streaming, which can be executed, for example, by the DPL 740 or chunk encrypter 840. The method 900-1 begins at block 910 where a request for a chunk of a media file is received. As indicated earlier, such a request can come from a MFDSP 150, media caching server 770, or other media servicing system. Alternatively, the request can come directly from a client 510 running on an end user device 140. At block 915, the requested chunk is retrieved.

[0090] At block 916, an encryption key is requested from a media provider 130, and at block 920 the encryption key is received from the media provider 130. Because this exchange involves an encryption key, it can be done over a secure communication link, as discussed above. Moreover, the request for the encryption key from the content provider may be sent prior to, or in conjunction with, the retrieval of the requested chunk. Such timing may increase efficiency by reducing the overall time it takes to execute the method 900-1 of FIG. 9A. Although the term "content provider" is used in the method 900-1 and in other figures provided herein, other entities can be used as an encryption key source. After the encryption key is received, the requested chunk is encrypted at block 925 and returned at block 930.

[0091] **FIG. 9B** illustrates a simplified flowchart of a method 900-2 for dynamically encrypting chunks of media for media streaming, similar to the method 900-1 illustrated in

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FIG. 9A. Here, however, in response to receiving a request for a chunk at block 910, the method 900-2 includes requesting a key-generation algorithm from a media provider 130 at block 917 and receiving the key-generation algorithm from the content provider at block 918. Additionally, at block 922, an encryption key is generated using the received key-generation algorithm. As indicated earlier, such functionality enables the system executing the method 900-2 to provide encryption without the need to store encryption keys and/or algorithms. It also enables the media provider 130 to control generation of the encryption keys, allowing the media provider 130 to rotate encryption keys at virtually any time.

[0092] **FIG. 9C** illustrates a simplified flowchart of a method 900-3 for dynamically encrypting chunks of media for media streaming involving encryption key generation, similar to the method 900-2 illustrated in FIG. 9B. Rather than request a key-generation algorithm, however, the method includes generating the encryption key at block 923 and providing the corresponding decryption key to the media provider 130 at block 924. Thus, unlike the methods 900-1, 900-2 of FIGs. 9A and 9B, the media provider 130 has a more passive role in the encryption of the chunks, with little or no involvement in the generation of the encryption key. That said, the generation of the encryption key may be in accordance with techniques and/or algorithms provided by a media provider 130.

[0093] FIGs. 9A-9C are provided as examples and are not limiting. The methods 700 can be modified for different functionality. For example, the methods may be modified to encrypt multiple chunks with the same encryption key, such as all chunks of a certain media file, all chunks requested within a certain time window, etc.

[0094] **FIG. 10** is an illustration of a simplified swim lane diagram showing the interaction of components in a system configured to provide dynamic encryption, according to one embodiment. In this embodiment, a client can send a request for a chunk at block 1005. Depending on the streaming protocol, the request may be made while a client plays a chunk of media previously downloaded during streaming. The request received by a MFDSP 150 at 1010. As discussed above, the use of a MFDSP 150 is optional; other embodiments may include components other than a MFDSP 150.

[0095] Blocks 1015 and 1017 help determine whether the MFDSP 150 can return the encrypted chunk corresponding to the requested chunk without a call to the DPL 740. At block 1015, the MFDSP 150 determines whether the requested chunk is in cache. If not, the process moves to block 1020, where the MFDSP 150 requests the chunk from the DPL 740.

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[0096] Otherwise, if the chunk is cached at the MFDSP 150, the process moves to block 1017 where the MFDSP 150 determines whether the encryption of the chunk is current. As discussed above, such a determination can be made in several ways. For example, an encryption version can be embedded in the URL, the MFDSP 150 can be notified by the DPL 740 of a change in the encryption key, etc. If the encryption is current, the MFDSP 150 can simply return the encrypted chunk, at block 1080. Otherwise, the MFDSP 150 requests the chunk from the DPL 740 at block 1020.

[0097] At block 1025, the DPL 740 receives the request for the chunk, and at block 1030 retrieves the chunk. As discussed previously, certain embodiments can allow for the chunk to be created dynamically by the DPL 740. Otherwise, the DPL 740 (or other system configured to encrypt chunks) can retrieve the chunk from storage. Before the chunk is encrypted, the encryption key must be obtained. Thus, at block 1035, the DPL 740 requests the encryption key.

[0098] At block 1040, the API server (which can be hosted by the content provider of the media file corresponding to the chunk, or other entity) receives the DPL's request for an encryption key. The API server then generates or otherwise obtains the encryption key, at block 1045. The encryption key can be, for example, stored in memory and used for multiple requests, rotated on a time and/or file basis, etc. Alternatively, a new key can be generated for each request received by the DPL 740. In any case, the encryption key is returned to the DPL 740 at block 1050.

[0099] The DPL 740 receives the encryption key from the API server at block 1055. With the encryption key, the DPL 540 encrypts the chunk, at block 1060. The encrypted chunk is then returned to the MFDSP 150 at block 1065.

[0100] At block 1070, the MFDSP 150 receives the encrypted chunk from the DPL 740. The MFDSP 150 then can cache the encrypted chunk at block 1075, thereby enabling the MFDSP 150 to provide it to clients who request the chunk in the future (provided, of course, that the encryption is current at the time of the future client requests). At block 1080, the MFDSP 150 returns the encrypted chunk to the client, which is received at block 1085. The client 510 can decrypt the encrypted chunk by utilizing a corresponding decryption key, which, in asymmetric encryption, can be provided by the API server 730 (or another system of the content provider) in a variety of ways.

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[0101] In addition to techniques for providing media with a data network using a single URL or other content indicator, including providing dynamic encryption, embodiments can include providing a range of dynamically-executed syndication services based on any type of contextual data. In so doing, a content owner can be provided with additional control over the distribution of media content, as well as its analysis, all while utilizing a single URL or other content indicator.

[0102] **FIG. 11** illustrates how a content owner 1110 may be included in a media servicing system 1100 similar to the media servicing system 100 shown in FIG. 1. Here however, the content owner 1110 can utilize one or more media provider(s) 130 to distribute the media content. For example, a content owner 1110 could be a movie studio that licenses distribution of certain media through various content providers 130 such as television networks, Internet media streaming websites and other on-demand media providers, media conglomerates, and the like. In some configurations, the content owner 1110 also can operate as a media provider 130.

[0103] Traditional media servicing system configurations would require a content owner to provide a copy of the media content to each of the media providers. The media content might be provided in one encoded format, multiple encoded formats, in conjunction with a branded media player, in conjunction with a chromeless media player, or in any of a variety of other packaging options. In such configurations, depending on the terms of the agreement between the content owner and each of the content providers, the content owner may have limited knowledge of how the media providers distribute the media content, relying on the content providers to observe the terms of the contractual agreement between the parties and to accurately report data such as advertisement revenue.

[0104] Given the dynamic servicing functionality of the CHIMPS 110, however, the media servicing system of FIG. 11 can allow the content owner 1110 to use a single URL or other content indicator for each media file, and simply provide the URL or other content indicator to each of the media providers 130, rather than providing copies of the media content, pre-built syndicated players, or another package. As indicated previously, the media providers 130 then can provide the URL or other content indicator to a client 510 running on an end user device 140. In turn, the client 510, by using the URL or other content indicator in, as part of, to send, or otherwise in conjunction with a request to stream and/or download the media file, is dynamically provided a customized playback experience

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by the CHIMPS 110, which receives the request from the client 510. The customized playback experience can be customized according to aspects of the context associated with the content at the time of the request, aspects of the content request itself, or both, including any of, all of, or any combination of, the media provider which presented the URL or other content indicator to the client, another media provider associated with the presentation of the URL or other content indicator to the client (for example, a social network message that contains a link or other reference to the media provider, which in turn presents the URL or other content indicator to the client), the user agent associated with the content request, the device associated with the content request, the network or type of network associated with the content request, a location associated with the content request, the user agent, the device, the user agent or device state, or the network associated with the request, the time or date, the elapsed time, or other time-based characteristic associated with the content or the content request, an application, application state, or other application characteristic associated with the content or request for content, or other characteristics or attributes of the content, the context associated with the content, the request for the content, or the context associated with the request for the content. It can be noted that although embodiments herein utilize media files explicitly, other embodiments may utilized other forms of media assets, such as live streams, or other forms of media, such as dynamic web pages, and may incorporate multiple media elements, including players, user interface components, user controls and control components, images, and other media content, objects, or types. Additionally, it can be noted that various functions, operations, processes, or other aspects that are described in this example, and other examples, as being performed by, or attributable to, the CHIMPS 110 can be performed by another system operating in conjunction with the CHIMPS 110, loosely or tightly synchronized with the CHIMPS 110, or independently; for example, collecting data from other digital services to be combined and reported with data collected by the CHIMPS 110 can, in some implementations, be performed by a system other than the CHIMPS 110.

[0105[**FIG. 12A** is a simplified flow chart illustrating an embodiment of a general method 1200-1 that can be executed by a system, such as the CHIMPS 110, to provide these dynamically-executed syndication services. At block 1210, a request for the media file is received 1210. The request can come in a variety of forms, depending on various factors, such as the type of client 510, the type of media, various communication standards and/or protocols used, and the like.

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[0106] At block 1220, contextual data relating to the request is then determined. The contextual data can come from a variety of sources, including the request itself. For example, a request from a browser-based client may include information regarding the web page of a media provider 130 within which the URL or other content indicator was contained. Information provided in the request may also include any of a variety of contextual items such as a client ID, globally-unique identifier (GUID) or other identifier, a network type, a device type and/or capability, an operating system executed by the end user device, an application, application identifier, application state, or other application information , a location associated with the device, information associated with a user of the end user device 140, information regarding the requested media file (e.g., genre, length, rating(s), ownership, artist, etc.). Additionally or alternatively, the request may simply include information that enables one or more of these items to be determined. Additionally or alternatively, a repository may be stored, maintained or derived, and queried for authorization, authentication, validation, or selection; for example, a repository of application identifiers may be maintained and queried to determine whether an application is authorized to request the content and if so, to select further aspects of or for processing the content request. Additionally or alternatively, such stored or derived repository data may be used in conjunction with other data, either internally or externally identified, such as a secret key, shared key, public key, stored certificate, other stored data, or other data for authorization, authentication, validation, or selection, including data stored on another digital service, on another server, on the client device, in a device associated with the client device, in the operating system, in the application, in another application, in a network, or in another location from which it may be retrieved.

[0107] The determination of contextual data can include utilizing information other than the information provided in the request. For example, the request may include a URL from which information regarding the requested media file (e.g., genre, length, rating(s), ownership, artist, etc.) can be determined, or account information from which information associated with a user of the end user device 140 (e.g., age, gender, location of residence, interests, subscriptions, etc.) can be determined. As another example, a session identifier or user identifier may be usable to determine historical, demographic, interest, utility, or other characteristics. This determination may involve accessing information stored in one or more a databases or other data structures internal or external to the CHIMPS 110. It may also involve communicating with other entities and/or systems, such as the content owner 1110

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or media provider 130. Additionally or alternatively, contextual information can be gathered using data independent of information provided in the request, such as the time at which the request was received. Additionally or alternatively, contextual information can be gathered from other digital services, for example, link-shortening services, social networking services, content sharing and recommendation services, digital content publication and management services, search services, archive services, content aggregation services, or other digital information services, which may include hyperlinks, messages, posts, status updates, or other shares or exchanges, as well as dates and times, sequence information, ratings and scores, user information, and other information from one or more digital services, and which also may include some or all of such contextual information describing the sequence, in whole or in part, leading to, or other circumstances influencing, a URL or other content indicator request.

[0108] At block 1230, corresponding syndication information (e.g., syndication rules) are determined, based on the determined contextual data related to the request. The syndication information can be any of a variety of rules that can impact how the requested media file is ultimately provided to the client 510. Such rules can correspond to the content of playback of the requested media file, advertisements shown during playback, streaming parameters for playback, security utilized during playback, version of the content to be played, and the like. At block 1240, the appropriate response is provided 1240. For example, an index file generated based on the syndication information can be provided.

[0109] **FIG 12B** is a simplified flow chart illustrating an embodiment of a method 1200-2 that demonstrates the customization of index files for different requests utilizing the same URL, based on different contextual data. At block 1205, a first request having a URL is received. As indicated above, the URL can include a variety of information, including information indicative of a requested media file. At block 1215, contextual data related to the first request is determined, and, at block 1225, a first set of syndication information is determined, based on the contextual data related to the first request. The syndication information can impact the playback of the requested media file, among other things, as described in more detail below. At block 1235, a first index file having information for streaming the requested media file is generated based (at least in part) on the first set of syndication information. At block 1245, the first index file is provided.

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[0110] Blocks 1255-1295 follow a process similar to blocks 1205-1245. At block 1255, a second request having a URL is received. At block 1265 contextual data of the second request is determined. Here, the contextual data related to the second request is different than the contextual data related to the first request. At block 1275 a second set of syndication information is determined. At block 1285, a second index file having information for streaming the requested media file is generated based (at least in part) on the second set of syndication information. At block 1295 the second index file is provided. Because the contextual data related to the second request is different than the contextual data related to the first request, the content of the second index file may be different from the content of the first index file. Thus, the implementation of syndication information based on contextual data related to each request can result in a customized playback experience that can be different for different requests.

[0111] Syndication information relating to the content of playback of the requested media file can be dependent on a variety of factors including the content of the requested media file itself. For example, syndication information can require altering the playback of the requested media file based on length and/or content of the media file. For example, if it is determined from the contextual data that a requested media file is a movie will be shown on an airplane, the playback of the media file may be altered to omit certain portions of the movie that may be objectionable to certain passengers, use an audio track during playback of the movie that uses less-objectionable language, omits scenes that involve plane crashes, and/or remove other portions of the movie to shorten the overall length of the movie to a length compatible with the flight time of the airplane.

[0112] Syndication information that relate to the content of playback of a requested media file can be impacted by numerous other contextual data. Among other contextual data, the time and the identity of a media provider 130 can be taken into account. Syndication information, for example, can require that a particular media file that is played back on a children's website excludes objectionable content, whereas the same media file can include the objectionable content if played back on certain radio and/or television stations after a certain time of night.

[0113] Syndication information can also include not allowing a certain audio track associated with the requested media file to be played during playback. For example, if it is determined from the contextual data that a requested media file is a movie to be played on a

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television station that has only been granted licensing rights to show the movie with a Spanish audio track, English and French audio tracks will not be provided.

[0114] Syndication information relating to advertisements also can be dependent on any of a variety of determined contextual data. Such syndication information can include determining whether to include one or more advertisements, identifying one or more advertisement servers to utilize during the playback of the requested media file, determining where, during the playback of the requested media file, to insert one or more advertisements, allocating advertisement time during playback of the requested media file among two or more advertisement servers, and the like. For example, it may be determined to not include advertisements in the playback of a requested media file if the corresponding request corresponds with a media provider 130 that offers a paid subscription service to customers. On the other hand, a request corresponding with a media provider 130 that offers advertisement-supported media content can include one or more advertisements. In addition, particular advertisements can be included or excluded, for example, when content is requested by a user of a particular telecommunications network, advertisements for competing telecommunications networks could be selected, preferred, or blocked.

[0115] Such syndication information regarding advertisements may be impacted by certain arrangements a content owner 1110 has with a media provider 130. For example, a content owner 1110 and a media provider 130 may have an arrangement that certain media files streamed to a website of the media provider 130 will contain some advertisements served by the media provider 130, and some advertisements served by the content owner 1110. Other arrangements can vary such that the content provider serves 130 all of the advertisements shown during playback of the requested media file, or the content owner 1110 serves all of the advertisements. Such allocation can dictate which advertisement servers 520 (see FIG. 5) are utilized during playback of the requested media file, and which advertisement servers are used to service which advertisement units. For example, the content owner 1110 may have an arrangement with a particular media provider 130 such that, for requests corresponding with a particular media provider 130, the media provider 130 can determine where during the playback of the media file advertisements are to be shown, and that the media provider 130 serves advertisements 25% of the time allocated for advertisements, where the content owner 1110 serves the advertisements the other 75% of the time. In response to requests corresponding with that particular media provider 130, the CHIMPS 110 can provide one or more index files to the requesting client 510 for playback

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of the requested media file. The one or more index files can ensure the advertisements are inserted at the specified parts of the playback of the requested media file, as well as utilize the particular content provider's advertisement server 25% of the time the content owner's advertisement server 75% of the time. Allocation schemes can be as detailed as desired, dictating not only which advertisement servers to use and how often to use them, but also when each server is to be used as well (e.g., use a particular server for a particular ad avail) as well as incorporating other factors. As with other syndication information discussed herein, syndication information regarding advertisements can take into account any of a variety of other contextual information, such as geographical location, time, information regarding a user of the end user device 140, network, and the like.

[0116] Syndication information relating to presentation can control the brand identity associated with the player, page, translucent logo or watermark, or other associated identifying information presented with the content before, after, or during playback. These syndication information can change over time, with the number of plays, or with the context within which the content appears. For example, the first playback could be associated with the media provider 130, while subsequent playbacks are associated with the content owner. As another example, playback for the first five days could be associated with the media provider 130, while playbacks after five days are associated with the content owner. As another example, playback within a page on the website of the media provider 130 could be associated with the media provider 130, but playback when the same URL or other content indicator is shared on a social networking site could be associated with the social network site.

[0117] Syndication information relating to streaming parameters can impact how a media file is served to the client 510. Such syndication information can, for example, determine chunk sizes and/or lengths, available bit rate(s), resolutions, frame rates, etc., that may be used during the playback of the requested media file. Certain content owners 1110 and/or content providers 130 may require, for example, require that certain media files be provided in a high-definition (HD) format only (e.g., requiring certain resolutions and frame rates). Syndication information regarding certain device types may require that the media file is served using particular-sized chunks to ensure the buffer of the end user device 140 is utilized efficiently for optimum playback. Other such syndication information are contemplated.

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[0118] Syndication information relating to security also can impact how a media file is served to the client 510 by the CHIMPS 110. Among other things, security can include digital rights management, watermarking, encryption, and the like. Thus, syndication information can be used to determine the type of DRM, watermarking, and/or encryption to use during the playback of the requested media file, if they are to be used at all. As shown herein, systems such as the CHIMPS 110 can implement encryption dynamically. Watermarking can be implemented in a similar fashion, as detailed in U.S. Patent Application No. 13/247,109 entitled "Forensic Watermarking," which is incorporated by reference herein in its entirety. Other forms of DRM may be executed in a similar fashion.

[0119] Syndication information relating to data collection can control how the CHIMPS 110, another digital process working with or independently from the CHIMPS 110, the client, the application on the client, the operating system or other software on the client, the network, or other element of digital service infrastructure interacts with one or more digital services to collect information or data to be used as additional context information, or to otherwise supplement the data otherwise available. For example, syndication information can control how the CHIMPS 110 or other digital process collects data from, or interacts with data collected from, link-shortening services, social networking services, digital content publication and management services, and content aggregation services to determine all or part of the combination, sequence, or both of some of, any of, all of, or any combination of, user, publication, or other actions associated with the content request.

[0120] Syndication information corresponding to reporting can control how the CHIMPS 110, another digital process working with or independently from the CHIMPS 110, the client, the application on the client, the operating system or other software on the client, the network, or other element of digital service infrastructure reports data associated with the content request to one or more digital information services. For example, syndication information can including which digital information services to which data will be reported, the data to be reported, and the data requirements, parameters, formats, protocols, or other technical characteristics to be used. As further examples, a given business rule could specify any of, all of, or any combination of, reporting data to a social networking service about a content request, the extent of content playback, and the user who requested the content (such as might be required for reporting to Facebook OpenGraph); reporting data to a social networking service about a content aggregation app used to request content (such as reporting to Twitter that News360 was used to request content from a Twitter message);

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reporting data to multiple analytics services, or to one analytics service with respect to more than one reporting entity, or both, about a content request and the extent of content playback (such that the analytics systems utilized by both the content owner 1110 and the media provider 130 receive information regarding the content playback); and reporting data to multiple media measurement services, or to one media measurement service with respect to more than one reporting entity, or both, about a content request and the extent of content playback (such that the media measurement services utilized by the content owner, the media provider 130, one or more advertisers associated with the content playback, and one or more advertising agencies, receive information regarding some or all aspects of the content playback).

[0121] It will be understood that syndication information not only can impact how systems such as the CHIMPS 110 provide index files for playback of a requested media file, but they can also impact any communication (e.g., XML instruction set) from the CHIMPS 110 to the client 510, and can also impact how the client 510 interacts with other digital services and resources, including the user agent, the device, the network servicing the device, or other digital services and resources available to the client 510. Syndication information based on contextual data may impact how the client 510 displays the requested media file on a particular end user device 140, which may or may not be included in an index file. For example, syndication information can dictate that certain data objects be utilized, which, among other things, can affect the appearance of a certain media player on an end user device 140. The data objects can be included in an instruction set provided to the client 510 by the CHIMPS 110. Utilization and customization of such data objects is disclosed in U.S. Patent Application No. 12/888,089, entitled "Dynamic Application Programming Interface," which is incorporated by reference herein in its entirety. Other categories of syndication information for dynamically executing syndication services are also contemplated.

[0122] The automatic implementation of syndication information based on contextual data for syndication services can provide a content owner with much more information for and control over media content than in traditional media servicing systems. Not only can the content owner 1110 control where the media is stored, as indicated above (e.g., at one or more MFDSPs 150 or other delivery infrastructure(s) compatible with the CHIMPS 110), it allows the content owner 1110 to utilize the CHIMPS 110 to provide analysis of playback and other reporting data for all content provider(s) 130. Because the CHIMPS 110 is

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utilized in determining the playback of the media, it can provide detailed analytics regarding playback of a media file. Among other things, such analytical data for all media provider(s) 130 can allow a content owner 1110 to maximize revenue and user experience in a variety of ways. For example, for a given media file, the content owner 1110 can see how many times the media file has been played for each media provider 130. The content owner 1110 further can determine how many advertisements each media provider 130 is inserting into the playback of the media file and when the advertisements are inserted. With this information, the content owner 1110 can compare, among content provider(s) 130, playback of the media file to help determine a best methods of playback for optimum user experience, advertisement revenue, etc.

[0123] Furthermore, a content owner 1110 can guard against improper and/or unlicensed use of media content. For example, if a request for a media file is associated with an unknown media provider 130, a third party, or is associated with a media provider 130 but utilized in an improper and/or unlicensed manner, syndication information can be implemented to take measures desired by the content owner 1110, such as prohibit playback of the media file, playback a video directing a user to another website to view the requested media file, or simply utilize a default ad server specified by the content owner 1110. Thus, embodiments provided herein enable a content owner 1110 far greater downstream syndication management than traditional techniques.

[0124] The CHIMPS 110, or another system operating in conjunction with the CHIMPS 110, loosely or tightly synchronized with the CHIMPS 110, or independently from the CHIMPS 110, also can be configured to interpret script language to implement the syndication information on multiple platforms (e.g., environments having different client types and/or end user device types) and add new capabilities, or can be configured to provide, transmit, load, or otherwise supply scripts, script files, and related scripting information to end user clients, devices, applications, operating systems, or other client elements, or be configured to do both. This allows a content owner 1110 and/or media provider(s) 130 to provide syndication information for one or more media files that can be dynamically implemented by the CHIMPS 110 during runtime on a variety of platforms.

[0125] **FIG. 13** is a simplified block diagram of an embodiment in which the CHIMPS 110 utilizes platform-specific software, such as software development kits (SDKs) 1310, to interpret script provided by a content owner 1110, media provider 130, stored in the

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CHIMPS 110, or received from another source. The CHIMPS 110 can then provide device and/or client-specific interpreted script such that syndication information provided in the script are dynamically implemented for the various end user device types 1320 (and/or clients) during runtime.

[0126] The script provided by the content owner 1110 can be any of a variety of known scripts. This includes, for example, Hyper Text Markup Language (HTML) 5, Cascading Style Sheets (CSS), JavaScript, other XML-based scripting languages, and the like. Additionally or alternatively, the script may be in a format specific to the CHIMPS 110. This script can define various context-based syndication information, such as those discussed above, to implement various features and/or functionality in different environments. For example, to implement a certain command under HTML 5 in an operating system running on a certain type of end user device type 1320-1, an objective C library may be required. Thus, an SDK 1310-1 corresponding to the type of operating system and/or end user device type 1320-1 can include the objective C library, which can be utilized by the CHIMPS 110 to ensure that the command is properly executed.

[0127] The SDKs 1310 utilized by the CHIMPS 110 can provide any of a variety of features and/or functionality to help apply the syndication information provided in the script. This can include dynamic stream switching (adaptive bit rate streaming), DRM protection, encryption, and other features. In one embodiment, for example, the SDKs 1310 include a series of JavaScript libraries that can be utilized to provide the desired functionality across various platforms, providing interpreted script in the native language of each end user device type 1320. Because the SDKs 1310 are customized to different end user device types 1320, the CHIMPS 110 can utilize the SDKs 1310 to take advantage of built-in functionality of certain end user device types 1320 (e.g., encryption, DRM, chunking, and other technologies), while providing additional functionality to other end user device types 1320. For example, a first end user device type 1320-2 may have encryption technology, in which case the corresponding SDK 1310-2 can be configured to utilize the encryption technology to communicate with devices of the first end user device type 1320-2. A second end user device type 1320-3 may not have any native encryption technology, in which case the corresponding SDK 1310-3 can include its own encryption/decryption libraries to compensate. Because the CHIMPS 110 automatically interprets the script provided by the content owner 1110, the content owner does not need to provide different scripts for different end user device types 1320-2, allowing the CHIMPS 110 to effectively

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close the gap between the script provided by the content owner 1110 and the interpreted script required by each end user device type 1320.

[0128] As another example, a first end user device type 1320-2 may provide adaptive bit rate streaming natively, in which case a corresponding SDK 1310-2 can be configured to utilize the native adaptive bit rate streaming to enable devices of the first end user device type 1320-2 to dynamically switch streams according to available band width and other factors. A second end user device type 1320-3 may not have any native adaptive bit rate streaming, in which case the corresponding SDK 1310-3 can implement a playback control that extends the native capabilities of the device type 1320-3 to include adaptive streaming. Again, because the CHIMPS 110 automatically interprets the script provided by the content owner 1110, the content owner does not need to provide different scripts for different end user device types 1320-2, allowing the CHIMPS 110 to uniformly provide adaptive streaming to all end user device types 1320, thereby providing a similar experience regardless of the device type 1320 utilized.

[0129] Notwithstanding the fact that the above functionality can allow the content owner to provide a single script that can be interpreted by the CHIMPS 110 in a variety of environments, syndication information provided by the content owner 1110 in the script can provide for syndication information that are specific to certain end user device types. For example, the syndication information can require the use of certain a DRM when streaming a requested media file to a particular end user device type 1320. A different DRM may be specified when streaming the requested media file to end user device type 1320. Furthermore, the above functionality enabled by the SDKs 1310 can apply to commands, control code, or instruction sets, including scripts such as XML or Javascript, pseudocode, bytecode, executable code, interpretable code, machine language, or other programming instructions, provided by the CHIMPS 110 to the various end user device types 1320 that include instructions regarding functionality other than streaming media files.

[0130] FIG. 14 is a simplified flow chart illustrating how a system, such as the CHIMPS 110, can utilize syndication information and contextual data to provide different instruction sets in response to different requests for the same media file by devices of different device types, according to one embodiment. As with all other figures provided herein, FIG. 14 is provided as an example and is not limiting. Various blocks may be combined, separated,

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and/or otherwise modified, depending on desired functionality. Furthermore, different blocks may be executed by different components of a system and/or different systems.

[0131] At block 1405, one or more syndication information relating to a media file are received. As indicated previously, such syndication information can be provided by a content owner or other entity utilizing a script, such as an XML-based scripting language, in any of a variety of formats. At block 1415, a first request for the media file corresponding to a first device type is received, and at block 1425 contextual data related to the first request is determined. As stated previously, contextual data can be obtained utilizing a variety of sources, and may include data corresponding to a variety of factors.

[0132] At block 1435 a first instruction set based on the syndication information and contextual data of the first request is generated. Generating the first instruction set can include use of an SDK corresponding to the first device type, which can allow instructions (i.e. syndication information) provided by a content owner to be downscripted into the language, or format, of the first device type. At block 1445 the first instruction set is provided in a first format.

[0133] Blocks 1455-1485 echo blocks 1415-1445 but in regards to a second request corresponding to a second device type. Accordingly, the second instruction set is provided in a second format different from the first, to accommodate a second language utilized by the second device type. Both first and second formats may be different from the format in which the syndication information relating to the media were received.

[0134] It should be noted that the methods, systems, and devices discussed above are intended merely to be examples. It must be stressed that various embodiments may omit, substitute, or add various procedures or components as appropriate. For instance, it should be appreciated that, in alternative embodiments, the methods may be performed in an order different from that described, and that various steps may be added, omitted, or combined. Also, features described with respect to certain embodiments may be combined in various other embodiments. Different aspects and elements of the embodiments may be combined in a similar manner. Also, it should be emphasized that technology evolves and, thus, many of the elements are examples and should not be interpreted to limit the scope of the invention.

[0135] Specific details are given in the description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the

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embodiments may be practiced without these specific details. For example, well-known circuits, processes, algorithms, structures, and techniques have been shown without unnecessary detail in order to avoid obscuring the embodiments. This description provides example embodiments only, and is not intended to limit the scope, applicability, or configuration of the invention. Rather, the preceding description of the embodiments will provide those skilled in the art with an enabling description for implementing embodiments of the invention. Various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the invention.

[0136] Also, it is noted that the embodiments may be described as a process which is depicted as a flow diagram or block diagram. Although each may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be rearranged. A process may have additional steps not included in the figure. Furthermore, embodiments of the methods may be implemented by hardware, software, firmware, middleware, microcode, hardware description languages, or any combination thereof. When implemented in software, firmware, middleware, or microcode, the program code or code segments to perform the necessary tasks may be stored in a non-volatile computer-readable medium such as a storage medium. Processors may perform the necessary tasks.

[0137] Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without departing from the spirit of the invention. For example, the above elements may merely be a component of a larger system, wherein other rules may take precedence over or otherwise modify the application of the invention. Also, a number of steps may be undertaken before, during, or after the above elements are considered. Accordingly, the above description should not be taken as limiting the scope of the invention.

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WHAT IS CLAIMED IS:

1. A method for enabling customized media file delivery via a data network, the method comprising:

extracting first contextual data from a first URL request for a media file, wherein the first URL request is received via the data network and corresponds to a first device type;

processing the first contextual data using syndication information to generate a first instruction set in a first format,

sending the first instruction set via the data network;

extracting second contextual data from a second URL request for the media file, wherein the second URL request is received via the data network and corresponds to a second device type;

processing the second contextual data using the syndication information to generate a second instruction set in a second format, and

sending the second instruction set via the data network.

2. The method for enabling customized media file delivery as recited in claim 1, wherein one or both of the first instruction set or the second instruction set includes information relating to at least one of:

a method of receiving chunks of the media file,

a form of digital rights management to utilize during playback of the media file,

one or more bit rates to use during playback of the media file, or

one or more advertisements to show during the playback of the media file.

3. The method for enabling customized media file delivery as recited in claim 1, further comprising receiving the syndication information in an Extensible Markup Language (XML)-based scripting language.

4. The method for enabling customized media file delivery as recited in claim 1, wherein processing the first contextual data using the syndication information to generate the first instruction set includes automatically utilizing a software development kit (SDK) corresponding to the first device type.

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5. The method for enabling customized media file delivery as recited in claim 1, wherein one or both of the first instruction set or the second instruction set includes an index file for streaming the media file.

6. The method for enabling customized media file delivery as recited in claim 5, further comprising including at least one Uniform Resource Locator (URL) in the index file.

7. The method for enabling customized media file delivery as recited in claim 1, wherein one or both of the first instruction set or the second instruction set includes a URL.

8. The method for enabling customized media file delivery as recited in claim 1, wherein either or both of the first contextual data or second contextual data comprises data corresponding to one or more of:

a network type,

one or both of the first device type or the second device type,

an operating system or application type,

a media provider,

a web page,

a globally-unique identifier (GUID),

a location associated with a device,

information associated with a user of a device, or

information regarding the media file.

9. A server enabling customized media file delivery with a data network, the server comprising:

a network interface for communicating with the data network;

a memory; and

a processor communicatively coupled with the memory and the network interface, the processor further configured to:

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extract first contextual data from a first URL request for a media file, wherein the first URL request is received via the network interface and corresponds to a first device type;

process the first contextual data using syndication information to generate a first instruction set in a first format,

send the first instruction set via the network interface;

extract second contextual data from a second URL request for the media file, wherein the second URL request is received via the network interface and corresponds to a second device type;

process the second contextual data using the syndication information to generate a second instruction set in a second format, and

send the second instruction set via the network interface.

10. The server enabling customized media file delivery as recited in claim 9, wherein the processor is further configured to generate one or both of the first instruction set or the second instruction set to include information relating to at least one of:

a method of receiving chunks of the media file,

a form of digital rights management to utilize during playback of the media file,

one or more bit rates to use during playback of the media file, or

one or more advertisements to show during the playback of the media file.

11. The server enabling customized media file delivery as recited in claim 9, wherein the processor is further configured to generate one or both of the first instruction set or the second instruction set to include an index file for streaming the media file.

12. The server for enabling customized media file delivery as recited in claim 11, wherein the index file includes at least one URL.

13. The server for enabling customized media file delivery as recited in claim 9, wherein the processor is further configured to generate one or both of the first instruction set or the second instruction set to include a URL.

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14. A system for enabling customized media file delivery via a data network, the system comprising:

means for extracting first contextual data from a first URL request for a media file, wherein the first URL request is received via the data network and corresponds to a first device type;

means for processing the first contextual data using syndication information to generate a first instruction set in a first format,

means for sending the first instruction set via the data network;

means for extracting second contextual data from a second URL request for the media file, wherein the second URL request is received via the data network and corresponds to a second device type;

means for processing the second contextual data using the syndication information to generate a second instruction set in a second format, and

means for sending the second instruction set via the data network.

15. The system for enabling customized media file delivery as recited in claim 14, further comprising means for receiving the syndication information in an Extensible Markup Language (XML)-based scripting language.

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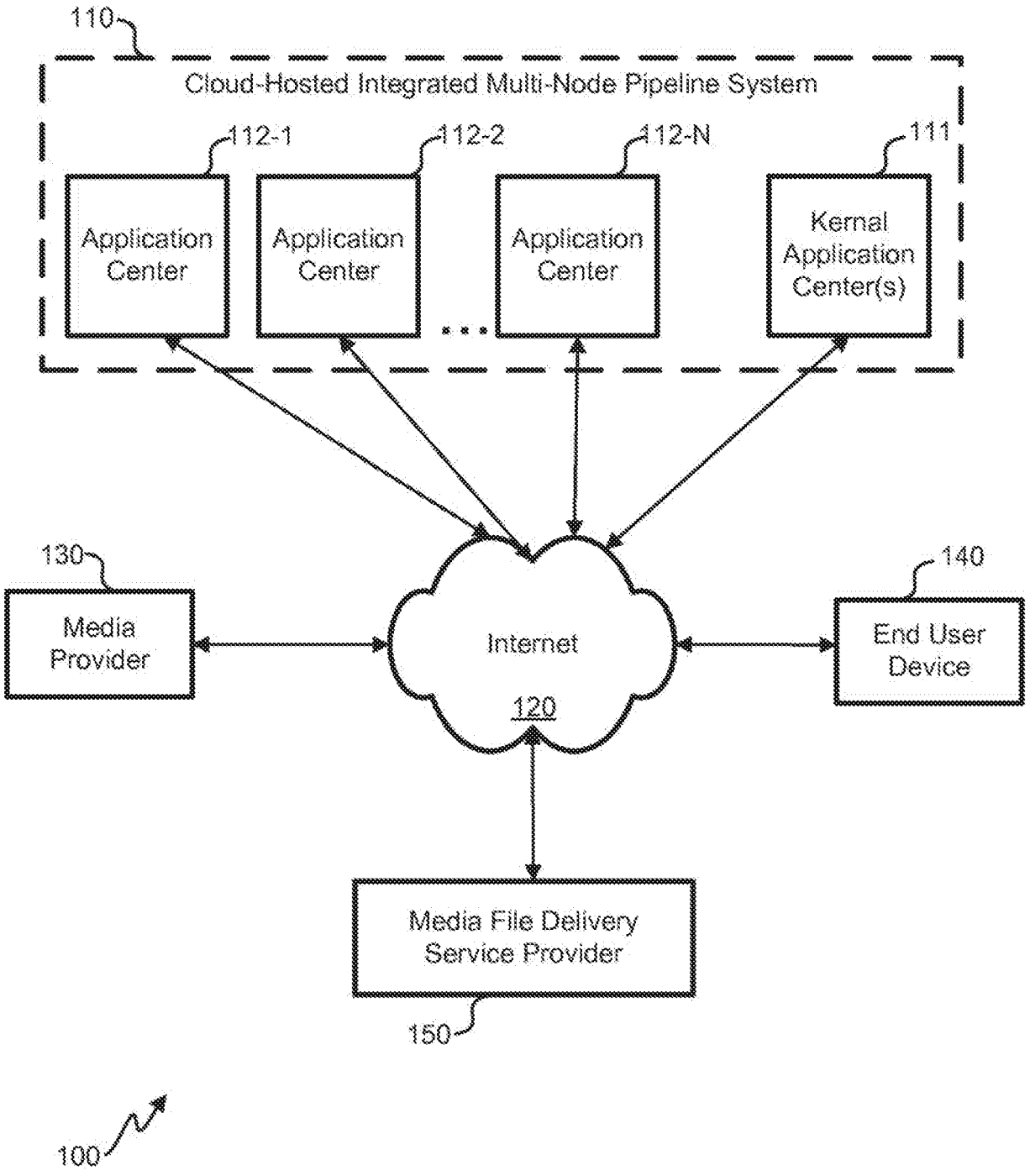

110
Cloud-Hosted Integrated Multi-Node Pipeline System
112-1
112-2
112-N
111
Application Center
Application Center
Application Center
Kernal Application Center(s)
130
Media Provider
Internet
120
140
End User Device
Media File Delivery Service Provider
150
100

FIG. 1

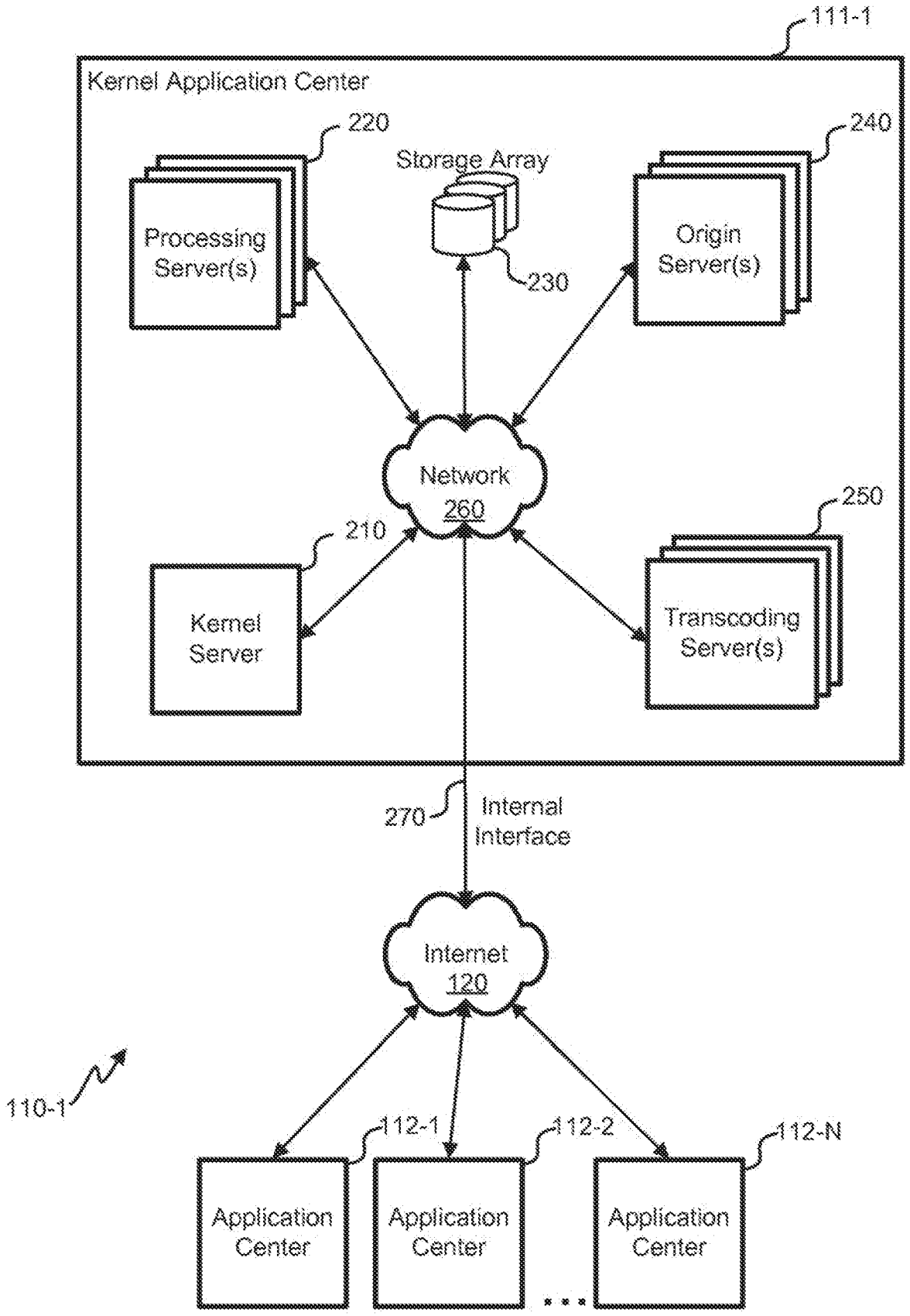

111-1
Kernel Application Center
220
Processing Server(s)
Storage Array
230
240
Origin Server(s)
Network 260
210
Kernel Server
250
Transcoding Server(s)
270
Internal Interface
Internet 120
110-1
112-1
112-2
112-N
Application Center
Application Center
Application Center

FIG. 2A

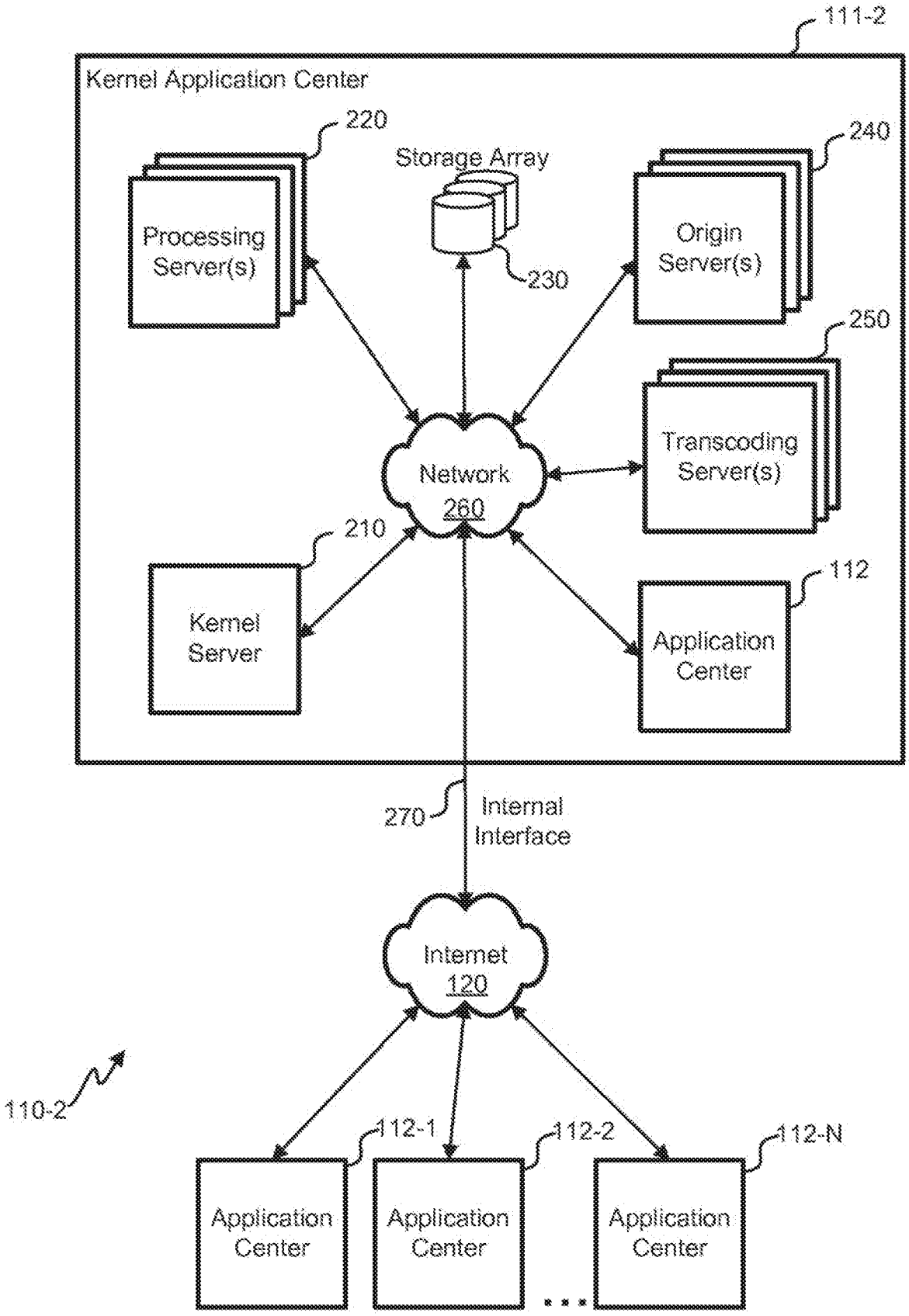

111-2
Kernel Application Center
220
Processing Server(s)
Storage Array
230
240
Origin Server(s)
250
Transcoding Server(s)
Network 260
210
Kernel Server
112
Application Center
270
Internal Interface
Internet 120
110-2
112-1
112-2
112-N
Application Center
Application Center
Application Center

FIG. 2B

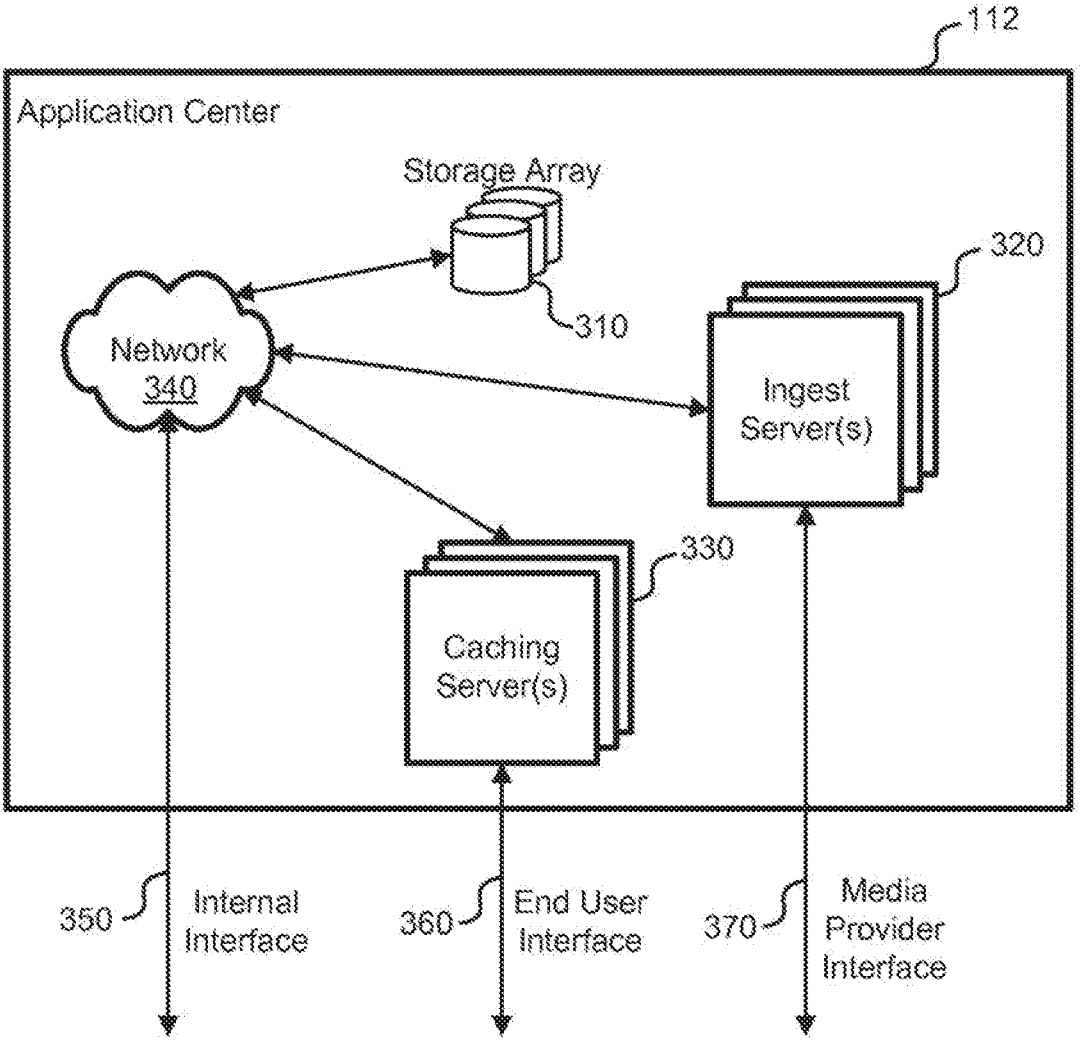

112
Application Center
Storage Array
310
320
Network
340
Ingest
Server(s)
330
Caching
Server(s)
350
Internal
Interface
360
End User
Interface
370
Media
Provider
Interface

FIG. 3

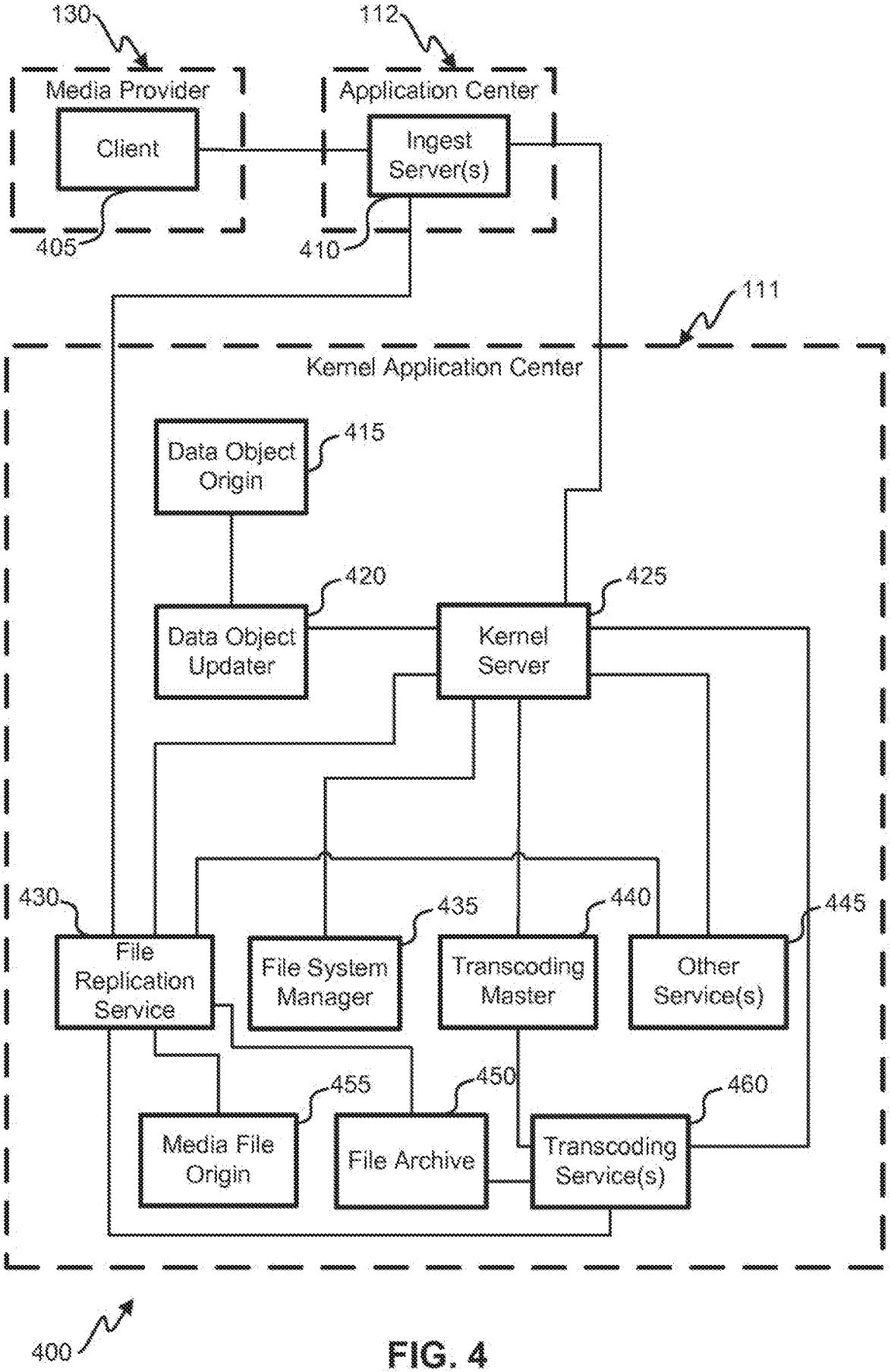

130
Media Provider
Client
405
112
Application Center
Ingest Server(s)
410
111
Kernel Application Center
Data Object Origin
415
Data Object Updater
420
Kernel Server
425
430
File Replication Service
File System Manager
435
Transcoding Master
440
Other Service(s)
445
Media File Origin
455
File Archive
450
Transcoding Service(s)
460
400

FIG. 4

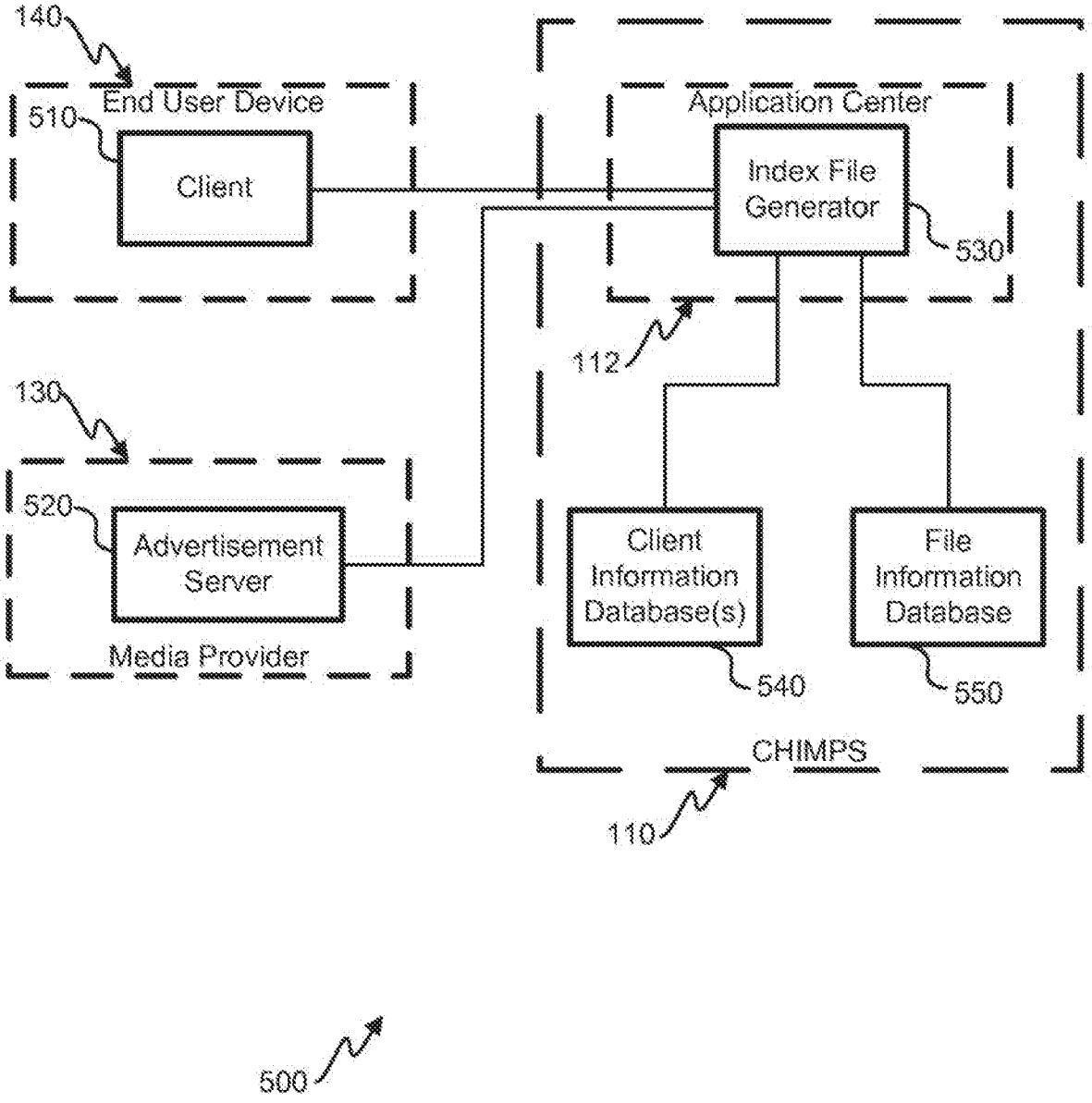

140
End User Device
510
Client
Application Center
Index File Generator
530
112
130
520
Advertisement Server
Media Provider
Client Information Database(s)
540
File Information Database
550
CHIMPS
110
500

FIG. 5

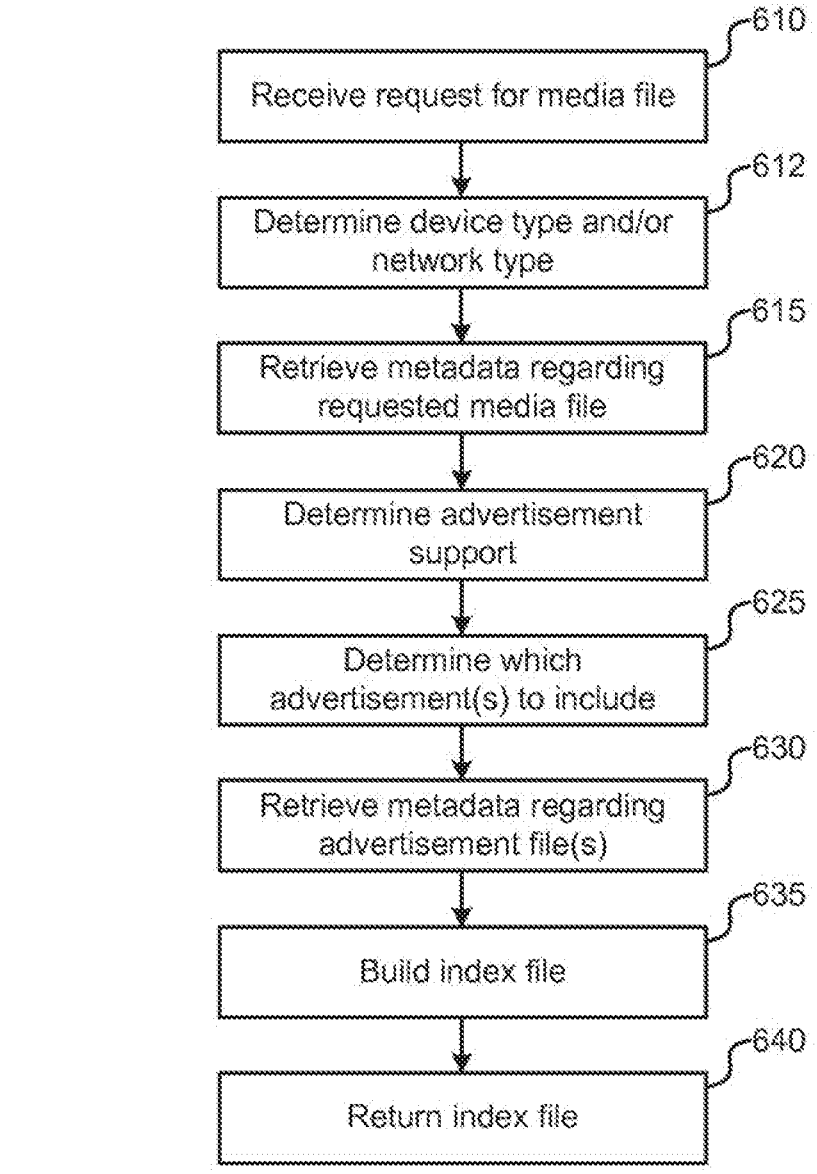

610
Receive request for media file
612
Determine device type and/or network type
615
Retrieve metadata regarding requested media file
620
Determine advertisement support
625
Determine which advertisement(s) to include
630
Retrieve metadata regarding advertisement file(s)
635
Build index file
640
Return index file
600-1

FIG. 6A

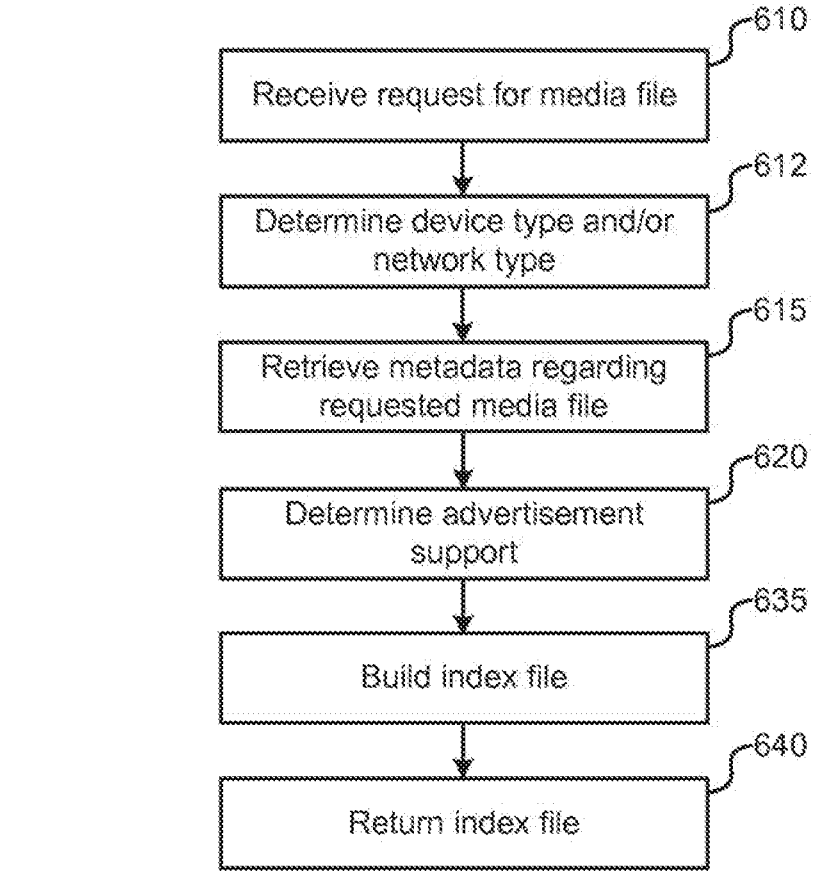

610
Receive request for media file
612
Determine device type and/or network type
615
Retrieve metadata regarding requested media file
620
Determine advertisement support
635
Build index file
640
Return index file
600-2

FIG. 6B

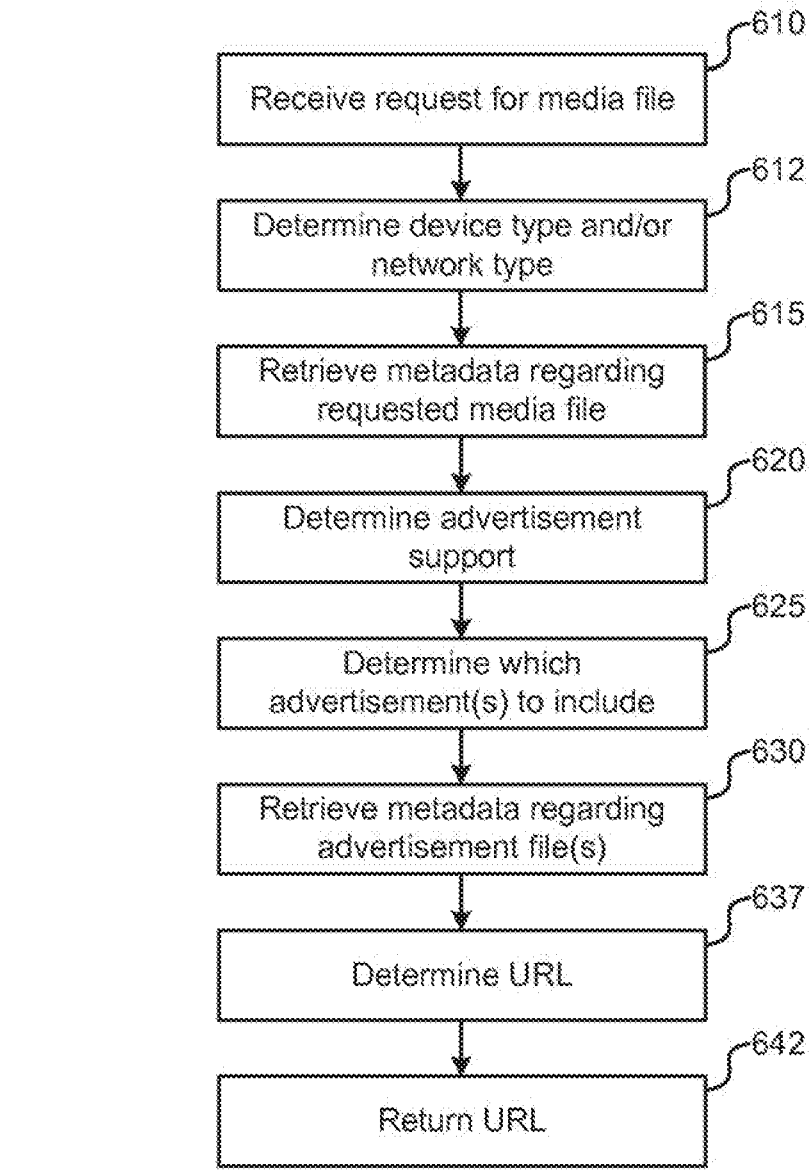

610
Receive request for media file
612
Determine device type and/or network type
615
Retrieve metadata regarding requested media file
620
Determine advertisement support
625
Determine which advertisement(s) to include
630
Retrieve metadata regarding advertisement file(s)
637
Determine URL
642
Return URL
600-3

FIG. 6C

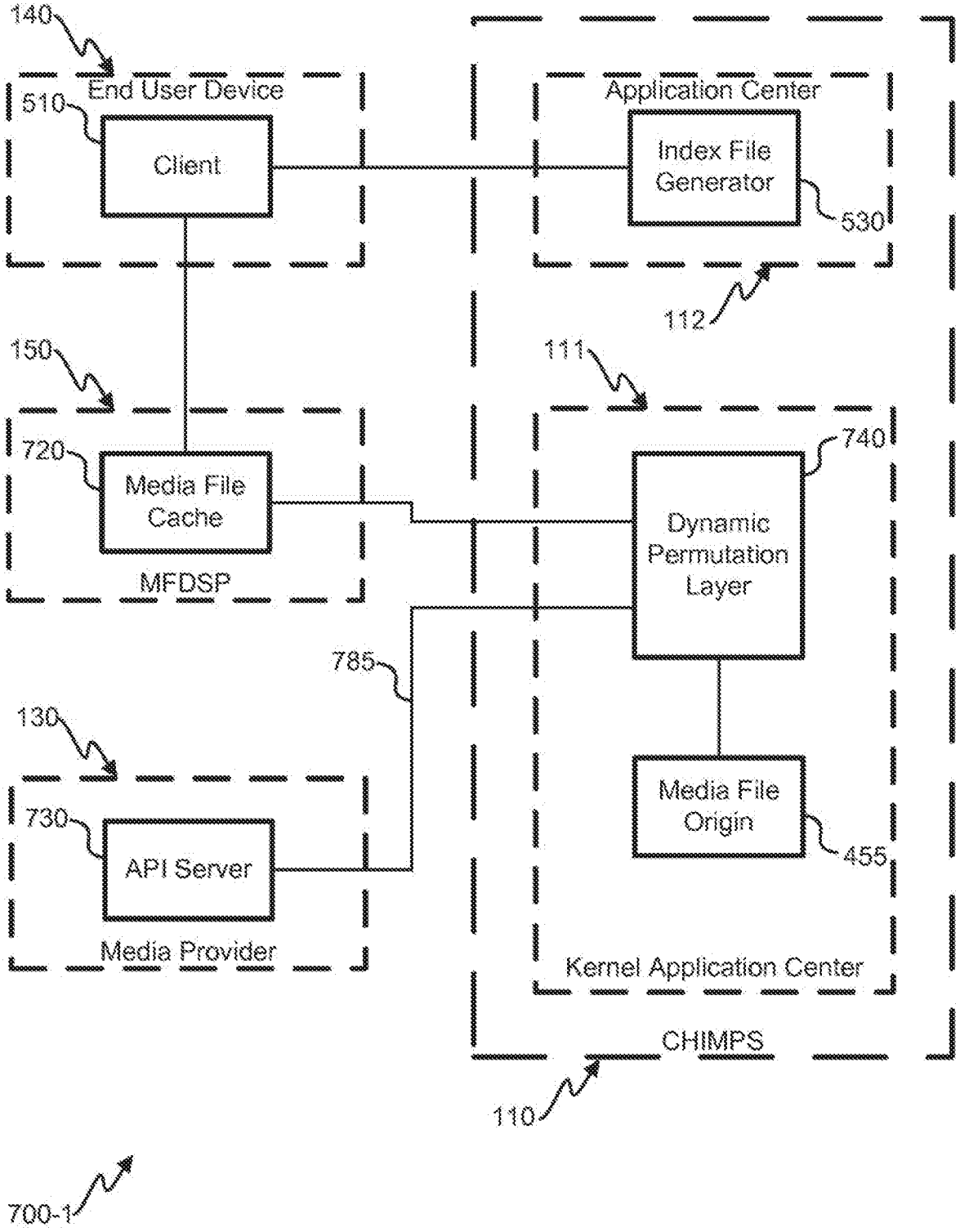

140
End User Device
510
Client
Application Center
Index File Generator
530
112
150
111
720
Media File Cache
MFDSP
740
Dynamic Permutation Layer
785
130
730
API Server
Media Provider
Media File Origin
455
Kernel Application Center
CHIMPS
110
700-1

FIG. 7A

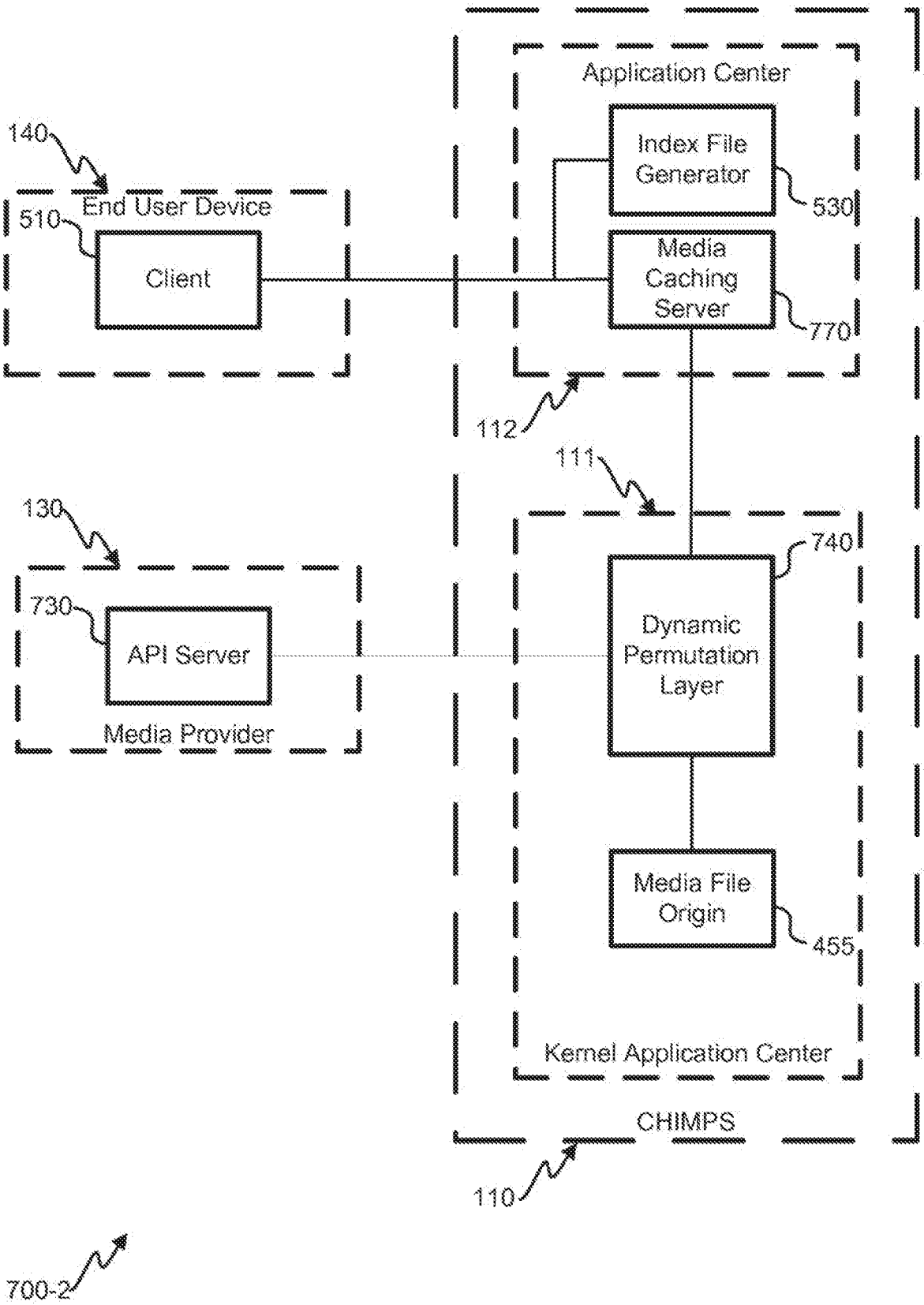

Application Center
Index File Generator
530
140
End User Device
510
Client
Media Caching Server
770
112
111
130
740
730
API Server
Dynamic Permutation Layer
Media Provider
Media File Origin
455
Kernel Application Center
CHIMPS
110
700-2

FIG. 7B

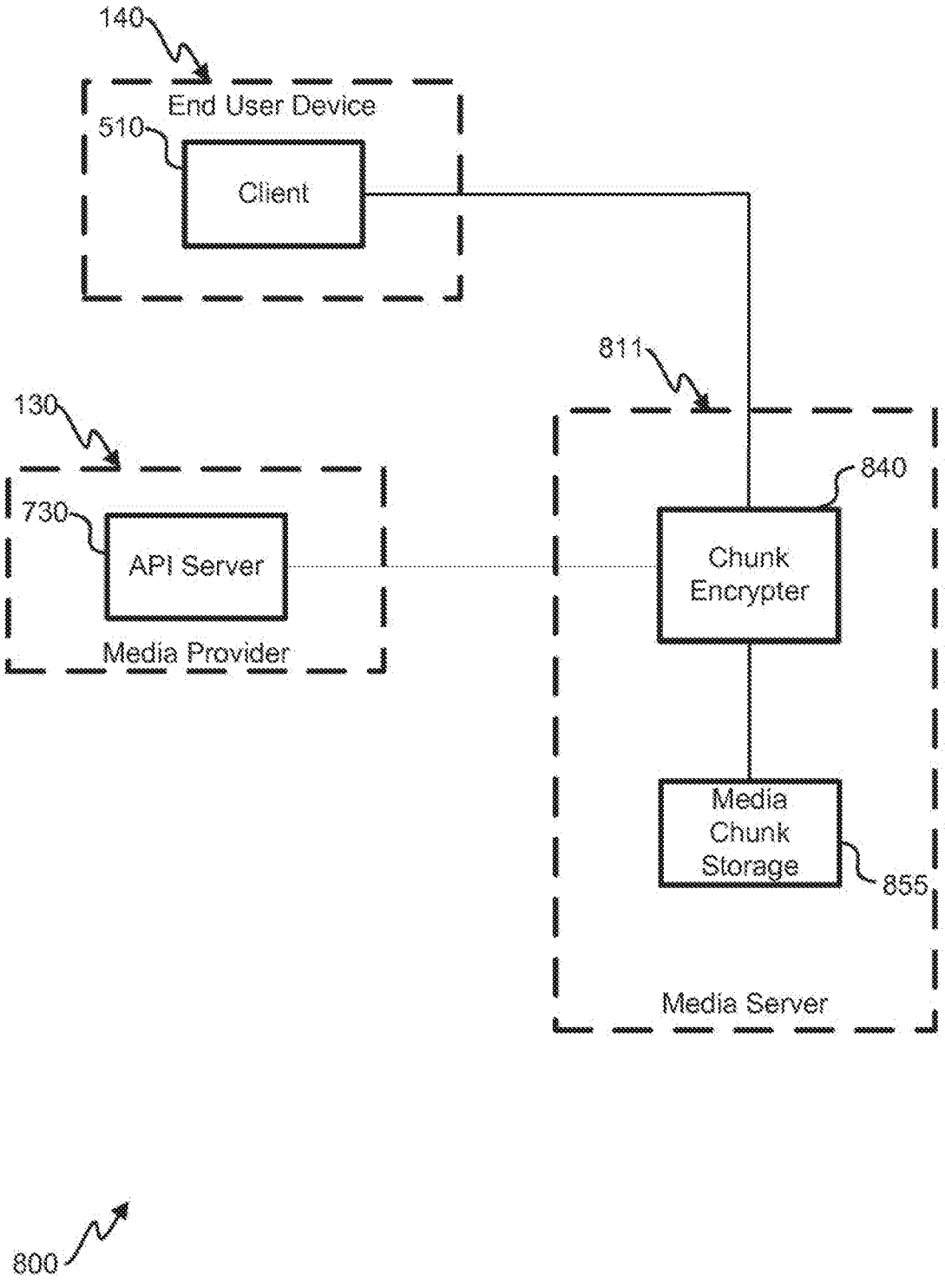

140
End User Device
510
Client
811
130
840
730
API Server
Chunk Encrypter
Media Provider
Media Chunk Storage
855
Media Server
800

FIG. 8

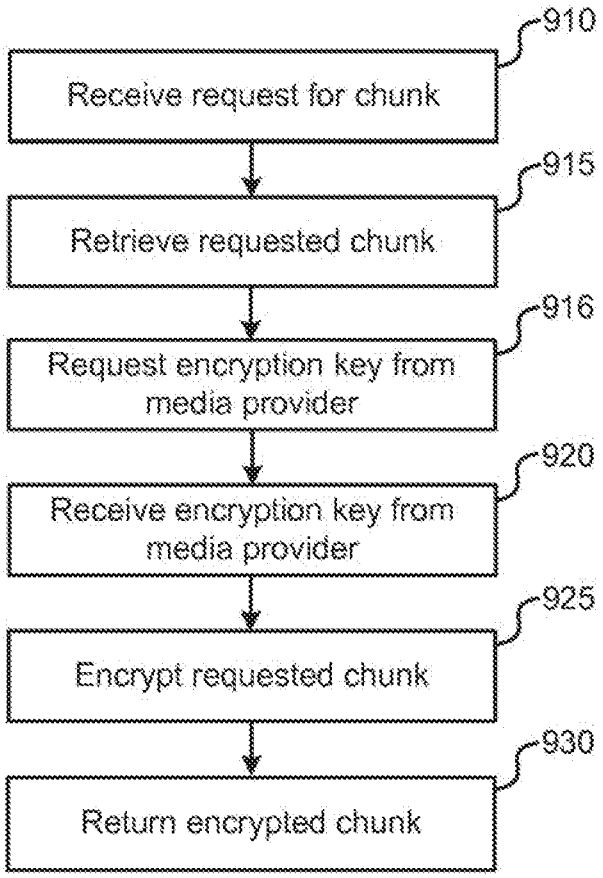

910
Receive request for chunk
915
Retrieve requested chunk
916
Request encryption key from media provider
920
Receive encryption key from media provider
925
Encrypt requested chunk
930
Return encrypted chunk
900-1

FIG. 9A

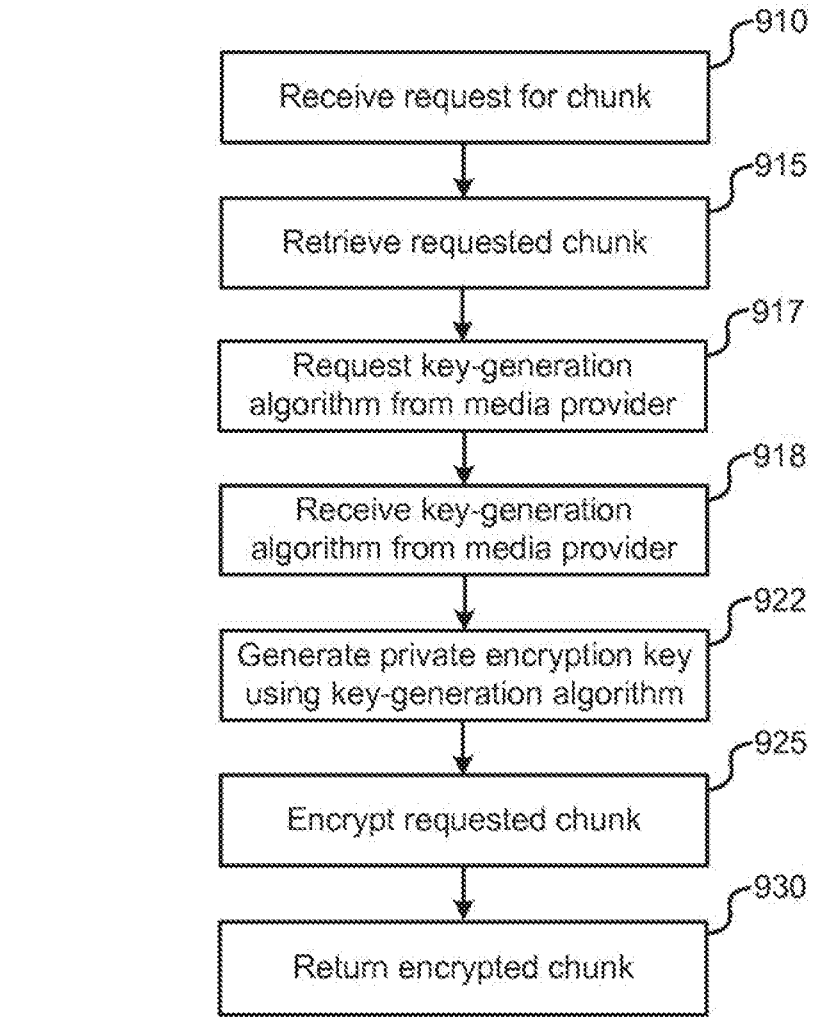

910
Receive request for chunk
915
Retrieve requested chunk
917
Request key-generation algorithm from media provider
918
Receive key-generation algorithm from media provider
922
Generate private encryption key using key-generation algorithm
925
Encrypt requested chunk
930
Return encrypted chunk
900-2

FIG. 9B

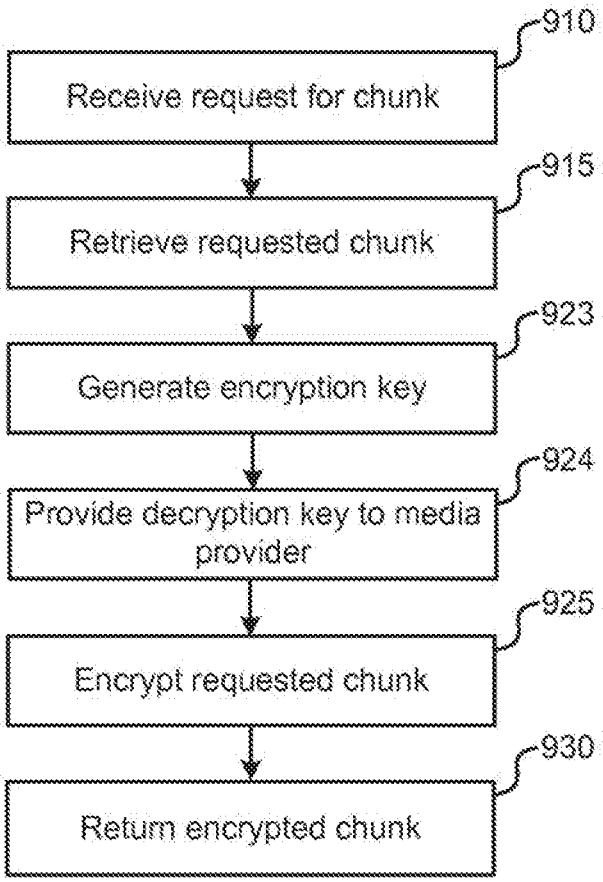

910
Receive request for chunk
915
Retrieve requested chunk
923
Generate encryption key
924
Provide decryption key to media provider
925
Encrypt requested chunk
930
Return encrypted chunk
900-3

FIG. 9C

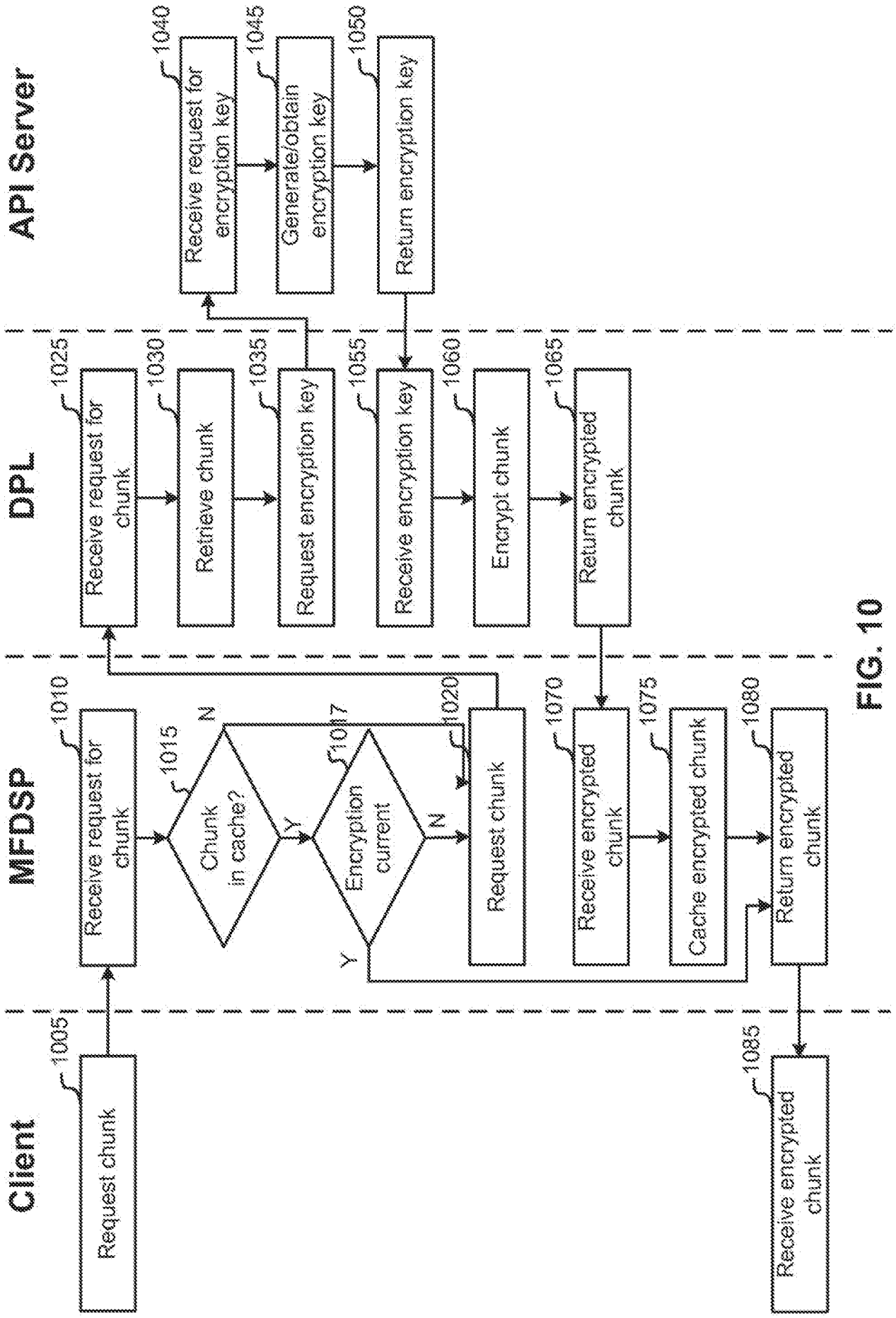

Client
MFDSP
DPL
API Server
Request chunk
1005
Receive request for chunk
1010
Chunk in cache?
1015
N
Y
Encryption current
1017
Y
N
Request chunk
1020
Receive request for chunk
1025
Retrieve chunk
1030
Request encryption key
1035
Receive request for encryption key
1040
Generate/obtain encryption key
1045
Return encryption key
1050
Receive encryption key
1055
Encrypt chunk
1060
Return encrypted chunk
1065
Receive encrypted chunk
1070
Cache encrypted chunk
1075
Return encrypted chunk
1080
Receive encrypted chunk
1085

FIG. 10

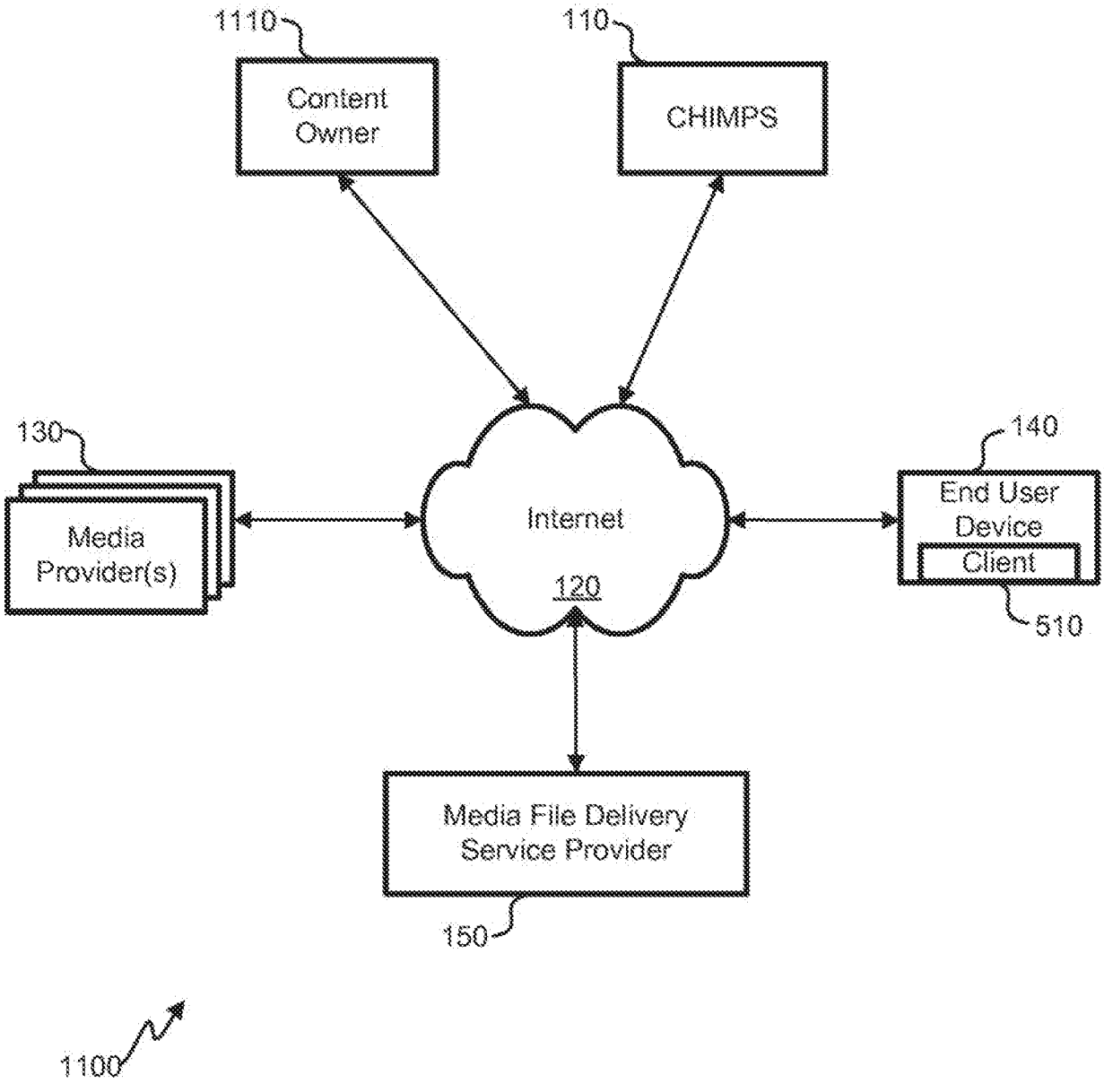
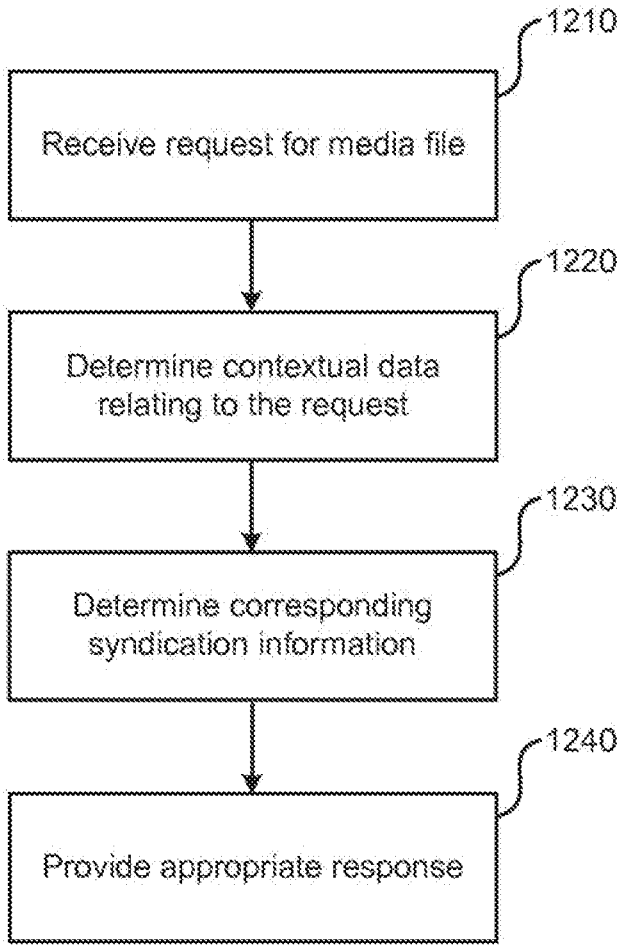

1110
Content Owner
110
CHIMPS
130
Media Provider(s)
Internet
120
140
End User Device
Client
510
Media File Delivery Service Provider
150
1100

FIG. 11



1200-1

FIG. 12A

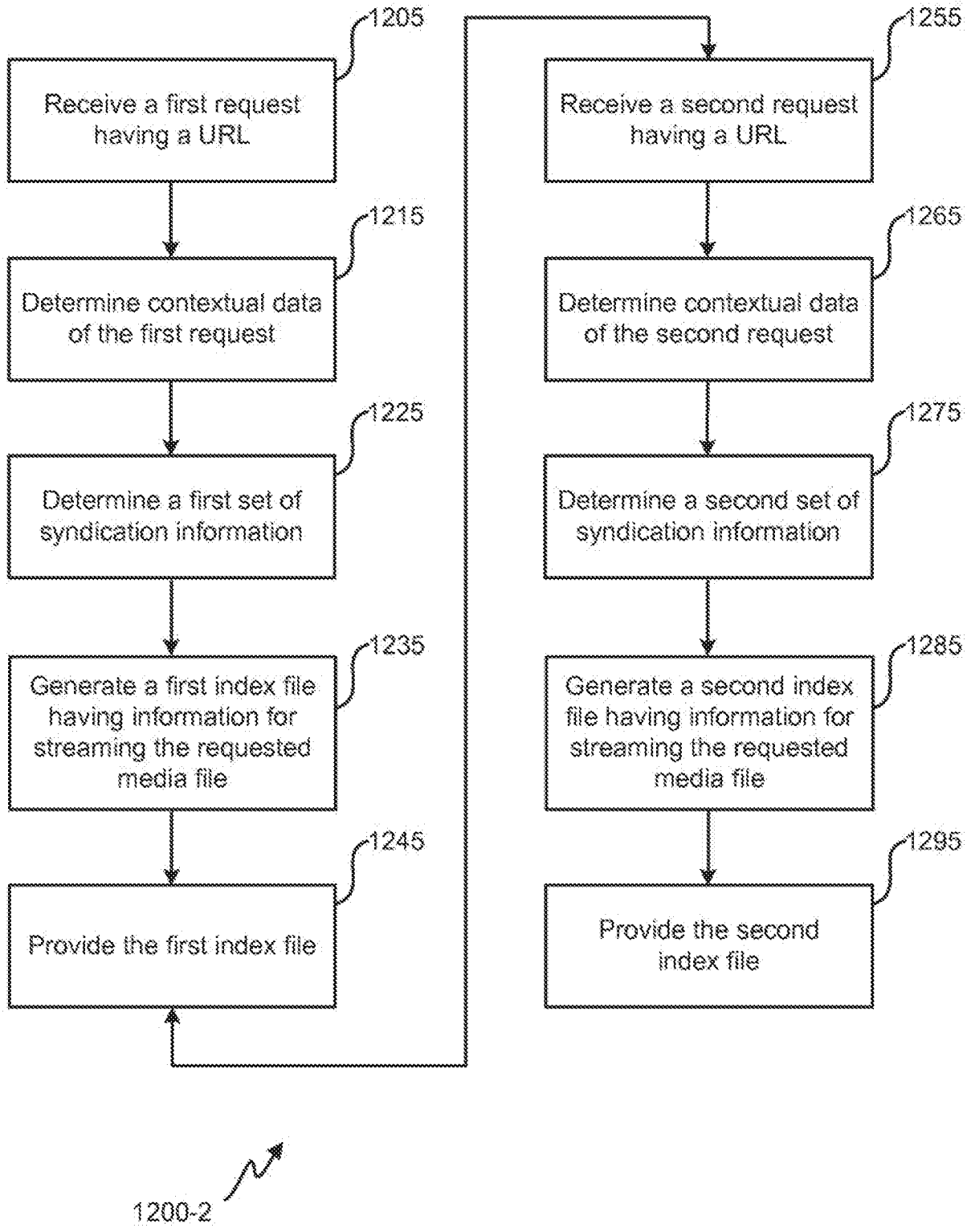

1205
Receive a first request having a URL
1215
Determine contextual data of the first request
1225
Determine a first set of syndication information
1235
Generate a first index file having information for streaming the requested media file
1245
Provide the first index file
1255
Receive a second request having a URL
1265
Determine contextual data of the second request
1275
Determine a second set of syndication information
1285
Generate a second index file having information for streaming the requested media file
1295
Provide the second index file
1200-2

FIG. 12B

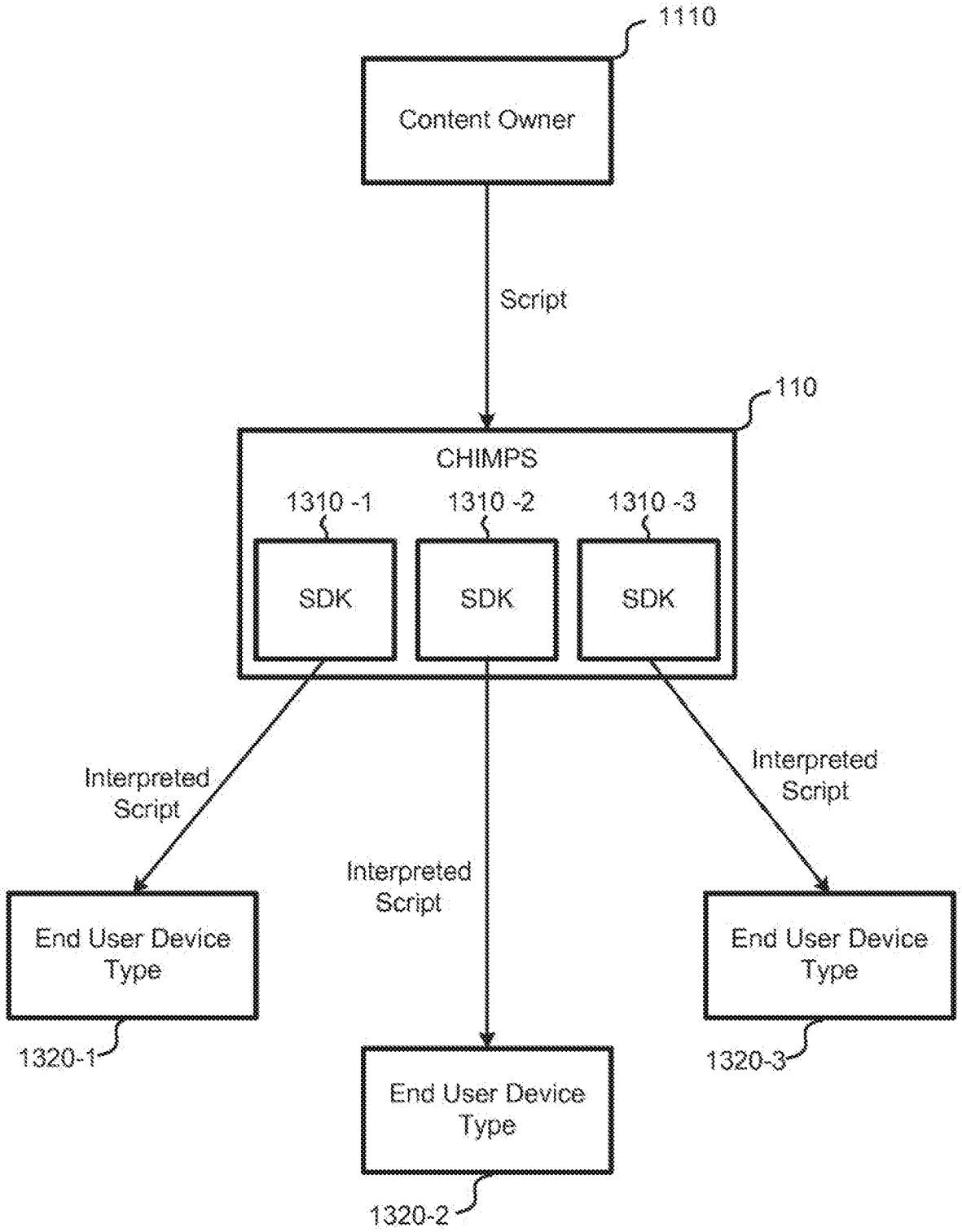

1110
Content Owner
Script
110
CHIMPS
1310 -1
1310 -2
1310 -3
SDK
SDK
SDK
Interpreted Script
Interpreted Script
Interpreted Script
End User Device Type
End User Device Type
End User Device Type
1320-1
1320-2
1320-3

FIG. 13

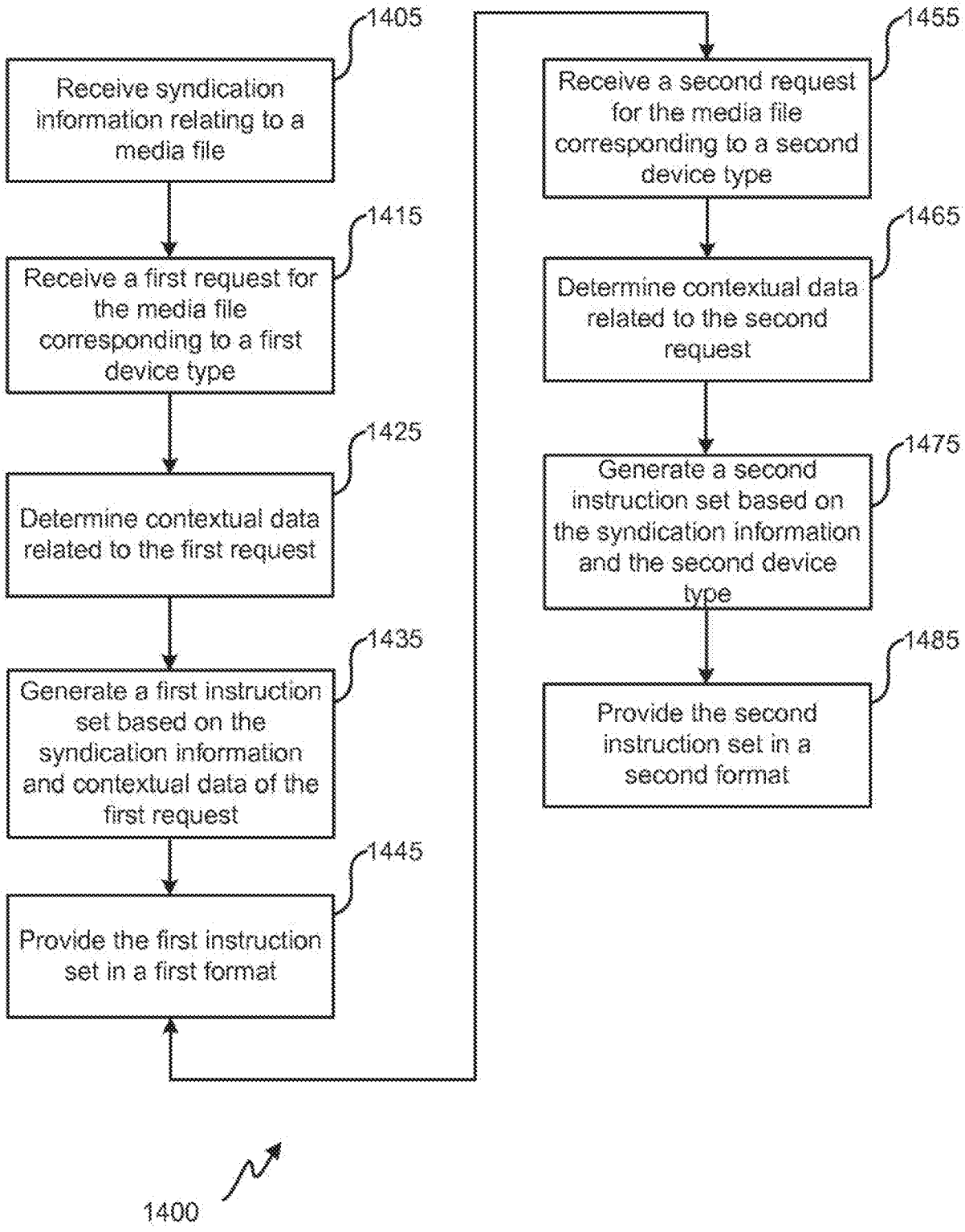

1405
Receive syndication information relating to a media file
1415
Receive a first request for the media file corresponding to a first device type
1425
Determine contextual data related to the first request
1435
Generate a first instruction set based on the syndication information and contextual data of the first request
1445
Provide the first instruction set in a first format
1455
Receive a second request for the media file corresponding to a second device type
1465
Determine contextual data related to the second request
1475
Generate a second instruction set based on the syndication information and the second device type
1485
Provide the second instruction set in a second format
1400

FIG. 14

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A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F17/30
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/129907 A1 (VOLK ANDREW R [US] ET AL) 15 June 2006 (2006-06-15) abstract paragraph [0003] - paragraph [0006] paragraph [0009] - paragraph [0014] paragraph [0019] - paragraph [0027] paragraph [0040] - paragraph [0045] paragraph [0051] - paragraph [0060] paragraph [0064] - paragraph [0071] paragraph [0073] - paragraph [0076] paragraph [0080] - paragraph [0092] paragraph [0096] - paragraph [0125] paragraph [0130] - paragraph [0147] paragraph [0151] - paragraph [0153] ----- -/--	1-15

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

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010 (2010-12-23) abstract paragraph [0001] - paragraph [0008] paragraph [0023] - paragraph [0037] paragraph [0047] - paragraph [0058] paragraph [0060] - paragraph [0070] paragraph [0074] - paragraph [0075] -----	1-15
A	US 2001/029525 A1 (LAHR NILS B [US]) 11 October 2001 (2001-10-11) abstract paragraph [0004] - paragraph [0006] paragraph [0017] - paragraph [0022] paragraph [0032] paragraph [0038] paragraph [0044] paragraph [0054] - paragraph [0059] -----	1-15

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AU 2010202741 B1	23-12-2010	AU 2010202741 B1	23-12-2010
		US 2012005312 A1	05-01-2012
		US 2012185608 A1	19-07-2012
US 2001029525 A1	11-10-2001	AU 3657101 A	07-08-2001
		US 2001029525 A1	11-10-2001
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Declarations under Rule 4.17:

— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) Title: DYNAMICALLY-EXECUTED SYNDICATION SERVICES

(57) Abstract: Systems and methods for dynamically executing syndication services are provided that automatically implement syndication information for syndication based on contextual data corresponding to a request for a media file. These systems and methods may be part of a larger media servicing network that can be used to, among other things, process uploaded media content, provide it for streaming/downloading, and collect metric information regarding the streaming/downloading. The disclosed systems and methods provide for receiving a request having a Uniform Resource Locator (URL) and providing an index file in accordance with syndication information based on contextual data associated with the request. Embodiments further enable media content owners to distribute a single URL corresponding to a particular media file among many media providers, allowing a single media delivery and analytics services to provide comprehensive metric information regarding syndication for the all the media providers.

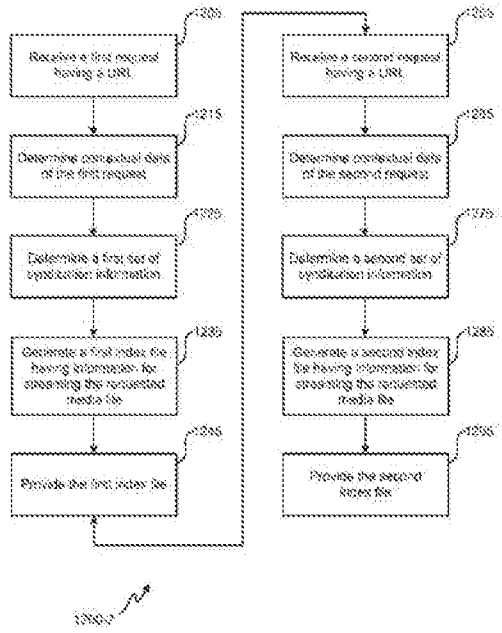


FIG. 12B

WO 2013/101841 A1

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

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DYNAMICALLY-EXECUTED SYNDICATION SERVICES

BACKGROUND OF THE INVENTION

[0001] The delivery of media over networks such as the Internet can be accomplished in many ways, including progressive downloading or streaming. Streaming a media file typically involves downloading "chunks," or small segments, of the media file. Information including where chunks may be accessed can be stored in an index file (also known as a "manifest" file). This index file can be delivered to a client, such as a media player application, for use in streaming. Additional information may also be provided, which can alter the appearance of the client. Due to the manner in which many media file delivery service providers deliver content, however, the degree to which media file delivery is customized, or media file syndication is controlled, is limited.

BRIEF SUMMARY OF THE INVENTION

[0002] Systems and methods are disclosed provide a technical solution for enabling customized media file delivery by utilizing syndication information based on contextual data extracted from a request for the media file. The disclosed systems and methods provide for receiving a request having a Uniform Resource Locator (URL) or other content indicator, such as an embed code, and providing an index file or other metadata suitably formatted and conveyed in accordance with syndication information based on contextual data associated with the content, the request for the content, both the content and the request for the content, the point in time corresponding to the content request, or other content or context attributes. Embodiments further enable media content owners to distribute, among many media providers, a single URL or other content indicator corresponding to a particular media file, such that the single URL or other content indicator is associated with different methods, characteristics, or aspects of identifying, presenting, monetizing, further distributing, sharing (by users or others), or otherwise handling, manipulating, or managing the content referenced by the single URL or other content indicator based on contextual data associated with the content, the request for the content, both the content and the request for the content, the point in time corresponding to the content request, or other content or context attributes, and enabling a single media delivery and analytics services to provide comprehensive metric information, including user, content, context,

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syndication, and other metrics, for the all the media providers and context with which the content is associated.

[0003] An example system for improved index files for media streaming via a data network, according to the description, can include a network interface for communicating with the data network, and an index file generator coupled to the network interface. The index file generator is configured to obtain, from one or more information sources, first contextual data related to a first request received by the network interface. The first request includes a URL indicative of a requested media file. The index file generator is further configured to generate a first index file based on the first contextual data and syndication information, send the first index file using the network interface, and obtain, from the one or more information sources, second contextual data related to a second request received using the network interface. The second request includes the same URL as the first request. The index file generator is also configured to generate a second index file based on the second contextual data and the syndication information, where content of the second index file is different from content of the first index file, and send the first index file using the network interface.

[0004] The example server for providing improved index file generation for media streaming via a data network, according to the description, includes communicating means for receiving, via the data network, a first request and a second request. The first request and the second request include a URL indicative of a requested media file. The communicating means are also configured to send a first index file and a second index file via the data network. The server further includes processing means for obtaining, from one or more information sources, first contextual data related to the first request, and second contextual data related to the second request, and generating, using syndication information, the first index file based on the first contextual data and the second index file based on the second contextual data. The content of the second index file is different from content of the first index file.

[0005] An example method for improved index file generation for media streaming via a data network, according to the description, can include obtaining, from one or more information sources, first contextual data related to a first request received via the data network. The first request includes a URL indicative of a requested media file. The method further includes generating a first index file based on the first contextual data and syndication information, sending the first index file via the data network, and obtaining, from the one or more information

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sources, second contextual data from a second request received via the data network. The second request includes the same URL as the first request. The method also includes generating a second index file based on the second contextual data and the syndication information, where content of the second index file is different from content of the first index file, and sending the first index file via the data network.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The present disclosure is described in conjunction with the appended figures:

[0007] FIG. 1 is a block diagram of a media servicing system.

[0008] FIG. 2A is a block diagram of an embodiment of a kernel application center connected with application centers.

[0009] FIG. 2B is a block diagram of an alternative embodiment of a kernel application center.

[0010] FIG. 3 is a block diagram of an embodiment of an application center.

[0011] FIG. 4 is a block diagram of processes and objects utilized by a cloud-hosted integrated multi-node pipelining system for media ingestion.

[0012] FIG. 5 is a system for providing an appropriate index file to any of a variety of clients utilizing a single URL.

[0013] FIG. 6A is a simplified flowchart of a method for providing a media file to any of a variety of clients 510 utilizing a single URL.

[0014] FIG. 6B is a simplified flowchart of another method for providing a media file to any of a variety of clients 510 utilizing a single URL.

[0015] FIG. 6C is a simplified flowchart of yet another method for providing a media file to any of a variety of clients 510 utilizing a single URL.

[0016] FIG. 7A is an embodiment of a system for delivering content, including media files, which can be chunked and/or encrypted.

[0017] FIG. 7B is another embodiment of a system for delivering content, including media files, which can be chunked and/or encrypted.

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[0018] FIG. 8 s a simplified illustration of an embodiment of a system for dynamic encryption integrated into a traditional system that may not have dynamic chunking and/or dynamic indexing capabilities.

[0019] FIG. 9A is a simplified flowchart of a method for dynamically encrypting chunks of media for media streaming.

[0020] FIG. 9B is a simplified flowchart of another method for dynamically encrypting chunks of media for media streaming.

[0021] FIG. 9C is a simplified flowchart of yet another method for dynamically encrypting chunks of media for media streaming.

[0022] FIG. 10 is a simplified swim lane flowchart describing the interaction of components in a system configured to provide dynamically encrypt chunks of media for media streaming.

[0023] FIG. 11 is a simplified block diagram of an embodiment of a media servicing system, similar to the media servicing system shown in FIG. 1, but further including a content owner and, optionally, additional media provider(s).

[0024] FIG. 12A is a simplified flow chart illustrating an embodiment of a general method that can be executed by a system to provide these dynamically-executed syndication services.

[0025] FIG. 12B is a simplified flow chart illustrating an embodiment of a method that demonstrates the customization of index files for different requests utilizing the same URL, based on different contextual data.

[0026] FIG. 13 is a simplified block diagram of an embodiment of a system that can utilize platform-specific software to interpret script provided by an entity such as a content owner.

[0027] FIG. 14 is a simplified flow chart illustrating how a system can utilize syndication information and contextual data to provide different instruction sets in response to different requests for the same media file by devices of different device types, according to one embodiment.

[0028] In the appended figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar

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components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

DETAILED DESCRIPTION OF THE INVENTION

[0029] The ensuing description provides preferred exemplary embodiment(s) only, and is not intended to limit the scope, applicability or configuration of the disclosure. Rather, the ensuing description of the preferred exemplary embodiment(s) will provide those skilled in the art with an enabling description for implementing a preferred exemplary embodiment. It is understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope as set forth in the appended claims.

[0030] The increased availability of media content over data communications networks such as the Internet has mirrored the increased bandwidth for these networks. Because media has recently taken a more prominent role in data communications, the distribution of media and the data associated with such distribution has become increasingly important, particularly to media content providers. Media streaming has become a widely-used method of media distribution, but the preprocessing associated with streaming can be burdensome. Certain protocols, including forms of Hypertext Transfer Protocol (HTTP) streaming, require chunking and storing the chunked media files, and generating a corresponding index file(s) (also known as a "manifest" file). In a traditional approach, this can involve a large amount of preprocessing.

[0031] Preprocessing media for streaming traditionally involves chunking media files, storing the chunks, then creating corresponding index files to indicate where chunks may be located to download for streaming. Streaming protocols often provide for frequently updating an index file for instances where the corresponding media is frequently updated, such as during live streaming. Thus, an index file does not need to contain all chunks for a requested media file. In addition, because media files are frequently stored in a format that requires little additional processing to chunk, the chunks can be created in real time, during the streaming of a media file. The systems and methods disclosed in U.S. Pat. App. No. 12/976,883, entitled "DYNAMIC CHUNKING FOR MEDIA STREAMING," and U.S. Pat. App. No. 12/976,890, entitled "DYNAMIC INDEXING FOR AD INSERTION IN MEDIA STREAMING," which are incorporated herein by reference, take advantage of these features to enable dynamic index file creation and dynamic media file chunking.

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[0032] In instances where a media provider desires secure streaming, preprocessing traditionally involves encrypting chunks of a media file as well. Such preprocessing can result in a large amount of stored encrypted chunks that can prove burdensome to manage. For example, if a media provider of a media file desires to update or change the encryption key(s) used to encrypt the stored encrypted chunks corresponding to the media file, each chunk would either need to be decrypted and re-encrypted or replaced altogether with a new chunk, encrypted with the new encryption key.

[0033] In contrast, the techniques provided herein enable dynamic encryption that can allow a system to encrypt chunks of a media file in real time, as the chunks are requested by a client streaming the media file. Such functionality can provide flexibility to a media provider to provide the encryption key(s) used to encrypt a media file at any time, including while media file is streaming to a client. In other embodiments, another entity, such as the content distributor, can provide the encryption key(s). This dynamic encryption can be utilized in a variety of systems, including those that preprocess and store chunks of a media file, as well as those that can dynamically create the chunks. Moreover, techniques described herein are not limited to encrypting chunks of a media file, but also can be utilized to encrypt whole files as well as non-media files and/or chunks of non-media files. Furthermore, the techniques described herein may also return a media file that has been dynamically stitched together from many chunks, which, to a client, can appear like a contagious file for continuous streaming protocols (Real Time Messaging Protocol (RTMP), Real Time Streaming Protocol (RTSP), etc.) as well as for progressive download.

[0034] The index file(s) utilized to access chunks of a media file (or whole files, in some embodiments) can vary in content and format, depending on protocols utilized by a media player application configured to play the streamed media file. For example, different index files can include information corresponding to a different number of chunks and/or chunks of media having differing playback parameters (e.g., bit rate, resolution, frame rate, etc.). Despite the differences in format and content, the techniques described herein can be utilized to enable any number of clients, having different index file requirements, to utilize a single Uniform Resource Locator URL (URL), or other indicator, to retrieve the index file corresponding to a particular media file in a format suitable for that client. As a result, a media content provider can provide a single URL for each media file, regardless of the type of client and/or platform requesting the media file.

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[0035] Furthermore, when a client uses the URL to request a media file, an index file generator receiving the request can determine whether advertisements are to be played during the playback of the media file, and enable a media provider to select the advertisements to be played. Moreover, the media provider further can provide the index file generator with one or more beaconing URLs to insert into an index file, which can serve as beacons to indicate to the media provider that certain content, such as advertisements, is being and/or has been played. A media provider can find the beaconing information to be vital in determining the value of the media.

[0036] The beaconing information may be used for various purposes. For example, it may be used to determine the state of a client (e.g., paused, skipping certain content, playing back certain content, etc.), which can be used in behavioral advertisement targeting and enforcement of session advertisement behavior, adjusting advertisement content and playback based on the behavior of a user. The state of a client also may be used to support individual encryption keys in an encryption scheme and allow the index file generator to return secure URLs (e.g., time expiring or Internet Protocol (IP) allowed) for chunks to support functions such as payment services.

[0037] While the above embodiments may be implemented in a variety of different systems, some particular embodiments may be implemented as part of a media service system. **FIG. 1** is a block diagram illustrating a media servicing system 100, according to some embodiments of the present invention. The system may deliver media content to the end user device 140 through a network such as the Internet 120. The end user device 140 can be one of any number of devices configured to receive media over the Internet 120, such as a mobile phone, tablet computer, personal computer, portable media device, etc. A media file provided by a media provider 130 can be processed and indexed by cloud-hosted integrated multi-node pipelining system (CHIMPS) 110, and further stored on media file delivery service provider (MFDSP) 150, such as a content delivery network, media streaming service provider, cloud data services provider, or other third-party media file delivery service provider. Additionally or alternatively, the CHIMPS 110 may also be adapted to store the media file.

[0038] The media servicing system further enables a media provider 130 or other entity to gather information regarding user behavior during media playback. For example, a media provider 130 can be provided with data indicating that end users tend to stop watching a video at a certain point in playback, or that users tended to follow links associated with certain

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advertisements displayed during playback. With this data, a media provider 130 can adjust factors such as media content, advertisement placement and content, etc., to increase revenue associated with the media content and provide the end user device 140 with a more desirable playback experience.

[0039] End user device 140 can request a media file to stream with a client program executed by the end user device 140. The client program can be, for example, a media player, browser, or other application adapted to request and/or play media files. In response to a request for a media file, the CHIMPS 110 can utilize any number of application centers 112 and/or kernel application center(s) 111 to provide the client program with a data object concerning the requested media file. The data object can include information about the media file, including where the media file can be located, such as within the MFDSP 150 or within the CHIMPS 110 itself. Location information may be provided by a URL or other indicator. During playback of the media file, the CHIMPS 110 can collect data regarding the playback through beaconing provided by a client program executed by the end user device 140 and/or indexing service from within the CHIMPS and/or MFDSP. The CHIMPS 110 can subsequently provide the data and/or any analytics information derived from the data to the media provider 130. Additionally, as discussed below, the media provider 130 can provide additional beaconing URLs to an index file generator with which the content provider can determine whether particular content has been viewed.

[0040] **FIG. 2A** is a block diagram illustrating an embodiment of a kernel application center 111-1 connected with application centers from within the CHIMPS 110-1. The kernel application center 111-1 and application centers 112 can be geographically distant and can be connected via the Internet 120, wide area network (WAN), and/or other data communication network. Because application centers can be geographically separated, DNS services (not shown) can be used to allow an end user device 140 to connect to the nearest available application center 112. The kernel application center 111-1 can connect with application centers 112 within the CHIMPS 110-1 through an internal interface 270, thereby enabling the application centers 112 access to the various components within the kernel application center 111-1.

[0041] Components within the kernel application center 111-1 can communicate through network 260 such as a local area network (LAN) and can include one or more origin servers 240

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and a storage array 230 with which data objects and/or media files may be stored and distributed. The storage array 230 may also be utilized by services running on processing server(s) 220 and/or transcoding server(s) 250 that may require temporary or long-term storage. Kernel server 210 can utilize processing server(s) 220, transcoding server(s) 250 to provide various functional capabilities to the CHIMPS 110.

[0042] For example, as described in more detail below, the CHIMPS 110-1 can provide transcoding service for media files provided by a media provider 130 for syndication. Such a service can allow a media provider 130 to upload a media file to an application center 112, after which the application center 112 would notify the kernel server 210 that the media file has been uploaded. The kernel server can then notify services running on the processing server(s) 220 of the upload. These services can utilize transcoding server(s) to transcode the media file, which can then be moved to a MFDSP and/or stored locally by storage array 230 and origin server(s) 240. Services running on the processing server(s) 220 can also update the associated data object stored by the storage array 230 and origin server(s) 240.

[0043] **FIG. 2B** is a block diagram illustrating an alternative embodiment of a kernel application center 111-2. In addition to the components of the embodiment of FIG. 2A, this embodiment incorporates an application center 112 within the kernel application center 111-2. The application center 112 incorporated within kernel application center 111-2 may be located at or near the other components of the kernel application center 111-2, and can be communicatively connected to the other components via network 260. The incorporated application center 112 can therefore have faster access to kernel application center functionality because it does not need to communicate over long distances. In consideration of this advantage, it will be understood that the CHIMPS 110 can include multiple kernel centers with one or more application centers incorporated therein. Additionally or alternatively, components of the kernel application center may be incorporated into one or more application centers 112 in the CHIMPS 110 to provide quicker access to certain functionality.

[0044] **FIG. 3** is a block diagram illustrating an embodiment of an application center 112. The application center 112 can include caching server(s) 330 and a storage array 310 for storing and distributing data objects of media files requested by end user devices through end user interface 360. Caching server(s) 330 and storage array 310 can also be used to collect, process, and/or store metrics information from beaconing data, media chunk requests, and/or other data sources,

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including data collected through end user interface 360. The application center can further include ingest server(s) 320 for ingesting uploaded media files from a media provider 130 through a content provider interface 370. The media files may be stored on the storage array 310. As with the kernel application center 111, the components of the application center 112 can be communicatively linked through a network 340, such as a LAN. The application center can further include an internal interface 350, providing a communication link from the application center to the rest of the CHIMPS. It is through internal interface 350, for example, that media files stored on storage array 310 can be made available to a kernel application center 111 for services such as transcoding.

[0045] **FIG. 4** is a block diagram 400 of processes and objects utilized by the CHIMPS 110 for media ingestion, according to some embodiments. Although FIG. 4 further indicates the physical systems in which my execute or store these processes and objects, it will be understood that the processes and objects disclosed may be executed or stored on more than one system, including systems not disclosed in FIG. 4. In other words, the processes and objects shown in FIG. 4 allow for a variety of implementations through one or more of hardware, software, firmware, microcode, etc.

[0046] Media can be ingested into the CHIMPS 110 when a media provider 130 uploads a media file to ingestion server(s) 410 in an application center 112 by utilizing a client 405. The client 405 can be a stand-alone application or browser based, for example, and can communicate with ingest server(s) 410 through an application programming interface (API) configured for the ingestion of media files.

[0047] Ingest server(s) 410 can communicate with devices in the kernel application center 111 executing programs such as kernel server 425 and file replication service 430. The kernel server 425 can be configured organize the workflow among services such as transcoding 440 file system manager 435, and other services 445 (e.g., analytics, dynamic API, etc.) Upon a particular event, for example, the kernel server can be configured to notify the relevant services of the event, causing the services to process tasks associated with the event.

[0048] The file replication service 430, under direction of the kernel server 425, can coordinate the movement of the media files between services. For example, retrieving the uploaded media file from the ingest server(s) 410 and storing it on the file archive 450, or retrieving transcoded media files from transcoding server(s) 460 and storing them in the media file origin.

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[0049] The data object updater 420 keeps the data object origin 415 up to date in response to any changes in the system. When, for example, a file is uploaded, transcoded, and stored in media file origin 455, the location and other metadata concerning the transcoded media files need to be created or updated in the data object origin 415 to ensure an end user device that accesses the object in the data object origin 415 has the correct information regarding the related media file. Because the data object updater 420 receives updates from the kernel server 425 (which is notified when a transcoded media file is stored in the media file origin 455, the system ensures the data objects in the data object origin are constantly up to date.

[0050] The upload of a media file to the ingest server(s) 410, as described above, can provide an example of how the kernel server 425 may coordinate workflow. For instance, in response to the upload, the ingest server(s) 410 can notify the kernel server 425 that a media file has been uploaded. The kernel server 425 informs the file replication service 430 of the uploaded media file, and the file replication service 430 moves the uploaded media file into the file archive 450 and notifies the kernel server 425 of the move. In response, the kernel server 425 notifies the file replication service 430, the file system manager 435, and the transcoding master 440 of the move. The file replication service 430 then will know it can delete the uploaded media file from the ingest server(s) 410, the file system manager 435 will update the file system accordingly, and the transcoding master 440 will notify transcoding service(s) 460 of different transcoding tasks to be performed. The transcoding service(s) 460 can then retrieve the uploaded media file from the file archive 450 to create transcoded media files. The transcoding service(s) 460 notify the kernel server 425 once transcoding is complete, and the kernel server 425 relays this information to the file replication service 430. The file replication service 430 then takes the transcoded media files from the transcoding services 460 and moves them to the media file origin 455. Once the file replication service 430 notifies the kernel server 425 of the move, the kernel server 425, in turn, notifies the file replication service 430 and the data object updater 420. The data object updater 420 which updates the data object origin 415 accordingly, and the file replication service 430 deletes the transcoded media files from the transcoding services 460.

[0051] The modular nature of the system enables all tasks associated with an event to be completed quickly. As illustrated in the example above, workflow relating to a particular event, such as a media file upload, can be spread among the various services simultaneously. Moreover, because the system's modularity enables it to be scaled to accommodate differing hardware capacities, and because the system can be configured to dynamically allocate hardware

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to different services according to the needs of the system, the speed of completing tasks relating to a particular event can further be increased. For example, a server of the CHIMPS 110 can be configured to dynamically switch its purpose based on external conditions such as load and overall system performance, providing functions such as transcode, upload, metrics collection, application web service, and more, on an as-needed basis.

[0052] Embodiments of such systems may include other systems that manage various requests from end users. For example, a system for providing an appropriate index file to any of a variety of clients utilizing a single URL. Referring to **FIG. 5**, an embodiment of such a system 500 is shown. Media may be streamed to end user device 140 though a client 510. As mentioned above, the client 510 can be stand-alone media player, a plug-in, a browser, or other application, which can be executed on a personal computer or other electronic device.

[0053] An index file (i.e. manifest file) generator 530 can be a program instantiated for media streaming to a particular client 510. The index file generator 530 can be executed on a server or other computing device within an application center 112 of the CHIMPS 110. Index files generated by the index file generator can include a wide variety of information such as starting, ending, and or run times for media chunks and locations for media chunks. This information can be embedded in a single string of data, such as a URL or other type of URL. If media includes various sub-streams (e.g., streams with alternative bitrates, captions, alternative languages, etc.) the index file can include data for chunks corresponding to each of the alternative sub-streams, as well as information regarding the bitrate and/or other unique information for each stream. Alternatively or in addition, index files indicating alternative sub-streams may be separate from index files indicating one or more media chunks for streaming.

[0054] It should be understood that the index file can further comprise a wide variety of formats, which can depend on a particular streaming protocol utilized by the client 510. HTTP streaming may, for example, require index files to comprise one or more of M3U, M3U8, Extensible Markup Language (XML), and XML-based formats. Of course, other formats can be used in accordance with relevant streaming protocols.

[0055] The index file generator 530 can determine the relevant streaming protocol from information included in a request sent from the client 510 to stream a media file. For example, a client 510 can utilize a URL, obtained from a media provider 130 or other entity to stream a particular media file, to request the media file from the index file generator 530. In addition to

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the URL, the request can included information regarding the identification of the client 510 (or "client ID"; e.g., a user agent identification in a request header) that the index file generator 530 can use to determine the proper format and content of an index file for the client 510.

[0056] A proper format and content of an index file can be determined in numerous ways. For example, the index file generator 530 itself may recognize the type of client from the client ID and determine a proper index file type accordingly. The index file generator 530, therefore, may include information regarding common client IDs and/or special use cases for which particular index file types are used. This information can be updated periodically, and/or as index file types are determined for different client IDs.

[0057] Alternatively, the index file generator 530 can access a client information database(s) 540 to determine the proper index file type. Such a database(s) can be located within the CHIMPS 110 (shown) and/or external to the CHIMPS 110 (not shown), depending on desired functionality. One example of an external client information database(s) 540 is the Wireless Universal Resource FiLe (WURFL), a device description repository maintained by ScientiaMobile, Inc. The proper index file type can be determined by identifying a index file type known to work for a particular client ID or matching a client ID to an index file type based on a profile of capabilities associated with the client ID.

[0058] If a proper index file type cannot be determined, the index file generator 530 can provide an index file of a default index file type. The default index file type can include information for streaming the requested media file using a basic media stream compatible with virtually any media client. For example, parameters associated with a basic video stream could include a resolution of 160 x 120, a 3GP (Third Generation Partnership Project file format) multimedia container format, and/or a streaming bit rate of 100 kilobits per second (kbps).

[0059] The index file generator 530 further can utilize a file information database 550 in the creation of an index file. The file information database 550 can provide information regarding the requested media file (e.g., length, genre, author, etc.) as well as information regarding whether any advertisements are to be shown during the playback of the requested media file. If advertisements are to be shown during the playback of the requested media file, the database further can provide points at which advertisements are to be played during playback of the media file by the client.

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[0060] An advertisement server 520, which can be maintained by a media provider 130, can provide the index file generator 530 with additional information regarding advertisements to be shown during the playback of the requested media file. For example, the index file generator 530 can determine, using information from the file information database 550, that three video advertisements are to be shown at certain points during the playback of a particular video file. The index file generator 530 then can request information from the advertisement server 520 regarding which advertisements to show. (This can be in the form of three different requests, or a single request, depending on the desired functionality of the system.) Moreover, the index file generator 530 can use the forwarded IP address and forwarded user agent of the client to identify the client, thereby allowing the media provider 130 to provide customized advertisements for the client. The advertisement server 520 can specify the advertisements to show (if an advertisements have been previously uploaded to the CHIMPS, and the index file generator can receive metadata regarding the advertisements from the file information database 550. Alternatively, the advertisements may be uploaded to and chunked by the CHIMPS 110 after the index file generator 530 requests the information from the advertisement server 520 regarding which advertisements to show. In this latter case, metadata regarding the advertisements would also be extracted and used in the creating of the index file. Regardless of when the advertisements are uploaded to the CHIMPS 110, the advertisement server 520 enables a media provider 130 to traffic new advertisements into the playback of a media file shortly before the index file is generated, which can occur shortly before or even during the playback of a media file.

[0061] In addition to providing information regarding advertisement content, the advertisement server 520 can designate certain URLs in the index file for beaconing. These beaconing URLs can be similar to normal URLs of an index file, but with additional information attached, designating it as a providing a "beacon" to report back to the media provider 130. The content provider can use these beacons to determine, among other things, if a particular advertisement is played. For example, a beaconing URL can be a redirect URL included in a request for a first chunk of an advertisement. The request, which initially is directed to an API server of the CHIMPS 110, is interpreted as a beacon by the API server and added to a list of items for which the API server requests of the advertisement server 520 (or other system of the media provider 130). The beacon itself can be, for example, a getRequestURL() or similar request that the advertisement server 520 can use to determine that a particular URL was made. The API server

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can use the forwarded IP address and forwarded user agent of the client to help ensure that the media provider 130 can correctly determine that a beacon corresponds with a request from a particular client 510. The API server also can redirect the client to a particular media file delivery service provider (MFDSP) (or other system hosting the requested chunk) to receive the requested chunk. In alternative embodiments, the media provider 130 can provide additional beaconing URLs that can be used to provide beaconing information regarding the playback of the media file itself. Through the use of such beaconing URLs, the media provider 130 to is able to provide its own beaconing data in addition or as an alternative to any beaconing data gathered by the CHIMPS 110.

[0062] The index file generator 530 then uses the information regarding the client ID, the requested media file, the advertisement(s) to be shown during playback of the media file, and the points of the media file at which the advertisement(s) are to be played, to create an index file of the right index file type to return to the client 510. As indicated above, the index file can include, among other things, a number of URLs indicating the location of each chunk of the media file to be played by the client 510, as well as chunks of the advertisement(s). The chunks of the advertisement(s) are included in an manner such that they are shown at a point(s) during the playback of the media file corresponding to the points designated by the file information database 550. Additionally, the index file can include one or more beaconing URLs which, when used, can be indicative of the playback of an advertisement as discussed above.

[0063] The URLs provided by an index file additionally can direct a client 510 to additional index files. For example, under certain adaptive bit rate streaming protocols, a first index file typically can include a number of URLs to additional index files, where each additional index file corresponds to a particular bit rate for streaming. The client 510 then can choose a bit rate based on one or more factors such as connection speed, device type, etc. Other streaming rates (bytes, etc.) may be used additionally or alternatively.

[0064] To this end, the index file generator 530 can be configured to create an index file that provides the client 510 with a particular set of bit rates adapted to the client's circumstances. The client's circumstances not only can include the type of end user device 140 (also referred to herein as "device type") on which the client is running, but also the type of network to which the device is connected, among other things. These circumstances may be determined from a request header provided by the client along with a URL, and/or they may be determined utilizing

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other data obtained from and/or regarding the client 510. (The index file generator 530, for example, can determine that the Autonomous System (AS) number of a particular client's IP address is associated with a provider of a mobile wireless network.) Because the set of bit rates provided in the index file provides a customized selection for the client 510, the resulting playback can be optimized to provide the best user experience.

		Device/Network Type			
		Smart Phone/ Mobile Wireless Network	Smart Phone/ Wired Network	Tablet/ Mobile Wireless Network	Tablet/ Wireless Network
Streaming Bit Rate (kbps)	1200			X	X
	800			(X)	X
	600	X	(X)	X	(X)
	400	(X)	X		X
	200	X	X		X
	100	X	X		X
	64	X	X	X	X

Table 1: Example Bit Rates for Certain Device/Network Types

[0065] **Table 1**, provided merely as an example, illustrates the different sets of streaming bit rates an index file can make available to a client, based on the device type and the network type. Not only can the index file include a selection of available bitrates, indicated by "X", but the index file further can designate an initial bit rate, indicated by "(X)", for the client 510. The client can then choose to steam the media file using the initial bit rate designated by the index file, or it may choose to stream the media file using one of the other bit rates provided in the index file. Alternatively, if the client 510 does not utilize an adaptive bit rate protocol, the index file generator can provide an index file of a single bit rate, where the single bit rate can be determined based on device type, network type, etc.

[0066] For example, an index file for a smart phone connected to a mobile wireless network (e.g., a wireless carrier for mobile phones and other wireless devices) can provide URLs for streaming a requested media file at 600, 400, 200, 100, and 64 kbps, where 400 kbps is designated as the initial rate at which the client can begin streaming the media file. However, if a smart phone is connected with a wired network (e.g., a cable or DSL internet connection), including a wireless local area network (LAN) connected to the internet through a wired network, the index file may provide the same set of URLs for streaming the requested media file,

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but designate a higher initial bit rate at which the client can begin streaming the media file. On the other hand, because a tablet computer may have a monitor capable of displaying higher-quality resolutions associated with a higher bit rate, the index file can provide a tablet computer with different sets of bit rates and different starting bit rate designations, including higher bit rates, that are not included in an index file provided to a client 510 running on a smart phone.

[0067] FIG. 6A illustrates a simplified flowchart of a method 600-1 for providing a media file to any of a variety of clients 510 utilizing a single URL. This method can be executed, for example, by the index file generator 530 of FIG. 5. The method 600-1 begins at block 610 where a request for a media file is received. Among other things, the request can contain a URL corresponding to the media file.

[0068] At block 612, the device type and/or network type is determined. As discussed above, the request can include a header with client ID information. The client ID information can be indicative of a particular device type, including the type of physical device, as well as the type of operating system and/or client the physical device is running. Determining the device type can include using one or more databases and/or resorting to a default device type if a particular device type is not identified. As discussed above, the network type can be determined, for example, from the AS number of the client's IP address, which can be associated with a particular network provider (e.g., wireless mobile network provider, wired network provider, etc.).

[0069] At block 615, metadata regarding the requested media file is retrieved. The metadata, which can be stored on one or more databases in the CHIMPS 110, for example, can include information regarding the media file such as length, title, author, etc. Additionally, at block 620, advertisement support can be determined. Information regarding advertisement support, which also can be stored on one or more databases, can include whether advertisements can be included in the playback of a media file, and if so, at what points during the playback of the media file.

[0070] At block 625, if the media file includes advertisement support, the advertisement(s) to include in the playback of the media file are determined. As discussed previously, determining the advertisement(s) to include can comprise communicating with a media provider 130 (or other entity), who can indicate the advertisement(s) to include. The advertisement(s) (which can be files with a video and/or audio) may be uploaded beforehand to a MFDSP 150, server, or other delivery system, or they may be uploaded by the media provider 130 (or other entity) after the

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request for the media file is received. The advertisement(s) further may be chunked beforehand, dynamically chunked once requested, comprise complete file(s), or may be already included as part of a permutation of a media file.

[0071] At block 630 metadata regarding the advertisement(s) is retrieved. Similar to the metadata for the media file, the metadata for the advertisement(s) can include length, title, etc., which can be used in creating the index file. At block 635, the index file is created using the metadata of the media file and advertisement(s) as well as information regarding the device type, which can impact the format and/or content of the index file. Finally, at block 640, the index file is returned.

[0072] The method 600-1 can be executed with every time a media file is requested. Even though a single URL can correspond with a single media file, the content of the index file returned at block 640 may be different. Depending on the type of client (e.g., client ID) and/or type of network and the advertisements to be included in the playback, among other things, the index file can vary to conform to different formats, include different available streaming bit rates, include information regarding different advertisements, and more. Thus, despite the fact that a media provider 130 can provide a single URL to correspond to a particular media file, the streaming experience can be tailored to a particular client 510.

[0073] **FIG. 6B** illustrates a simplified flowchart of a method 600-2 for providing a media file to any of a variety of clients 510 utilizing a single URL, similar to the method 600-1 of FIG. 6A. Here, however, the illustrated method 600-2 demonstrates how there can be a reduced number of blocks if it is determined, in block 620, that there is no advertisement support for the requested media file. In this case, the index file can be built at block 635 without any additional determination of advertisement(s) to include in the playback of the media file. That said, there may be one or more advertisements already integrated into the media file.

[0074] **FIG. 6C** illustrates a simplified flowchart of a method 600-3 for enabling a system to provide a media file to any of a variety of clients 510 utilizing a single URL, similar to the methods 600-1, 600-2 of FIGs. 6A-6B. In this method 600-3, however, an index file is not returned. Instead, a URL (or other indicator) is determined, at block 637, and returned, at block 642, to the client 510. This method 600-3 illustrates how the systems and methods described herein can be used in applications where the client does not utilize an index file, but rather requests an entire media file at once. The URL returned to the client at block 642 can indicate

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the location of a particular permutation of the requested media file with advertisements included as determined at block 625. Depending on the capabilities of the system providing the media file, the particular permutation of the media file can be dynamically generated upon request by the client if not otherwise stored on the system.

[0075] Dynamic generation of chunks and/or entire media files may or may not involve transcoding. The media file can be stored in a format where transcoding may not be needed, thereby reducing the processing requirements for creating chunks of media during streaming. For example, media files may be stored such as H.264 or MPEG-4 video format and/or AAC, HE-AAC, or MP3 audio format. According to some streaming protocols, such as some forms of HTTP streaming, chunks of media in these formats would not need transcoding before being wrapped in an MPEG-2 transport stream container format. Instead, such a conversion essentially would require the addition of metadata to create the streaming format from the format of the stored media file. In other words, generating a deliverable chunk of media may only require identifying the stored media file, extracting the relevant segment of the media from the media file, and adding certain metadata in accordance with a container format. This process requires little processing power and can be easily performed on the fly during streaming. More details regarding this process can be found in U.S. Pat. App. No. 13/092,299, entitled "TRANSCODELESS ON-THE-FLY AD INSERTION," which is incorporated herein in its entirety. Once the deliverable chunk of media is generated, it can be encrypted according to the techniques described herein.

[0076] Where an index file is used, the client can stream the requested media file by using the URLs designated in the index file to download the chunks from a content delivery service. **FIG. 7A**, shows an embodiment of a system 700-1 for delivering content, including media files, which can be chunked and/or encrypted. The client 510 and index file generator 530 are also illustrated for reference.

[0077] In this system 700-1, chunks of media can be generated during media streaming by a dynamic segmentor, which of a dynamic permutation layer (DPL) 740 providing an HTTP service. The DPL 740, as well as the media file origin 455 can be located within a kernel application center 111 of the CHIMPS 110 on, for example, a media file origin server. The system 700-1 can be configured such that the kernel application center 111 provides dynamically-created chunks of media to a MFDSP 150 for delivery to client 510. The MFDSP

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150 can store the chunks locally in, for example, a media file cache 720, thereby forgoing the need to dynamically create a chunk again if the same chunk is requested in the future.

[0078] After a chunk is dynamically created, if encryption is desired, the DPL 740 also can encrypt the chunk using an encryption key. The encryption key can be, for example, a private key of an asymmetric encryption scheme. Because the overhead of encrypting a chunk of a media file is relatively small, the DPL 740 can encrypt the chunks in real time, as the client 510 is streaming the media file (i.e., as the chunks are being requested). Such a scheme can be implemented in numerous ways.

[0079] In one embodiment, the DPL 740 can request a private key through an Application Programming Interface (API) server 730 of the media provider 130. The API server 730 can return the requested encryption key to the DPL 740 via a secure communication link 785, which can be encrypted and/or otherwise secured to help ensure the security of the encryption key is not compromised. The DPL 740 can then use the encryption key to encrypt one or more chunks of a media file, returning the encrypted chunk(s) to the MFDSP 150 for delivery to the client 510. The client can obtain the corresponding decryption key (e.g., public key) from the media provider 130, the CHIMPS 110, or other source.

[0080] The functionality provided by this system 700-1 enables the media provider 130 to control encryption of chunks of media. Depending on the desired encryption scheme, the DPL 740 can request a new encryption key—which is provided by the API server 730—for each chunk of a media file. Additionally or alternatively, the DPL 740 can request a new encryption key less frequently, such as with each media file and/or group of media files. Moreover, changing an encryption key may be time based, such that the DPL 740 requests a new encryption key every minute, hour, day, etc. In addition, or as an alternative, the API server 730 may provide a new encryption key to the DPL 740 without a request from the DPL 740.

[0081] In another embodiment, the DPL 740 can generate an encryption key. In this embodiment, the DPL 740 can utilize an algorithm provided by the API server 730 via the secure communication link 785. The API server 730 and DPL 740 can run the algorithm in synchronization to generate identical encryption/decryption keys, such that the encryption key does not need to be communicated between the API server 730 and the DPL 740. Moreover, the API server 730 can provide an algorithm in each response to the DPL's requests, thereby allowing the DPL 740 to generate the encryption key without the need to store an algorithm or

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otherwise have access to the algorithm beforehand. Alternatively, the DPL 740 can store a variety of algorithms for encryption key generation, and the API server 730 could indicate an algorithm to use in response to an algorithm request from the DPL 740. Such functionality can give the allow media provider 130 control of encryption keys and/or encryption key generation.

[0082] Alternatively, the DPL 740 can simply generate the encryption key (which can be generated for each chunk, media file, etc., or may be time based, as discussed above). In this case, the DPL 740 can provide the encryption key to the API server 730, or retain the encryption key without sharing it, depending on the desired functionality.

[0083] In sum, the system 700-1 for indexing and encrypting dynamically-created chunks of a media file can, after receiving a request for an index file from a client 510, dynamically generate an index file with an index file generator 530. The index file can, among other things, indicate where a next chunk of a media file may be located. A client can then request the chunk from the location indicated by the index file, which can comprise a media file cache 720 in a MFDSP 150. If the chunk is not found in the media file cache 720, or if the chunk is encrypted with an outdated encryption key, the cache miss can redirect the request to a DPL 740, which can dynamically generate the requested chunk by accessing the corresponding media file in the media file origin 455. The DPL 740 determines an encryption key (e.g., by generating the encryption key, receiving it from the API server, etc.) and creates an encrypted chunk by encrypting the requested chunk with the encryption key. The encrypted chunk then can be provided to the MFDSP 150 for storage in the media file cache 720 and delivery to the client 510. If the same chunk is requested at a later point in time (and the chunk is not encrypted with an outdated encryption key) the MFDSP 150 can deliver the chunk from the media file cache 720, thereby forgoing the need to redirect the request to the DPL 740 to regenerate the chunk.

[0084] The determination of whether an encrypted chunk in the media file cache 720 of the MFDSP 150 has an outdated encryption key can be made in a variety of ways. For example, the DPL 740, upon receiving and/or generating the encryption key, can notify the MFDSP 150 of the update so that the MFDSP 150 can delete and/or overwrite any affected files. Alternatively, the DPL 740 can inform the index file generator 530 of an update in the encryption key. The index file generator 530 can adjust index files accordingly, indicating, for example, an encryption key version number in a URL of the index file. If the MFDSP 150 cannot match the URL to any cashed location in the media file cache 720, it will request an updated chunk from the DPL 740.

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Other techniques for indicating expired encryption keys, and other methods of encryption (e.g., RSA, symmetric key, etc.) also are contemplated.

[0085] **FIG. 7B** illustrates an alternative embodiment 700-2 of a system for indexing and encrypting dynamically-created chunks of a media for media streaming. Rather than utilize a MFDSP, this embodiment 700-2 includes a media caching server 770 within an application center 112 of the CHIMPS 110. The media caching server 770 can receive chunk requests from, and provide the corresponding chunks to, a client 510. It will be understood that such a media caching server(s) 770 or similar device(s) can be located anywhere within the CHIMPS 110 and/or in a system(s) communicatively linked to the CHIMPS 110.

[0086] **FIG. 8** is a simplified illustration of an embodiment 800 of a system for dynamic encryption integrated into a traditional system that may not have dynamic chunking and/or dynamic indexing capabilities. Here, an index file for streaming a media file can include a URL that directs a client 510 to a media server 811. The media server 811 can include a chunk encrypter 840 communicatively connected with an API server 730 of a media provider 130, as well as a media chunk storage 855 that stores media chunks for media file(s). After receiving a request for a media chunk from the client 510, the chunk encrypter 840 can retrieve the requested chunk from media chunk storage 855 and determine an encryption key using techniques such as those disclosed above (e.g., receive an encryption key from the API server 730, generate the encryption key, etc.). The chunk encrypter 840 then can create an encrypted media chunk by encrypting the requested media chunk with the encryption key, and provide the encrypted media chunk to the client.

[0087] The embodiment 800 shown in FIG. 8 is provided as an example and is not limiting. As with other illustrations provided herein, the embodiment 800 can be altered in numerous ways without departing from the spirit and scope of this disclosure. For example, the media chunks may be stored at a location and/or system remote from the media server 811. Moreover, encrypted chunks may be cached by one or more caching server(s) that may be communicatively linked between the client 510 and the chunk encrypter 840. Other such variations are contemplated.

[0088] **FIG. 9A** illustrates a simplified flowchart of a method 900-1 for dynamically encrypting chunks of media for media streaming, which can be executed, for example, by the DPL 740 or chunk encrypter 840. The method 900-1 begins at block 910 where a request for a

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chunk of a media file is received. As indicated earlier, such a request can come from a MFDSP 150, media caching server 770, or other media servicing system. Alternatively, the request can come directly from a client 510 running on an end user device 140. At block 915, the requested chunk is retrieved.

[0089] At block 916, an encryption key is requested from a media provider 130, and at block 920 the encryption key is received from the media provider 130. Because this exchange involves an encryption key, it can be done over a secure communication link, as discussed above. Moreover, the request for the encryption key from the content provider may be sent prior to, or in conjunction with, the retrieval of the requested chunk. Such timing may increase efficiency by reducing the overall time it takes to execute the method 900-1 of FIG. 9A. Although the term "content provider" is used in the method 900-1 and in other figures provided herein, other entities can be used as an encryption key source. After the encryption key is received, the requested chunk is encrypted at block 925 and returned at block 930.

[0090] **FIG. 9B** illustrates a simplified flowchart of a method 900-2 for dynamically encrypting chunks of media for media streaming, similar to the method 900-1 illustrated in FIG. 9A. Here, however, in response to receiving a request for a chunk at block 910, the method 900-2 includes requesting a key-generation algorithm from a media provider 130 at block 917 and receiving the key-generation algorithm from the content provider at block 918. Additionally, at block 922, an encryption key is generated using the received key-generation algorithm. As indicated earlier, such functionality enables the system executing the method 900-2 to provide encryption without the need to store encryption keys and/or algorithms. It also enables the media provider 130 to control generation of the encryption keys, allowing the media provider 130 to rotate encryption keys at virtually any time.

[0091] **FIG. 9C** illustrates a simplified flowchart of a method 900-3 for dynamically encrypting chunks of media for media streaming involving encryption key generation, similar to the method 900-2 illustrated in FIG. 9B. Rather than request a key-generation algorithm, however, the method includes generating the encryption key at block 923 and providing the corresponding decryption key to the media provider 130 at block 924. Thus, unlike the methods 900-1, 900-2 of FIGs. 9A and 9B, the media provider 130 has a more passive role in the encryption of the chunks, with little or no involvement in the generation of the encryption key.

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That said, the generation of the encryption key may be in accordance with techniques and/or algorithms provided by a media provider 130.

[0092] FIGs. 9A-9C are provided as examples and are not limiting. The methods 700 can be modified for different functionality. For example, the methods may be modified to encrypt multiple chunks with the same encryption key, such as all chunks of a certain media file, all chunks requested within a certain time window, etc.

[0093] **FIG. 10** is an illustration of a simplified swim lane diagram showing the interaction of components in a system configured to provide dynamic encryption, according to one embodiment. In this embodiment, a client can send a request for a chunk at block 1005. Depending on the streaming protocol, the request may be made while a client plays a chunk of media previously downloaded during streaming. The request received by a MFDSP 150 at 1010. As discussed above, the use of a MFDSP 150 is optional; other embodiments may include components other than a MFDSP 150.

[0094] Blocks 1015 and 1017 help determine whether the MFDSP 150 can return the encrypted chunk corresponding to the requested chunk without a call to the DPL 740. At block 1015, the MFDSP 150 determines whether the requested chunk is in cache. If not, the process moves to block 1020, where the MFDSP 150 requests the chunk from the DPL 740.

[0095] Otherwise, if the chunk is cached at the MFDSP 150, the process moves to block 1017 where the MFDSP 150 determines whether the encryption of the chunk is current. As discussed above, such a determination can be made in several ways. For example, an encryption version can be embedded in the URL, the MFDSP 150 can be notified by the DPL 740 of a change in the encryption key, etc. If the encryption is current, the MFDSP 150 can simply return the encrypted chunk, at block 1080. Otherwise, the MFDSP 150 requests the chunk from the DPL 740 at block 1020.

[0096] At block 1025, the DPL 740 receives the request for the chunk, and at block 1030 retrieves the chunk. As discussed previously, certain embodiments can allow for the chunk to be created dynamically by the DPL 740. Otherwise, the DPL 740 (or other system configured to encrypt chunks) can retrieve the chunk from storage. Before the chunk is encrypted, the encryption key must be obtained. Thus, at block 1035, the DPL 740 requests the encryption key.

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[0097] At block 1040, the API server (which can be hosted by the content provider of the media file corresponding to the chunk, or other entity) receives the DPL's request for an encryption key. The API server then generates or otherwise obtains the encryption key, at block 1045. The encryption key can be, for example, stored in memory and used for multiple requests, rotated on a time and/or file basis, etc. Alternatively, a new key can be generated for each request received by the DPL 740. In any case, the encryption key is returned to the DPL 740 at block 1050.

[0098] The DPL 740 receives the encryption key from the API server at block 1055. With the encryption key, the DPL 540 encrypts the chunk, at block 1060. The encrypted chunk is then returned to the MFDSP 150 at block 1065.

[0099] At block 1070, the MFDSP 150 receives the encrypted chunk from the DPL 740. The MFDSP 150 then can cache the encrypted chunk at block 1075, thereby enabling the MFDSP 150 to provide it to clients who request the chunk in the future (provided, of course, that the encryption is current at the time of the future client requests). At block 1080, the MFDSP 150 returns the encrypted chunk to the client, which is received at block 1085. The client 510 can decrypt the encrypted chunk by utilizing a corresponding decryption key, which, in asymmetric encryption, can be provided by the API server 730 (or another system of the content provider) in a variety of ways.

[0100] In addition to techniques for providing media with a data network using a single URL or other content indicator, including providing dynamic encryption, embodiments can include providing a range of dynamically-executed syndication services based on any type of contextual data. In so doing, a content owner can be provided with additional control over the distribution of media content, as well as its analysis, all while utilizing a single URL or other content indicator.

[0101] **FIG. 11** illustrates how a content owner 1110 may be included in a media servicing system 1100 similar to the media servicing system 100 shown in FIG. 1. Here however, the content owner 1110 can utilize one or more media provider(s) 130 to distribute the media content. For example, a content owner 1110 could be a movie studio that licenses distribution of certain media through various content providers 130 such as television networks, Internet media streaming websites and other on-demand media providers, media conglomerates, and the like. In some configurations, the content owner 1110 also can operate as a media provider 130.

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[0102] Traditional media servicing system configurations would require a content owner to provide a copy of the media content to each of the media providers. The media content might be provided in one encoded format, multiple encoded formats, in conjunction with a branded media player, in conjunction with a chromeless media player, or in any of a variety of other packaging options. In such configurations, depending on the terms of the agreement between the content owner and each of the content providers, the content owner may have limited knowledge of how the media providers distribute the media content, relying on the content providers to observe the terms of the contractual agreement between the parties and to accurately report data such as advertisement revenue.

[0103] Given the dynamic servicing functionality of the CHIMPS 110, however, the media servicing system of FIG. 11 can allow the content owner 1110 to use a single URL or other content indicator for each media file, and simply provide the URL or other content indicator to each of the media providers 130, rather than providing copies of the media content, pre-built syndicated players, or another package. As indicated previously, the media providers 130 then can provide the URL or other content indicator to a client 510 running on an end user device 140. In turn, the client 510, by using the URL or other content indicator in, as part of, to send, or otherwise in conjunction with a request to stream and/or download the media file, is dynamically provided a customized playback experience by the CHIMPS 110, which receives the request from the client 510. The customized playback experience can be customized according to aspects of the context associated with the content at the time of the request, aspects of the content request itself, or both, including any of, all of, or any combination of, the media provider which presented the URL or other content indicator to the client, another media provider associated with the presentation of the URL or other content indicator to the client (for example, a social network message that contains a link or other reference to the media provider, which in turn presents the URL or other content indicator to the client), the user agent associated with the content request, the device associated with the content request, the network or type of network associated with the content request, a location associated with the content request, the user agent, the device, the user agent or device state, or the network associated with the request, the time or date, the elapsed time, or other time-based characteristic associated with the content or the content request, an application, application state, or other application characteristic associated with the content or request for content, or other characteristics or attributes of the content, the context associated with the content, the request for the content, or the context associated with the

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request for the content. It can be noted that although embodiments herein utilize media files explicitly, other embodiments may utilized other forms of media assets, such as live streams, or other forms of media, such as dynamic web pages, and may incorporate multiple media elements, including players, user interface components, user controls and control components, images, and other media content, objects, or types. Additionally, it can be noted that various functions, operations, processes, or other aspects that are described in this example, and other examples, as being performed by, or attributable to, the CHIMPS 110 can be performed by another system operating in conjunction with the CHIMPS 110, loosely or tightly synchronized with the CHIMPS 110, or independently; for example, collecting data from other digital services to be combined and reported with data collected by the CHIMPS 110 can, in some implementations, be performed by a system other than the CHIMPS 110.

[0104] **FIG. 12A** is a simplified flow chart illustrating an embodiment of a general method 1200-1 that can be executed by a system, such as the CHIMPS 110, to provide these dynamically-executed syndication services. At block 1210, a request for the media file is received 1210. The request can come in a variety of forms, depending on various factors, such as the type of client 510, the type of media, various communication standards and/or protocols used, and the like.

[0105] At block 1220, contextual data relating to the request is then determined. The contextual data can come from a variety of sources, including the request itself. For example, a request from a browser-based client may include information regarding the web page of a media provider 130 within which the URL or other content indicator was contained. Information provided in the request may also include any of a variety of contextual items such as a client ID, globally-unique identifier (GUID) or other identifier, a network type, a device type and/or capability, an operating system executed by the end user device, an application, application identifier, application state, or other application information , a location associated with the device, information associated with a user of the end user device 140, information regarding the requested media file (e.g., genre, length, rating(s), ownership, artist, etc.). Additionally or alternatively, the request may simply include information that enables one or more of these items to be determined. Additionally or alternatively, a repository may be stored, maintained or derived, and queried for authorization, authentication, validation, or selection; for example, a repository of application identifiers may be maintained and queried to determine whether an application is authorized to request the content and if so, to select further aspects of or for

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processing the content request. Additionally or alternatively, such stored or derived repository data may be used in conjunction with other data, either internally or externally identified, such as a secret key, shared key, public key, stored certificate, other stored data, or other data for authorization, authentication, validation, or selection, including data stored on another digital service, on another server, on the client device, in a device associated with the client device, in the operating system, in the application, in another application, in a network, or in another location from which it may be retrieved.

[0106] The determination of contextual data can include utilizing information other than the information provided in the request. For example, the request may include a URL from which information regarding the requested media file (e.g., genre, length, rating(s), ownership, artist, etc.) can be determined, or account information from which information associated with a user of the end user device 140 (e.g., age, gender, location of residence, interests, subscriptions, etc.) can be determined. As another example, a session identifier or user identifier may be usable to determine historical, demographic, interest, utility, or other characteristics. This determination may involve accessing information stored in one or more a databases or other data structures internal or external to the CHIMPS 110. It may also involve communicating with other entities and/or systems, such as the content owner 1110 or media provider 130. Additionally or alternatively, contextual information can be gathered using data independent of information provided in the request, such as the time at which the request was received. Additionally or alternatively, contextual information can be gathered from other digital services, for example, link-shortening services, social networking services, content sharing and recommendation services, digital content publication and management services, search services, archive services, content aggregation services, or other digital information services, which may include hyperlinks, messages, posts, status updates, or other shares or exchanges, as well as dates and times, sequence information, ratings and scores, user information, and other information from one or more digital services, and which also may include some or all of such contextual information describing the sequence, in whole or in part, leading to, or other circumstances influencing, a URL or other content indicator request.

[0107] At block 1230, corresponding syndication information (e.g., syndication rules) are determined, based on the determined contextual data related to the request. The syndication information can be any of a variety of rules that can impact how the requested media file is ultimately provided to the client 510. Such rules can correspond to the content of playback of

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the requested media file, advertisements shown during playback, streaming parameters for playback, security utilized during playback, version of the content to be played, and the like. At block 1240, the appropriate response is provided 1240. For example, an index file generated based on the syndication information can be provided.

[0108] FIG 12B is a simplified flow chart illustrating an embodiment of a method 1200-2 that demonstrates the customization of index files for different requests utilizing the same URL, based on different contextual data. At block 1205, a first request having a URL is received. As indicated above, the URL can include a variety of information, including information indicative of a requested media file. At block 1215, contextual data related to the first request is determined, and, at block 1225, a first set of syndication information is determined, based on the contextual data related to the first request. The syndication information can impact the playback of the requested media file, among other things, as described in more detail below. At block 1235, a first index file having information for streaming the requested media file is generated based (at least in part) on the first set of syndication information. At block 1245, the first index file is provided.

[0109] Blocks 1255-1295 follow a process similar to blocks 1205-1245. At block 1255, a second request having a URL is received. At block 1265 contextual data of the second request is determined. Here, the contextual data related to the second request is different than the contextual data related to the first request. At block 1275 a second set of syndication information is determined. At block 1285, a second index file having information for streaming the requested media file is generated based (at least in part) on the second set of syndication information. At block 1295 the second index file is provided. Because the contextual data related to the second request is different than the contextual data related to the first request, the content of the second index file may be different from the content of the first index file. Thus, the implementation of syndication information based on contextual data related to each request can result in a customized playback experience that can be different for different requests.

[0110] Syndication information relating to the content of playback of the requested media file can be dependent on a variety of factors including the content of the requested media file itself. For example, syndication information can require altering the playback of the requested media file based on length and/or content of the media file. For example, if it is determined from the contextual data that a requested media file is a movie will be shown on an airplane, the playback

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of the media file may be altered to omit certain portions of the movie that may be objectionable to certain passengers, use an audio track during playback of the movie that uses less-objectionable language, omits scenes that involve plane crashes, and/or remove other portions of the movie to shorten the overall length of the movie to a length compatible with the flight time of the airplane.

[0111] Syndication information that relate to the content of playback of a requested media file can be impacted by numerous other contextual data. Among other contextual data, the time and the identity of a media provider 130 can be taken into account. Syndication information, for example, can require that a particular media file that is played back on a children's website excludes objectionable content, whereas the same media file can include the objectionable content if played back on certain radio and/or television stations after a certain time of night.

[0112] Syndication information can also include not allowing a certain audio track associated with the requested media file to be played during playback. For example, if it is determined from the contextual data that a requested media file is a movie to be played on a television station that has only been granted licensing rights to show the movie with a Spanish audio track, English and French audio tracks will not be provided.

[0113] Syndication information relating to advertisements also can be dependent on any of a variety of determined contextual data. Such syndication information can include determining whether to include one or more advertisements, identifying one or more advertisement servers to utilize during the playback of the requested media file, determining where, during the playback of the requested media file, to insert one or more advertisements, allocating advertisement time during playback of the requested media file among two or more advertisement servers, and the like. For example, it may be determined to not include advertisements in the playback of a requested media file if the corresponding request corresponds with a media provider 130 that offers a paid subscription service to customers. On the other hand, a request corresponding with a media provider 130 that offers advertisement-supported media content can include one or more advertisements. In addition, particular advertisements can be included or excluded, for example, when content is requested by a user of a particular telecommunications network, advertisements for competing telecommunications networks could be selected, preferred, or blocked.

[0114] Such syndication information regarding advertisements may be impacted by certain arrangements a content owner 1110 has with a media provider 130. For example, a content

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owner 1110 and a media provider 130 may have an arrangement that certain media files streamed to a website of the media provider 130 will contain some advertisements served by the media provider 130, and some advertisements served by the content owner 1110. Other arrangements can vary such that the content provider serves 130 all of the advertisements shown during playback of the requested media file, or the content owner 1110 serves all of the advertisements. Such allocation can dictate which advertisement servers 520 (see FIG. 5) are utilized during playback of the requested media file, and which advertisement servers are used to service which advertisement units. For example, the content owner 1110 may have an arrangement with a particular media provider 130 such that, for requests corresponding with a particular media provider 130, the media provider 130 can determine where during the playback of the media file advertisements are to be shown, and that the media provider 130 serves advertisements 25% of the time allocated for advertisements, where the content owner 1110 serves the advertisements the other 75% of the time. In response to requests corresponding with that particular media provider 130, the CHIMPS 110 can provide one or more index files to the requesting client 510 for playback of the requested media file. The one or more index files can ensure the advertisements are inserted at the specified parts of the playback of the requested media file, as well as utilize the particular content provider's advertisement server 25% of the time the content owner's advertisement server 75% of the time. Allocation schemes can be as detailed as desired, dictating not only which advertisement servers to use and how often to use them, but also when each server is to be used as well (e.g., use a particular server for a particular ad avail) as well as incorporating other factors. As with other syndication information discussed herein, syndication information regarding advertisements can take into account any of a variety of other contextual information, such as geographical location, time, information regarding a user of the end user device 140, network, and the like.

[0115] Syndication information relating to presentation can control the brand identity associated with the player, page, translucent logo or watermark, or other associated identifying information presented with the content before, after, or during playback. These syndication information can change over time, with the number of plays, or with the context within which the content appears. For example, the first playback could be associated with the media provider 130, while subsequent playbacks are associated with the content owner. As another example, playback for the first five days could be associated with the media provider 130, while playbacks after five days are associated with the content owner. As another example, playback within a

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page on the website of the media provider 130 could be associated with the media provider 130, but playback when the same URL or other content indicator is shared on a social networking site could be associated with the social network site.

[0116] Syndication information relating to streaming parameters can impact how a media file is served to the client 510. Such syndication information can, for example, determine chunk sizes and/or lengths, available bit rate(s), resolutions, frame rates, etc., that may be used during the playback of the requested media file. Certain content owners 1110 and/or content providers 130 may require, for example, require that certain media files be provided in a high-definition (HD) format only (e.g., requiring certain resolutions and frame rates). Syndication information regarding certain device types may require that the media file is served using particular-sized chunks to ensure the buffer of the end user device 140 is utilized efficiently for optimum playback. Other such syndication information are contemplated.

[0117] Syndication information relating to security also can impact how a media file is served to the client 510 by the CHIMPS 110. Among other things, security can include digital rights management, watermarking, encryption, and the like. Thus, syndication information can be used to determine the type of DRM, watermarking, and/or encryption to use during the playback of the requested media file, if they are to be used at all. As shown herein, systems such as the CHIMPS 110 can implement encryption dynamically. Watermarking can be implemented in a similar fashion, as detailed in U.S. Patent Application No. 13/247,109 entitled "Forensic Watermarking," which is incorporated by reference herein in its entirety. Other forms of DRM may be executed in a similar fashion.

[0118] Syndication information relating to data collection can control how the CHIMPS 110, another digital process working with or independently from the CHIMPS 110, the client, the application on the client, the operating system or other software on the client, the network, or other element of digital service infrastructure interacts with one or more digital services to collect information or data to be used as additional context information, or to otherwise supplement the data otherwise available. For example, syndication information can control how the CHIMPS 110 or other digital process collects data from, or interacts with data collected from, link-shortening services, social networking services, digital content publication and management services, and content aggregation services to determine all or part of the

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combination, sequence, or both of some of, any of, all of, or any combination of, user, publication, or other actions associated with the content request.

[0119] Syndication information corresponding to reporting can control how the CHIMPS 110, another digital process working with or independently from the CHIMPS 110, the client, the application on the client, the operating system or other software on the client, the network, or other element of digital service infrastructure reports data associated with the content request to one or more digital information services. For example, syndication information can including which digital information services to which data will be reported, the data to be reported, and the data requirements, parameters, formats, protocols, or other technical characteristics to be used. As further examples, a given syndication information could specify any of, all of, or any combination of, reporting data to a social networking service about a content request, the extent of content playback, and the user who requested the content (such as might be required for reporting to Facebook OpenGraph); reporting data to a social networking service about a content aggregation app used to request content (such as reporting to Twitter that News360 was used to request content from a Twitter message); reporting data to multiple analytics services, or to one analytics service with respect to more than one reporting entity, or both, about a content request and the extent of content playback (such that the analytics systems utilized by both the content owner 1110 and the media provider 130 receive information regarding the content playback); and reporting data to multiple media measurement services, or to one media measurement service with respect to more than one reporting entity, or both, about a content request and the extent of content playback (such that the media measurement services utilized by the content owner, the media provider 130, one or more advertisers associated with the content playback, and one or more advertising agencies, receive information regarding some or all aspects of the content playback).

[0120] It will be understood that syndication information not only can impact how systems such as the CHIMPS 110 provide index files for playback of a requested media file, but they can also impact any communication (e.g., XML instruction set) from the CHIMPS 110 to the client 510, and can also impact how the client 510 interacts with other digital services and resources, including the user agent, the device, the network servicing the device, or other digital services and resources available to the client 510. Syndication information based on contextual data may impact how the client 510 displays the requested media file on a particular end user device 140, which may or may not be included in an index file. For example, syndication information can

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dictate that certain data objects be utilized, which, among other things, can affect the appearance of a certain media player on an end user device 140. The data objects can be included in an instruction set provided to the client 510 by the CHIMPS 110. Utilization and customization of such data objects is disclosed in U.S. Patent Application No. 12/888,089, entitled "Dynamic Application Programming Interface," which is incorporated by reference herein in its entirety. Other categories of syndication information for dynamically executing syndication services are also contemplated.

[0121] The automatic implementation of syndication information based on contextual data for syndication services can provide a content owner with much more information for and control over media content than in traditional media servicing systems. Not only can the content owner 1110 control where the media is stored, as indicated above (e.g., at one or more MFDSPs 150 or other delivery infrastructure(s) compatible with the CHIMPS 110), it allows the content owner 1110 to utilize the CHIMPS 110 to provide analysis of playback and other reporting data for all content provider(s) 130. Because the CHIMPS 110 is utilized in determining the playback of the media, it can provide detailed analytics regarding playback of a media file. Among other things, such analytical data for all media provider(s) 130 can allow a content owner 1110 to maximize revenue and user experience in a variety of ways. For example, for a given media file, the content owner 1110 can see how many times the media file has been played for each media provider 130. The content owner 1110 further can determine how many advertisements each media provider 130 is inserting into the playback of the media file and when the advertisements are inserted. With this information, the content owner 1110 can compare, among content provider(s) 130, playback of the media file to help determine a best methods of playback for optimum user experience, advertisement revenue, etc.

[0122] Furthermore, a content owner 1110 can guard against improper and/or unlicensed use of media content. For example, if a request for a media file is associated with an unknown media provider 130, a third party, or is associated with a media provider 130 but utilized in an improper and/or unlicensed manner, syndication information can be implemented to take measures desired by the content owner 1110, such as prohibit playback of the media file, playback a video directing a user to another website to view the requested media file, or simply utilize a default ad server specified by the content owner 1110. Thus, embodiments provided herein enable a content owner 1110 far greater downstream syndication management than traditional techniques.

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[0123] The CHIMPS 110, or another system operating in conjunction with the CHIMPS 110, loosely or tightly synchronized with the CHIMPS 110, or independently from the CHIMPS 110, also can be configured to interpret script language to implement the syndication information on multiple platforms (e.g., environments having different client types and/or end user device types) and add new capabilities, or can be configured to provide, transmit, load, or otherwise supply scripts, script files, and related scripting information to end user clients, devices, applications, operating systems, or other client elements, or be configured to do both. This allows a content owner 1110 and/or media provider(s) 130 to provide syndication information for one or more media files that can be dynamically implemented by the CHIMPS 110 during runtime on a variety of platforms.

[0124] **FIG. 13** is a simplified block diagram of an embodiment in which the CHIMPS 110 utilizes platform-specific software, such as software development kits (SDKs) 1310, to interpret script provided by a content owner 1110, media provider 130, stored in the CHIMPS 110, or received from another source. The CHIMPS 110 can then provide device and/or client-specific interpreted script such that syndication information provided in the script are dynamically implemented for the various end user device types 1320 (and/or clients) during runtime.

[0125] The script provided by the content owner 1110 can be any of a variety of known scripts. This includes, for example, Hyper Text Markup Language (HTML) 5, Cascading Style Sheets (CSS), JavaScript, other XML-based scripting languages, and the like. Additionally or alternatively, the script may be in a format specific to the CHIMPS 110. This script can define various context-based syndication information, such as those discussed above, to implement various features and/or functionality in different environments. For example, to implement a certain command under HTML 5 in an operating system running on a certain type of end user device type 1320-1, an objective C library may be required. Thus, an SDK 1310-1 corresponding to the type of operating system and/or end user device type 1320-1 can include the objective C library, which can be utilized by the CHIMPS 110 to ensure that the command is properly executed.

[0126] The SDKs 1310 utilized by the CHIMPS 110 can provide any of a variety of features and/or functionality to help apply the syndication information provided in the script. This can include dynamic stream switching (adaptive bit rate streaming), DRM protection, encryption, and other features. In one embodiment, for example, the SDKs 1310 include a series of

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JavaScript libraries that can be utilized to provide the desired functionality across various platforms, providing interpreted script in the native language of each end user device type 1320. Because the SDKs 1310 are customized to different end user device types 1320, the CHIMPS 110 can utilize the SDKs 1310 to take advantage of built-in functionality of certain end user device types 1320 (e.g., encryption, DRM, chunking, and other technologies), while providing additional functionality to other end user device types 1320. For example, a first end user device type 1320-2 may have encryption technology, in which case the corresponding SDK 1310-2 can be configured to utilize the encryption technology to communicate with devices of the first end user device type 1320-2. A second end user device type 1320-3 may not have any native encryption technology, in which case the corresponding SDK 1310-3 can include its own encryption/decryption libraries to compensate. Because the CHIMPS 110 automatically interprets the script provided by the content owner 1110, the content owner does not need to provide different scripts for different end user device types 1320-2, allowing the CHIMPS 110 to effectively close the gap between the script provided by the content owner 1110 and the interpreted script required by each end user device type 1320.

[0127] As another example, a first end user device type 1320-2 may provide adaptive bit rate streaming natively, in which case a corresponding SDK 1310-2 can be configured to utilize the native adaptive bit rate streaming to enable devices of the first end user device type 1320-2 to dynamically switch streams according to available band width and other factors. A second end user device type 1320-3 may not have any native adaptive bit rate streaming, in which case the corresponding SDK 1310-3 can implement a playback control that extends the native capabilities of the device type 1320-3 to include adaptive streaming. Again, because the CHIMPS 110 automatically interprets the script provided by the content owner 1110, the content owner does not need to provide different scripts for different end user device types 1320-2, allowing the CHIMPS 110 to uniformly provide adaptive streaming to all end user device types 1320, thereby providing a similar experience regardless of the device type 1320 utilized.

[0128] Notwithstanding the fact that the above functionality can allow the content owner to provide a single script that can be interpreted by the CHIMPS 110 in a variety of environments, syndication information provided by the content owner 1110 in the script can provide for syndication information that are specific to certain end user device types. For example, the syndication information can require the use of certain a DRM when streaming a requested media file to a particular end user device type 1320. A different DRM may be specified when

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streaming the requested media file to end user device type 1320. Furthermore, the above functionality enabled by the SDKs 1310 can apply to commands, control code, or instruction sets, including scripts such as XML or Javascript, pseudocode, bytecode, executable code, interpretable code, machine language, or other programming instructions, provided by the CHIMPS 110 to the various end user device types 1320 that include instructions regarding functionality other than streaming media files.

[0129] FIG. 14 is a simplified flow chart illustrating how a system, such as the CHIMPS 110, can utilize syndication information and contextual data to provide different instruction sets in response to different requests for the same media file by devices of different device types, according to one embodiment. As with all other figures provided herein, FIG. 14 is provided as an example and is not limiting. Various blocks may be combined, separated, and/or otherwise modified, depending on desired functionality. Furthermore, different blocks may be executed by different components of a system and/or different systems.

[0130] At block 1405, one or more syndication information relating to a media file are received. As indicated previously, such syndication information can be provided by a content owner or other entity utilizing a script, such as an XML-based scripting language, in any of a variety of formats. At block 1415, a first request for the media file corresponding to a first device type is received, and at block 1425 contextual data related to the first request is determined. As stated previously, contextual data can be obtained utilizing a variety of sources, and may include data corresponding to a variety of factors.

[0131] At block 1435 a first instruction set based on the syndication information and contextual data of the first request is generated. Generating the first instruction set can include use of an SDK corresponding to the first device type, which can allow instructions (i.e. syndication information) provided by a content owner to be downscripted into the language, or format, of the first device type. At block 1445 the first instruction set is provided in a first format.

[0132] Blocks 1455-1485 echo blocks 1415-1445 but in regards to a second request corresponding to a second device type. Accordingly, the second instruction set is provided in a second format different from the first, to accommodate a second language utilized by the second device type. Both first and second formats may be different from the format in which the syndication information relating to the media were received.

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[0133] It should be noted that the methods, systems, and devices discussed above are intended merely to be examples. It must be stressed that various embodiments may omit, substitute, or add various procedures or components as appropriate. For instance, it should be appreciated that, in alternative embodiments, the methods may be performed in an order different from that described, and that various steps may be added, omitted, or combined. Also, features described with respect to certain embodiments may be combined in various other embodiments. Different aspects and elements of the embodiments may be combined in a similar manner. Also, it should be emphasized that technology evolves and, thus, many of the elements are examples and should not be interpreted to limit the scope of the invention.

[0134] Specific details are given in the description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, well-known circuits, processes, algorithms, structures, and techniques have been shown without unnecessary detail in order to avoid obscuring the embodiments. This description provides example embodiments only, and is not intended to limit the scope, applicability, or configuration of the invention. Rather, the preceding description of the embodiments will provide those skilled in the art with an enabling description for implementing embodiments of the invention. Various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the invention.

[0135] Also, it is noted that the embodiments may be described as a process which is depicted as a flow diagram or block diagram. Although each may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be rearranged. A process may have additional steps not included in the figure. Furthermore, embodiments of the methods may be implemented by hardware, software, firmware, middleware, microcode, hardware description languages, or any combination thereof. When implemented in software, firmware, middleware, or microcode, the program code or code segments to perform the necessary tasks may be stored in a non-volatile computer-readable medium such as a storage medium. Processors may perform the necessary tasks.

[0136] Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without departing from the spirit of the invention. For example, the above elements may merely be a

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component of a larger system, wherein other rules may take precedence over or otherwise modify the application of the invention. Also, a number of steps may be undertaken before, during, or after the above elements are considered. Accordingly, the above description should not be taken as limiting the scope of the invention.

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WHAT IS CLAIMED IS:

1. A system for improved index files for media streaming via a data network, the system comprising:

a network interface for communicating with the data network; and

an index file generator coupled to the network interface and configured to:

obtain, from one or more information sources, first contextual data related to a first request received by the network interface, the first request including a URL indicative of a requested media file;

generate a first index file based on the first contextual data and syndication information;

send the first index file using the network interface;

obtain, from the one or more information sources, second contextual data related to a second request received using the network interface, the second request including the same URL as the first request;

generate a second index file based on the second contextual data and the syndication information, wherein content of the second index file is different from content of the first index file; and

send the first index file using the network interface.

2. The system for improved index files for media streaming via a data network as recited in claim 1, wherein the index file generator is configured to receive the syndication information in an Extensible Markup Language (XML)-based scripting language.

3. The system for improved index files for media streaming via a data network as recited in claim 1, wherein the index file generator is configured to use the syndication information to generate the first index file such that one or more of the following occur:

the playback of the requested media file is based on a length of the requested media file,

the playback of the requested media file is based on the content of the requested media file, or

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a certain audio track associated with the requested media file is not allowed to be played during playback of the requested media file.

4. The system for improved index files for media streaming via a data network as recited in claim 1, wherein the index file generator is configured to generate the first index file by doing one or more of the following:

including, in the first index file, information indicating one or more bit rates that may be used during playback of the requested media file,

determining a size or length of one or more chunks for playback of the requested media file, based on the syndication information, or

including, in the first index file, information indicating one or more resolutions that may be used during playback of the requested media file.

5. The system for improved index files for media streaming via a data network as recited in claim 1, wherein the index file generator is configured to use the syndication information to determine one or more of the following:

a type of digital rights management (DRM) to use during playback of the requested media file,

a type of watermark to use during playback of the requested media file, or

a type of encryption to use during playback of the requested media file.

6. A server for providing improved index file generation for media streaming via a data network, the server comprising:

communicating means for:

receiving, via the data network, a first request and a second request, wherein the first request and the second request include a URL indicative of a requested media file; and

sending a first index file and a second index file via the data network; and

processing means for

obtaining, from one or more information sources, first contextual data related to the first request, and second contextual data related to the second request; and

generating, using syndication information, the first index file based on the first contextual data and the second index file based on the second contextual data, wherein content of the second index file is different from content of the first index file.

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7. The server for providing improved index file generation for media streaming via a data network as recited in claim 6, wherein the communicating means are configured to receive the syndication information in an Extensible Markup Language (XML)-based scripting language

8. The server for providing improved index file generation for media streaming via a data network as recited in claim 6, wherein the processing means are configured to use the syndication information to generate the first index file such that one or more of the following occur:

the playback of the requested media file is based on a length of the requested media file,

the playback of the requested media file is based on the content of the requested media file, or

a certain audio track associated with the requested media file is not allowed to be played during playback of the requested media file.

9. The server for providing improved index file generation for media streaming via a data network as recited in claim 6, wherein the processing means are configured to generate the first index file by doing one or more of the following:

including, in the first index file, information indicating one or more bit rates that may be used during playback of the requested media file,

determining a size or length of one or more chunks for playback of the requested media file, based on the syndication information, or

including, in the first index file, information indicating one or more resolutions that may be used during playback of the requested media file.

10. The server for providing improved index file generation for media streaming via a data network as recited in claim 6, wherein the processing means are configured to use the syndication information to determine one or more of the following:

a type of digital rights management (DRM) to use during playback of the requested media file,

a type of watermark to use during playback of the requested media file, or

a type of encryption to use during playback of the requested media file.

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11. A method for improved index file generation for media streaming via a data network, the method comprising:

obtaining, from one or more information sources, first contextual data related to a first request received via the data network, the first request including a URL indicative of a requested media file;

generating a first index file based on the first contextual data and syndication information;

sending the first index file via the data network;

obtaining, from the one or more information sources, second contextual data from a second request received via the data network, the second request including the same URL as the first request;

generating a second index file based on the second contextual data and the syndication information, wherein content of the second index file is different from content of the first index file; and

sending the first index file via the data network.

12. The method for improved index file generation for media streaming as recited in claim 11, wherein either or both the first contextual data or the second contextual data comprises data corresponding to one or more of:

a network type,

a device type,

an operating system or application type,

a media provider,

a web page,

a globally-unique identifier (GUID),

a location associated with a device,

information associated with a user of a device, or

information regarding the requested media file.

13. The method for improved index file generation for media streaming as recited in claim 11, wherein the syndication information includes information for adjusting the first index file, the second index file, or both, such that one or more of the following items occur:

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the playback of the requested media file is altered based on a length of the requested media file,

the playback of the requested media file is altered based on content of the requested media file, or

a certain audio track associated with the requested media file is not allowed to be played during playback of the requested media file.

14. The method for improved index file generation for media streaming as recited in claim 11, wherein generating the first index file includes one or more of:

including, in the first index file, information indicating one or more bit rates that may be used during playback of the requested media file,

determining a size or length of one or more chunks for playback of the requested media file, based on the syndication information, or

including, in the first index file, information indicating one or more resolutions that may be used during playback of the requested media file.

15. The method for improved index file generation for media streaming as recited in claim 11, wherein generating the first index file includes one or more of:

determining a type of digital rights management (DRM) to use during playback of the requested media file,

determining a type of watermark to use during playback of the requested media file, or

determining a type of encryption to use during playback of the requested media file.

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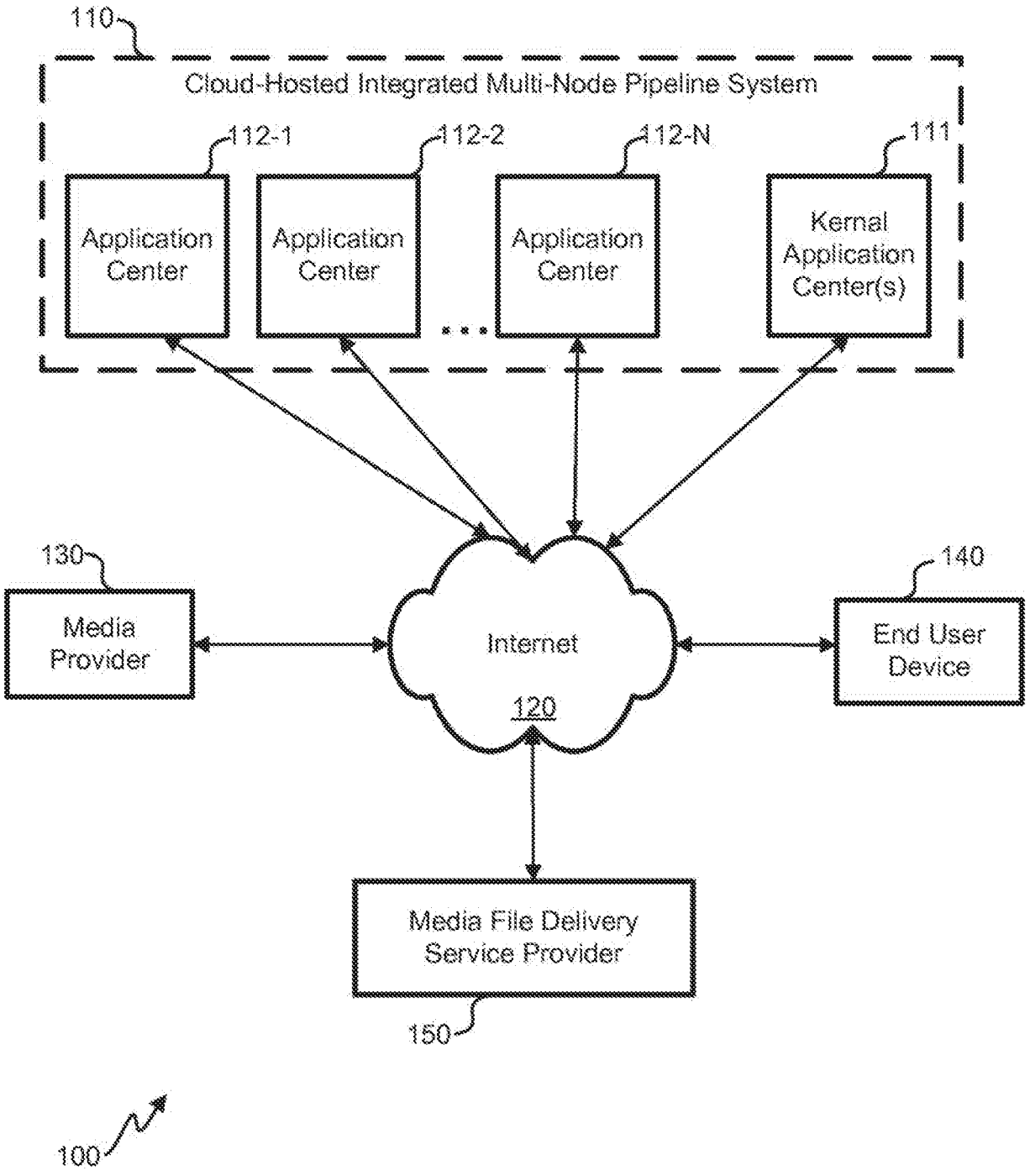

110
Cloud-Hosted Integrated Multi-Node Pipeline System
112-1
112-2
112-N
111
Application Center
Application Center
Application Center
Kernal Application Center(s)
130
Media Provider
Internet
120
140
End User Device
Media File Delivery Service Provider
150
100

FIG. 1

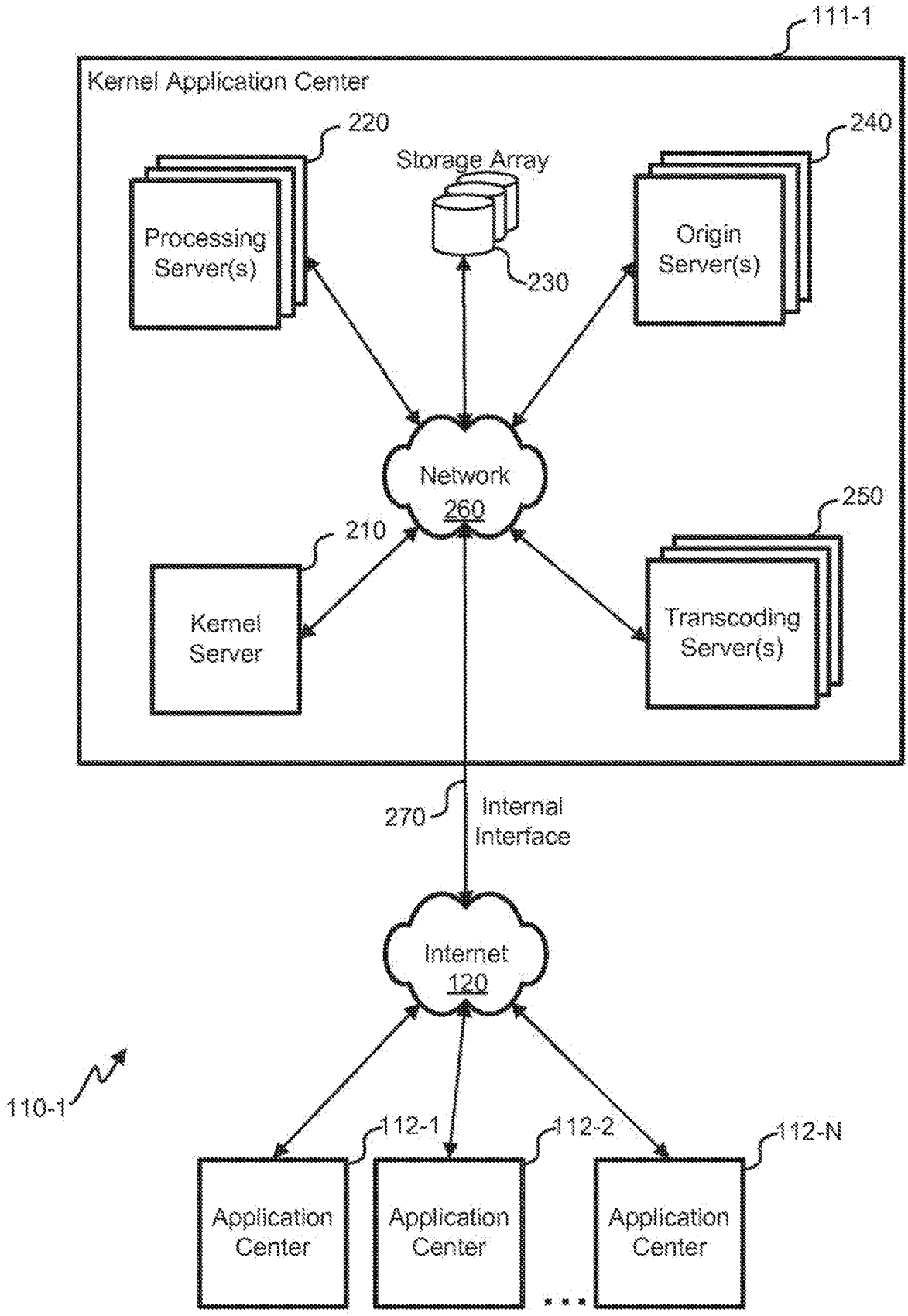

111-1
Kernel Application Center
220
Processing Server(s)
Storage Array
230
240
Origin Server(s)
Network 260
210
Kernel Server
250
Transcoding Server(s)
270
Internal Interface
Internet 120
110-1
112-1
112-2
112-N
Application Center
Application Center
Application Center

FIG. 2A

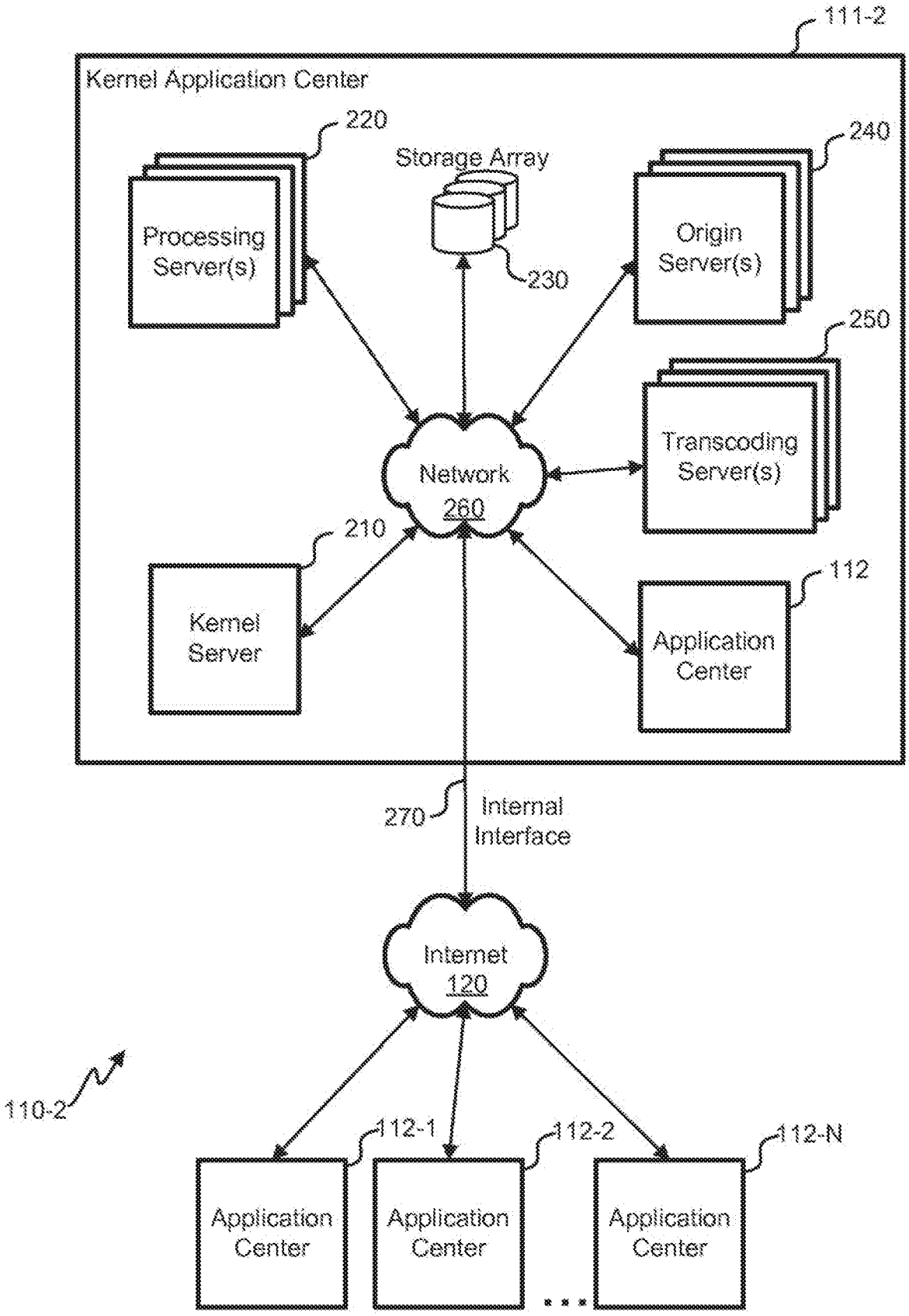

111-2
Kernel Application Center
220
Processing Server(s)
Storage Array
230
240
Origin Server(s)
250
Transcoding Server(s)
Network 260
210
Kernel Server
112
Application Center
270
Internal Interface
Internet 120
110-2
112-1
112-2
112-N
Application Center
Application Center
Application Center
...

FIG. 2B

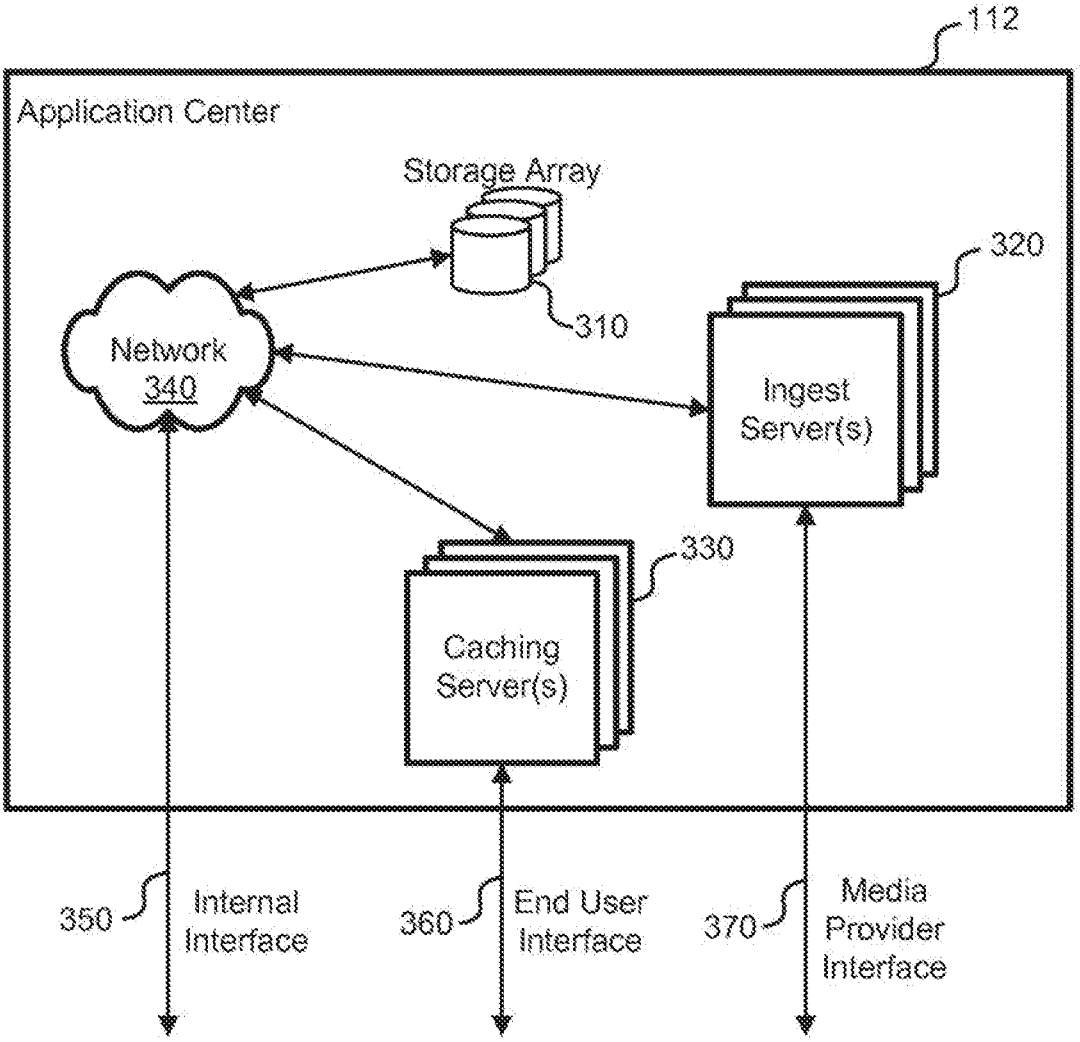

112
Application Center
Storage Array
310
320
Network
340
Ingest
Server(s)
330
Caching
Server(s)
350
Internal
Interface
360
End User
Interface
370
Media
Provider
Interface

FIG. 3

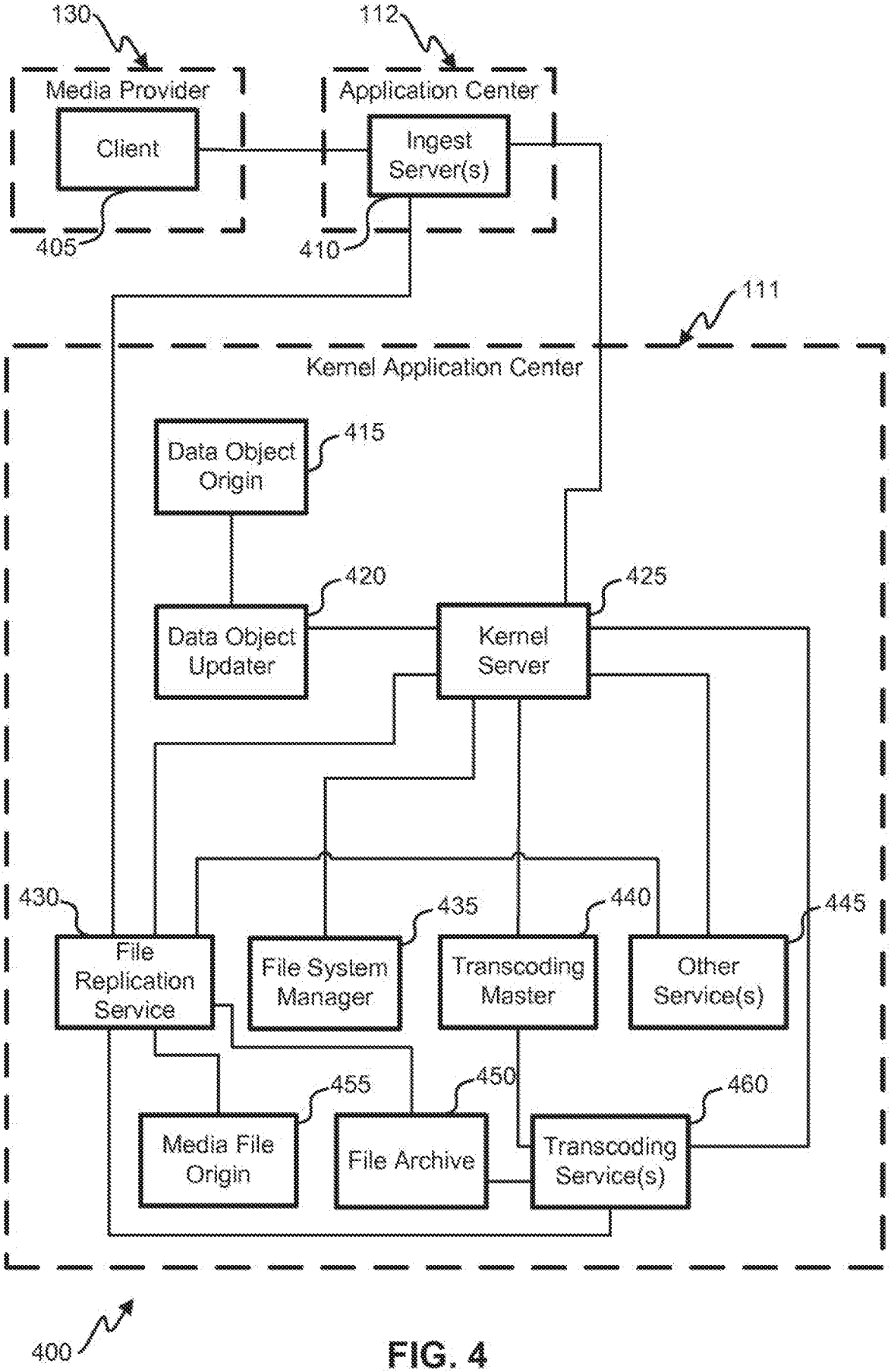

130
Media Provider
Client
405
112
Application Center
Ingest Server(s)
410
111
Kernel Application Center
Data Object Origin
415
Data Object Updater
420
Kernel Server
425
430
File Replication Service
File System Manager
435
Transcoding Master
440
Other Service(s)
445
Media File Origin
455
File Archive
450
Transcoding Service(s)
460
400

FIG. 4

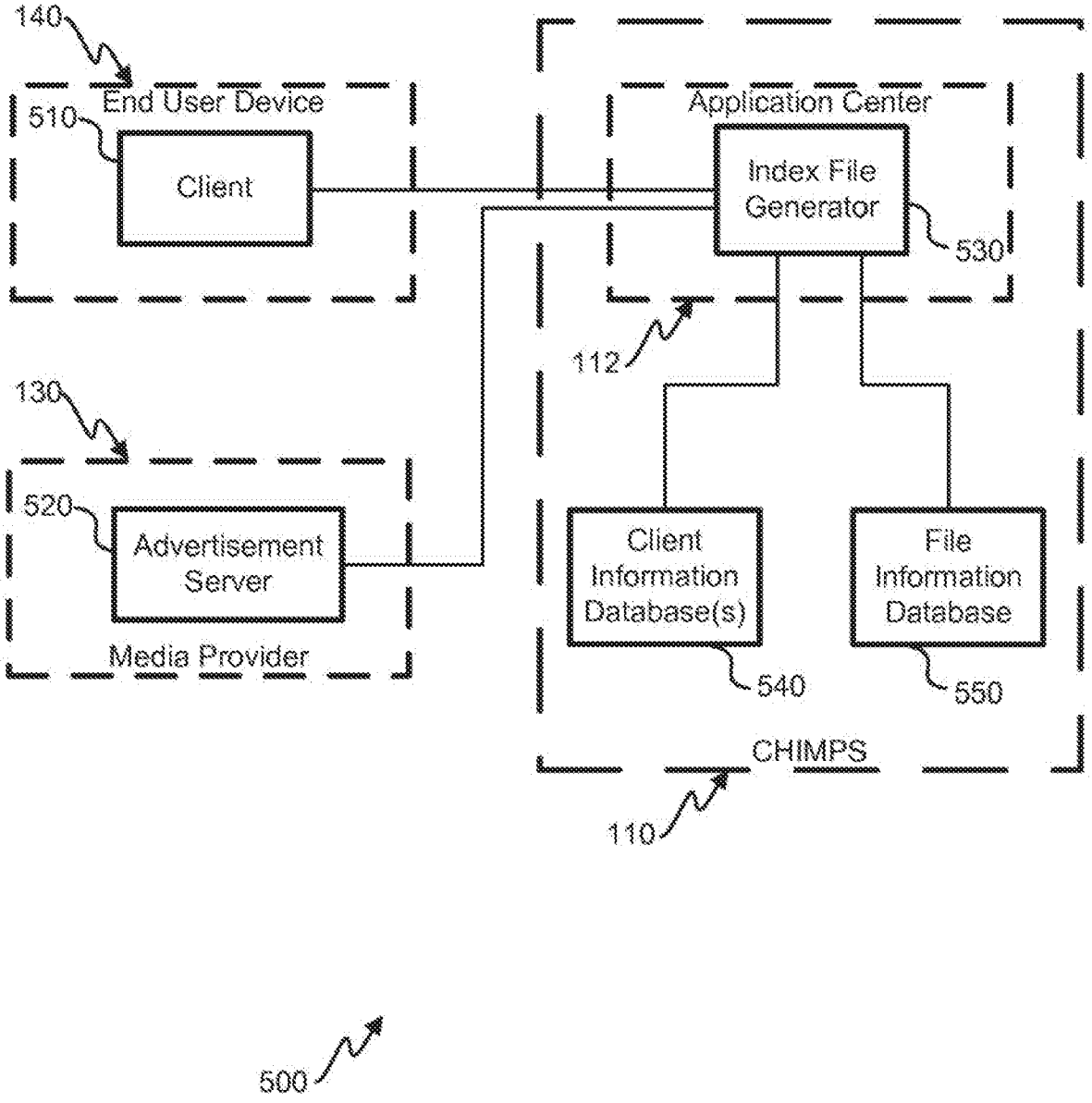

140
End User Device
510
Client
Application Center
Index File Generator
530
112
130
520
Advertisement Server
Media Provider
Client Information Database(s)
540
File Information Database
550
CHIMPS
110
500

FIG. 5

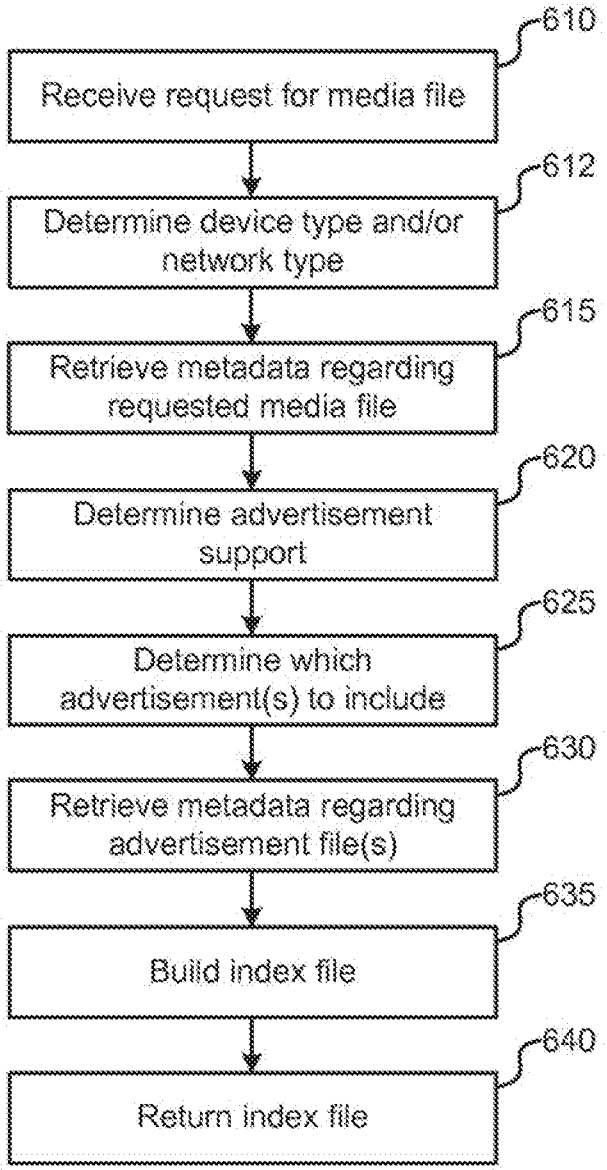

610
Receive request for media file
612
Determine device type and/or network type
615
Retrieve metadata regarding requested media file
620
Determine advertisement support
625
Determine which advertisement(s) to include
630
Retrieve metadata regarding advertisement file(s)
635
Build index file
640
Return index file
600-1

FIG. 6A

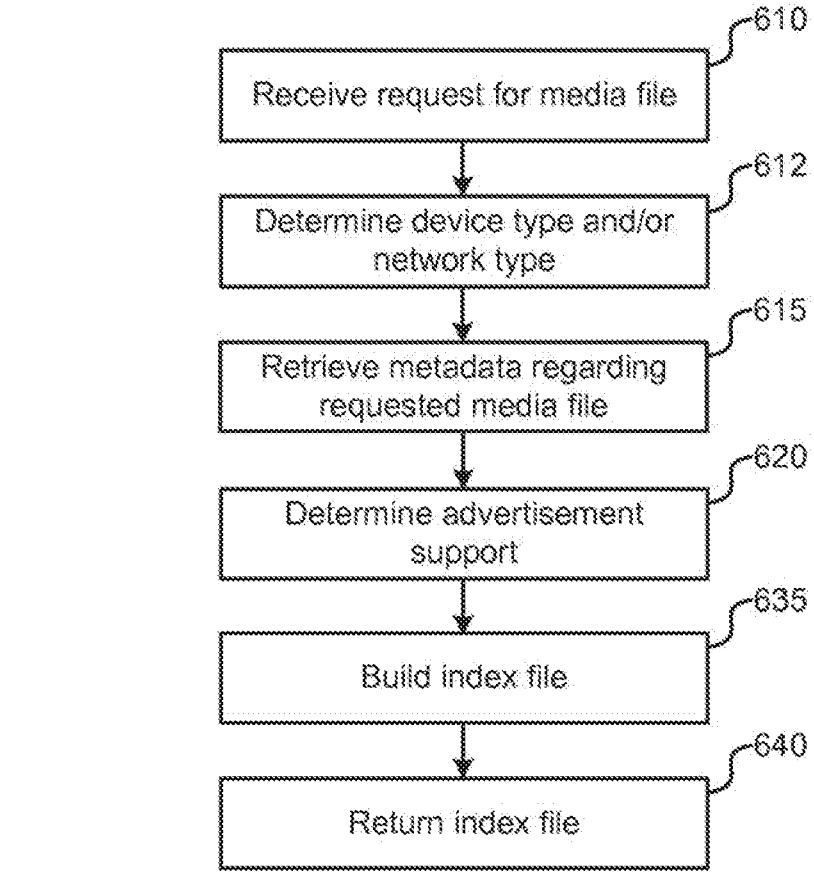

610
Receive request for media file
612
Determine device type and/or network type
615
Retrieve metadata regarding requested media file
620
Determine advertisement support
635
Build index file
640
Return index file
600-2

FIG. 6B

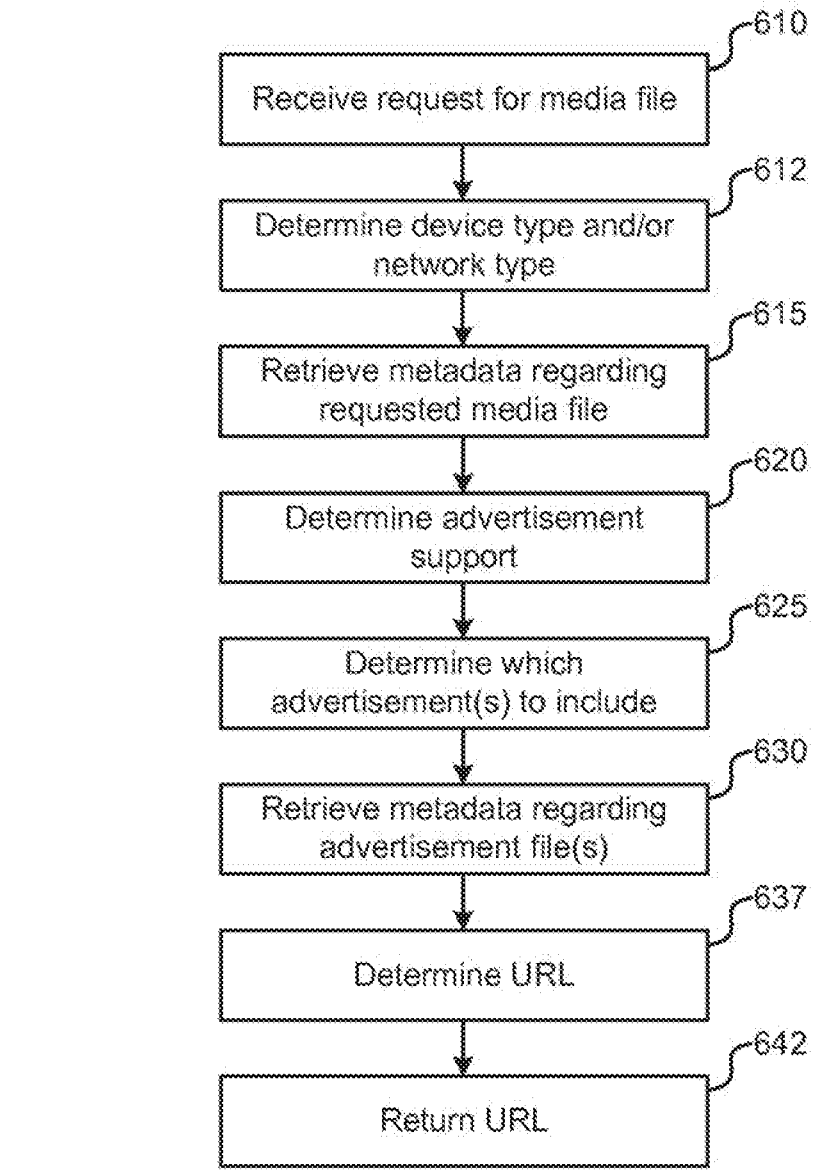

610
Receive request for media file
612
Determine device type and/or network type
615
Retrieve metadata regarding requested media file
620
Determine advertisement support
625
Determine which advertisement(s) to include
630
Retrieve metadata regarding advertisement file(s)
637
Determine URL
642
Return URL
600-3

FIG. 6C

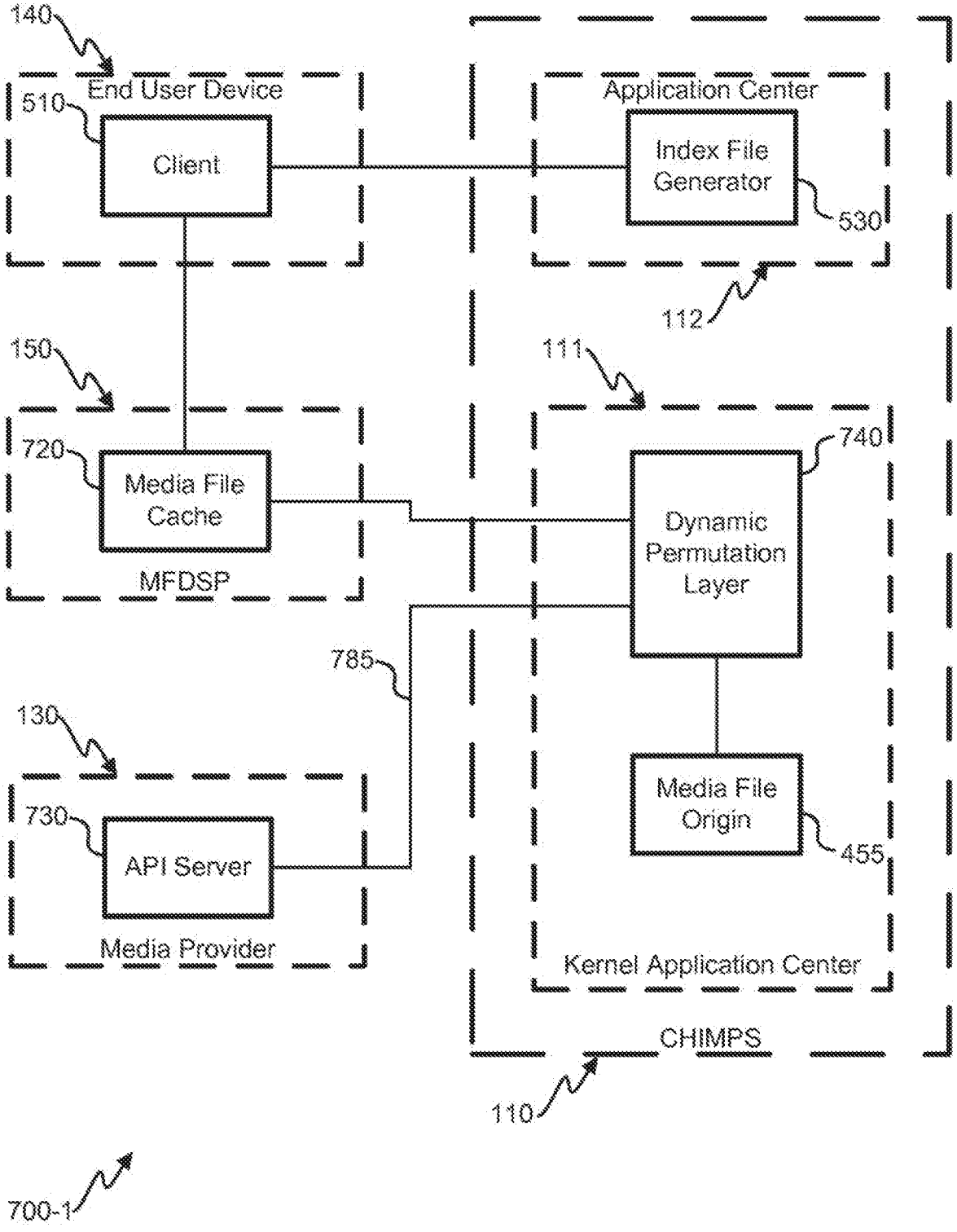

140
End User Device
510
Client
Application Center
Index File Generator
530
112
150
111
720
Media File Cache
MFDSP
740
Dynamic Permutation Layer
785
130
730
API Server
Media Provider
Media File Origin
455
Kernel Application Center
CHIMPS
110
700-1

FIG. 7A

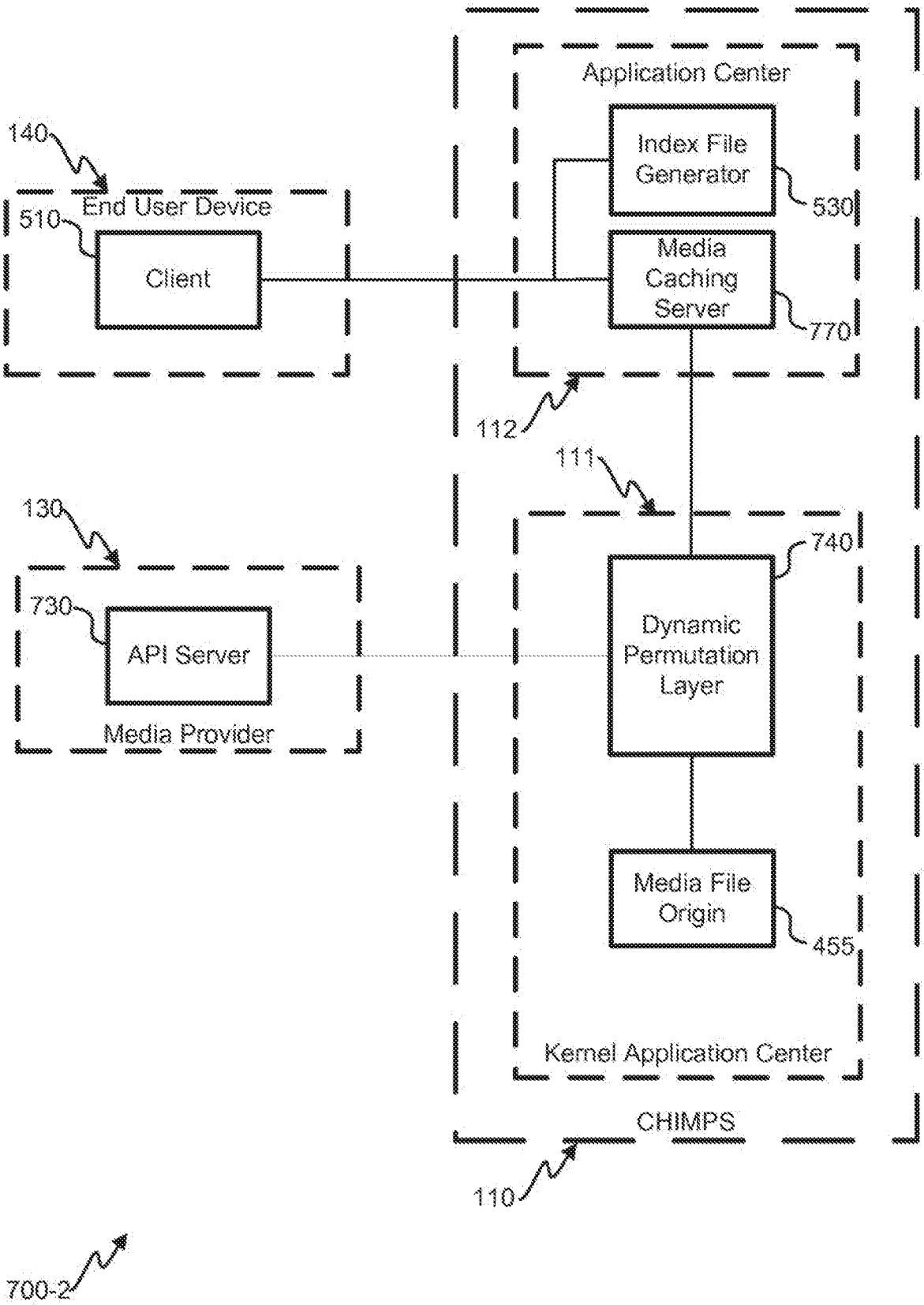

Application Center
Index File Generator
530
140
End User Device
510
Client
Media Caching Server
770
112
111
130
740
730
API Server
Dynamic Permutation Layer
Media Provider
Media File Origin
455
Kernel Application Center
CHIMPS
110
700-2

FIG. 7B

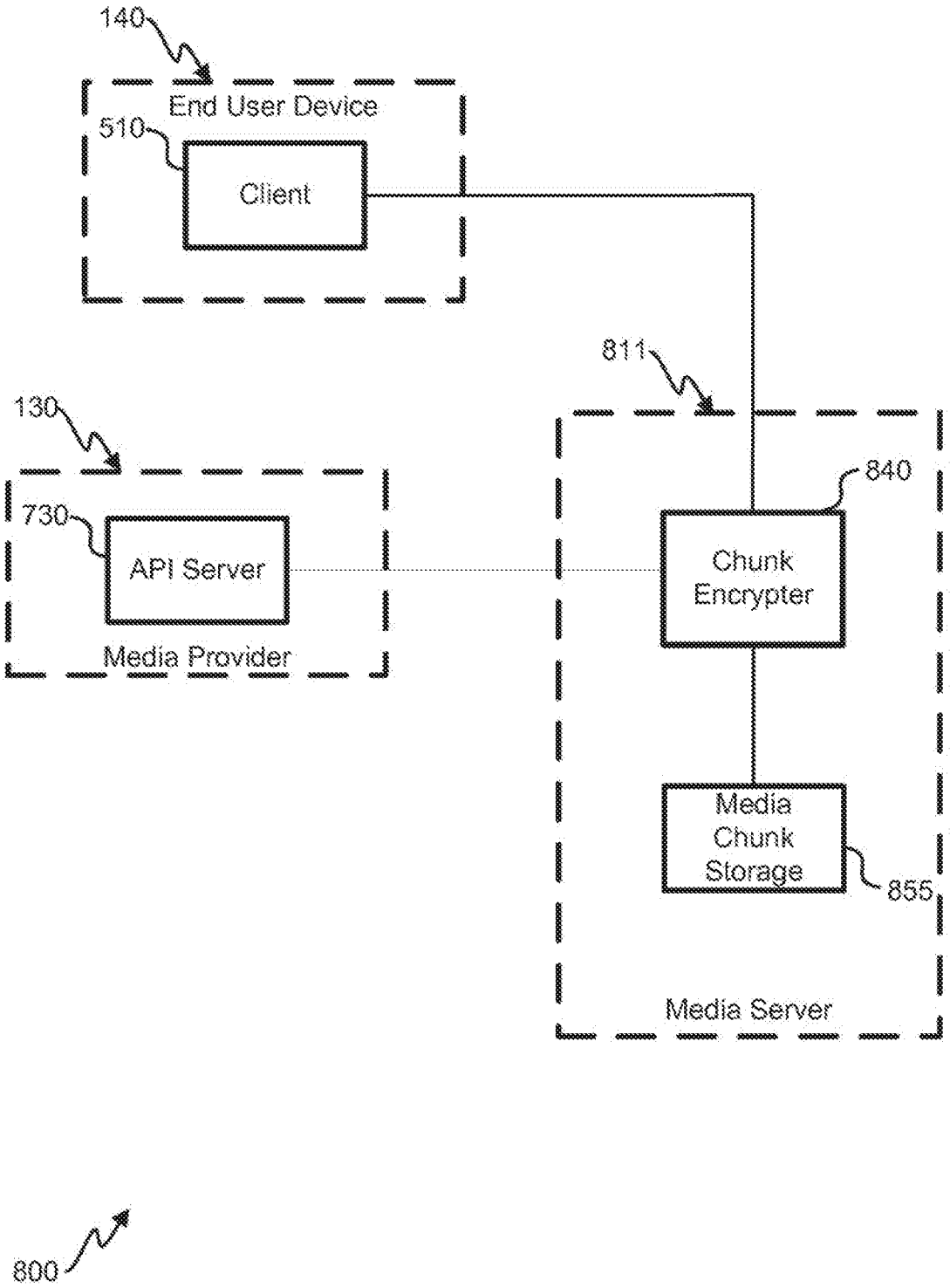

140
End User Device
510
Client
811
130
840
730
API Server
Chunk Encrypter
Media Provider
Media Chunk Storage
855
Media Server
800

FIG. 8

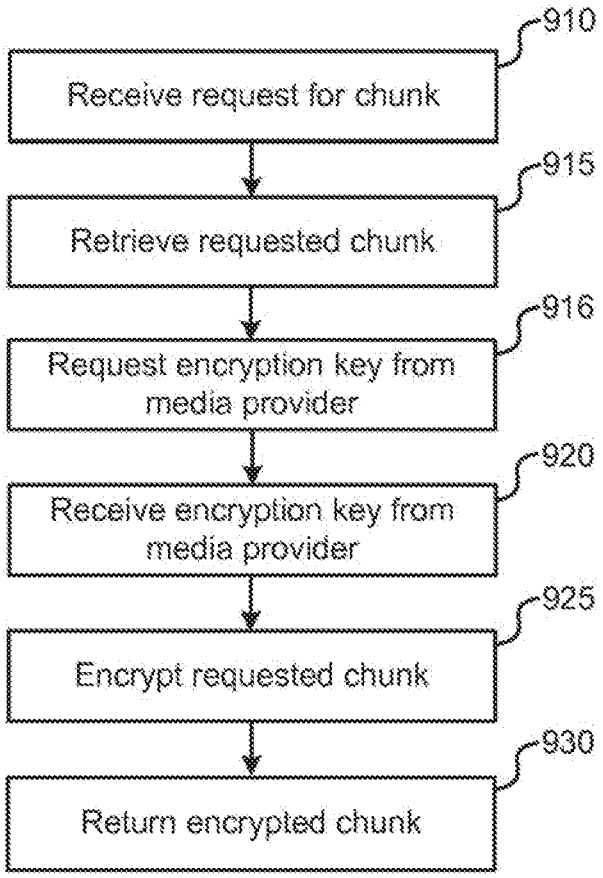

910
Receive request for chunk
915
Retrieve requested chunk
916
Request encryption key from media provider
920
Receive encryption key from media provider
925
Encrypt requested chunk
930
Return encrypted chunk
900-1

FIG. 9A

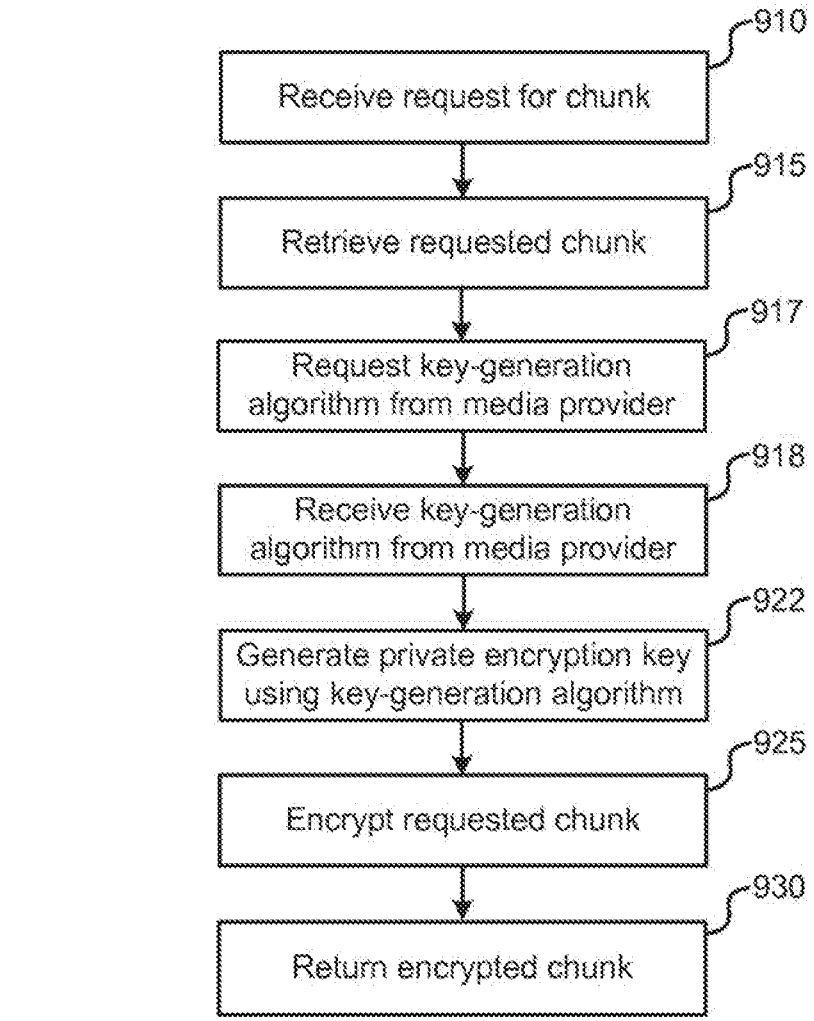

910
Receive request for chunk
915
Retrieve requested chunk
917
Request key-generation algorithm from media provider
918
Receive key-generation algorithm from media provider
922
Generate private encryption key using key-generation algorithm
925
Encrypt requested chunk
930
Return encrypted chunk
900-2

FIG. 9B

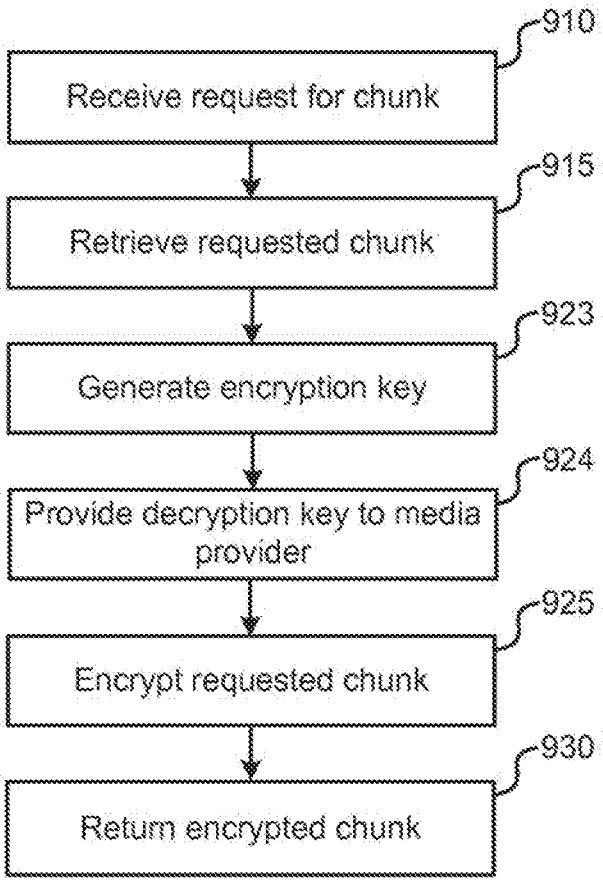

910
Receive request for chunk
915
Retrieve requested chunk
923
Generate encryption key
924
Provide decryption key to media provider
925
Encrypt requested chunk
930
Return encrypted chunk
900-3

FIG. 9C

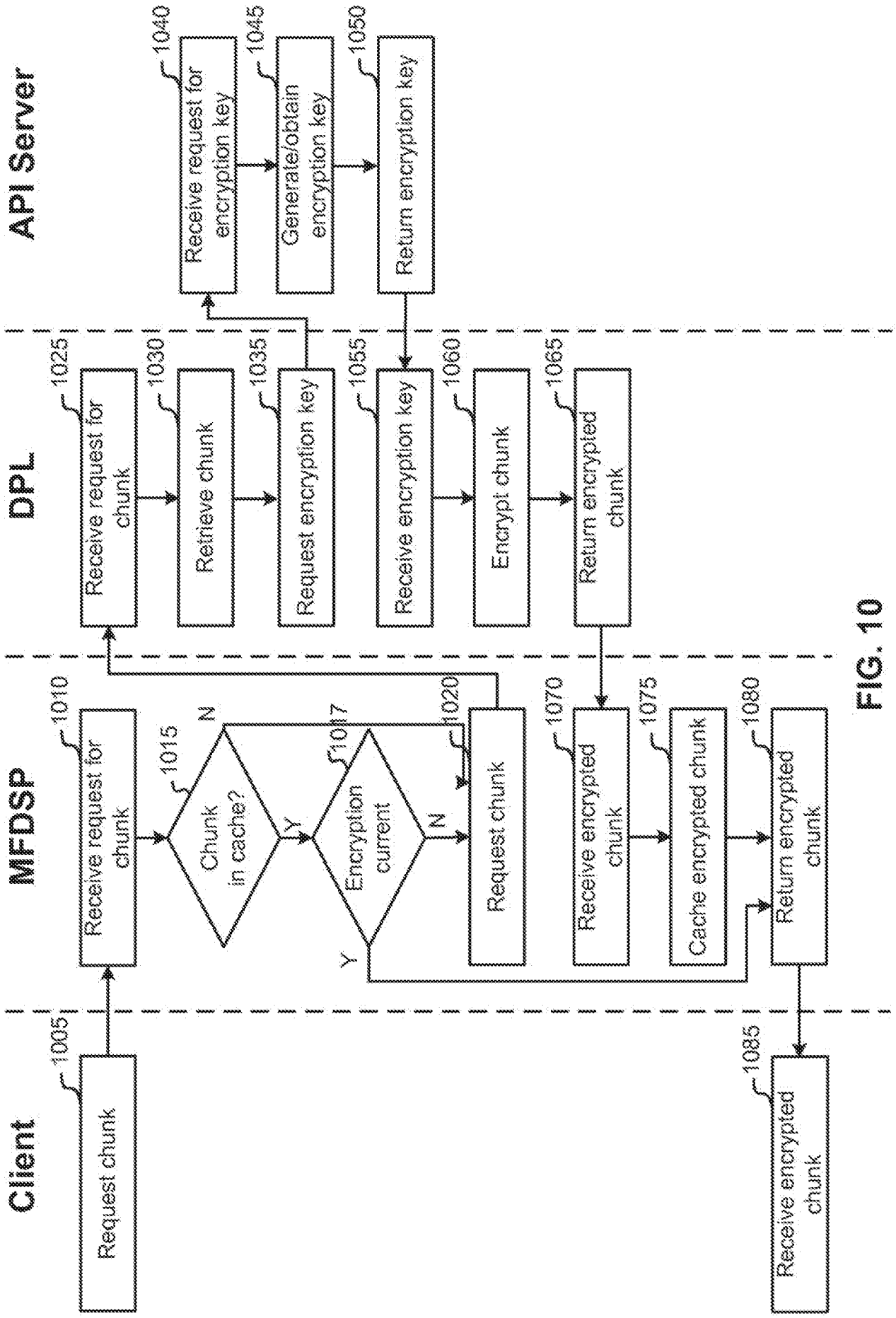

Client
MFDSP
DPL
API Server
Request chunk
1005
Receive request for chunk
1010
Chunk in cache?
1015
N
Y
Encryption current
1017
Y
N
Request chunk
1020
Receive request for chunk
1025
Retrieve chunk
1030
Request encryption key
1035
Receive request for encryption key
1040
Generate/obtain encryption key
1045
Return encryption key
1050
Receive encryption key
1055
Encrypt chunk
1060
Return encrypted chunk
1065
Receive encrypted chunk
1070
Cache encrypted chunk
1075
Return encrypted chunk
1080
Receive encrypted chunk
1085

FIG. 10

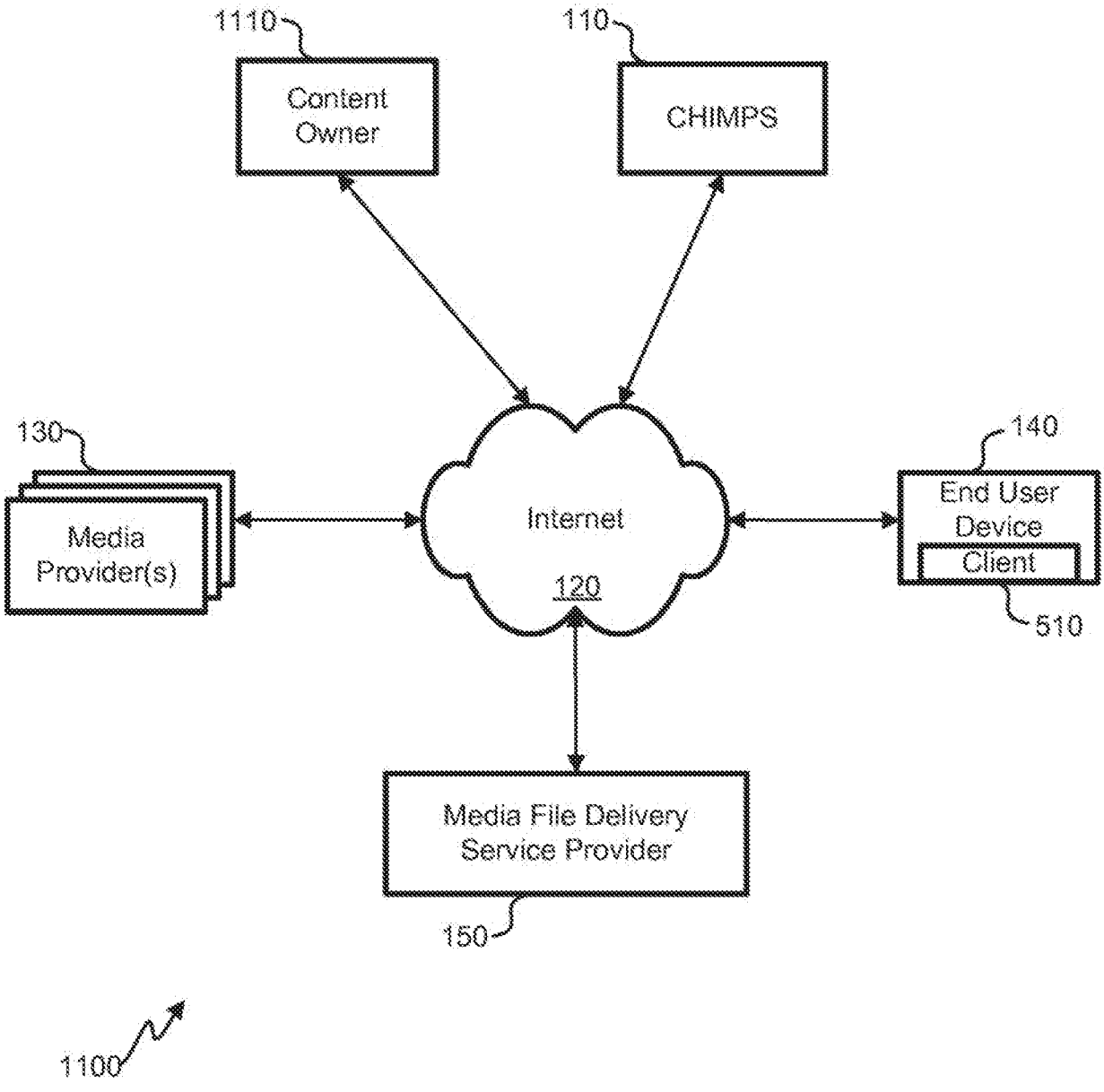
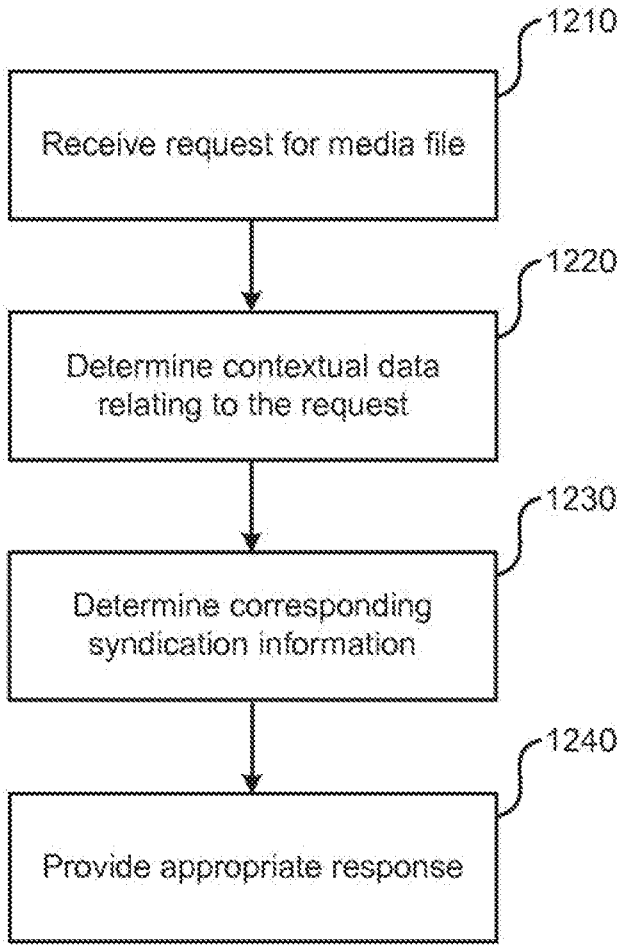

1110
Content Owner
110
CHIMPS
130
Media Provider(s)
Internet
120
140
End User Device
Client
510
Media File Delivery Service Provider
150
1100

FIG. 11



1200-1

FIG. 12A

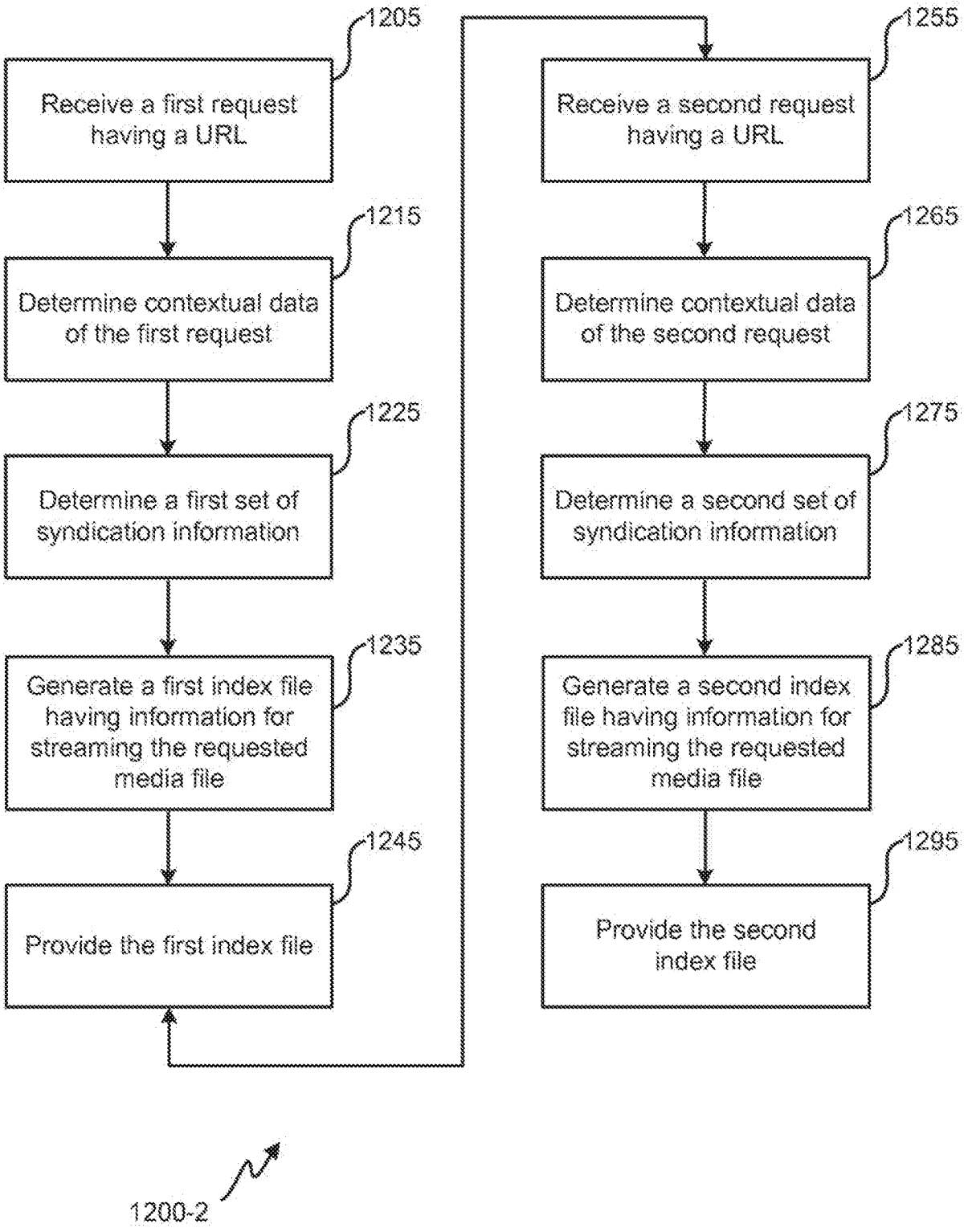

1205
Receive a first request having a URL
1215
Determine contextual data of the first request
1225
Determine a first set of syndication information
1235
Generate a first index file having information for streaming the requested media file
1245
Provide the first index file
1255
Receive a second request having a URL
1265
Determine contextual data of the second request
1275
Determine a second set of syndication information
1285
Generate a second index file having information for streaming the requested media file
1295
Provide the second index file
1200-2

FIG. 12B

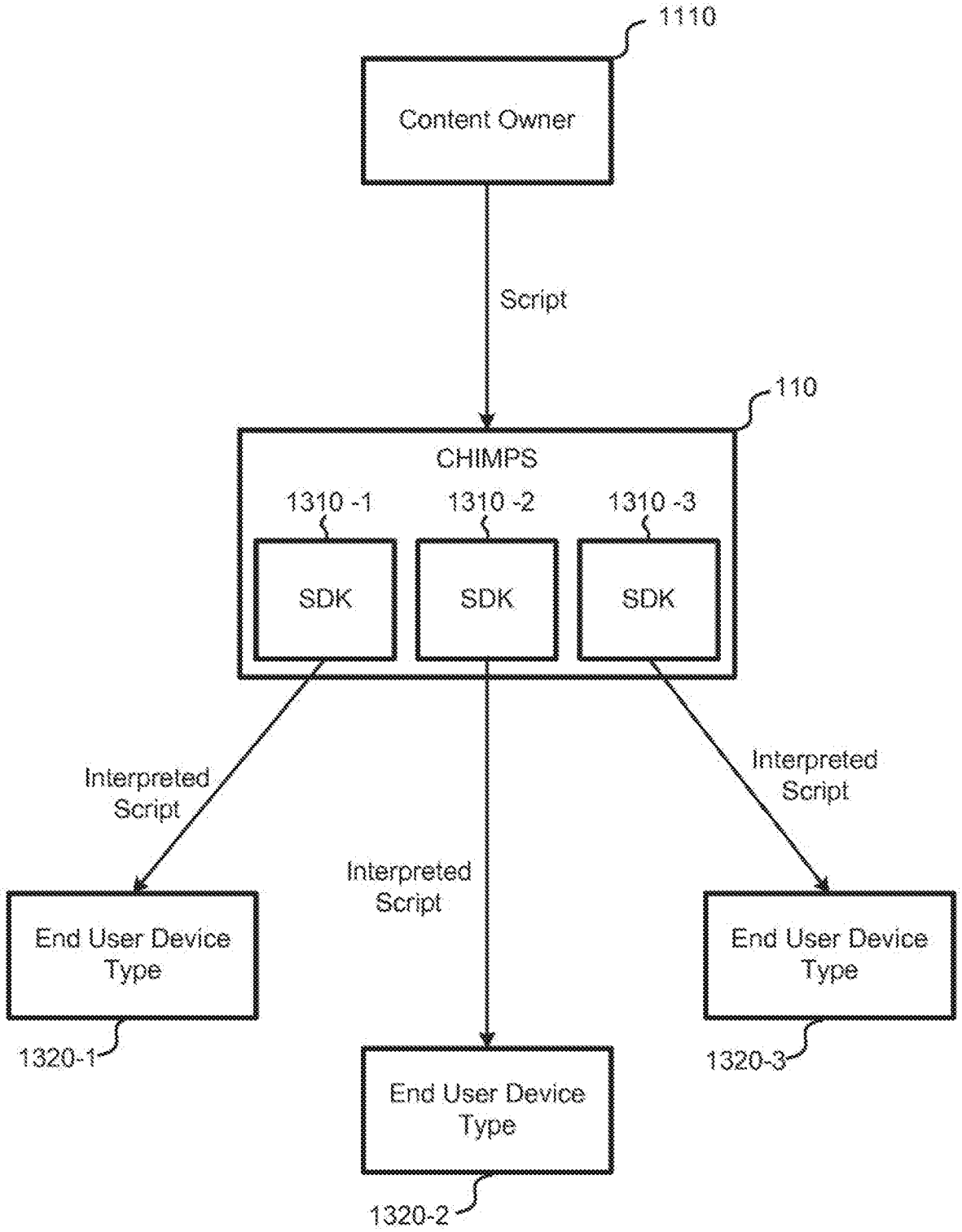

1110
Content Owner
Script
110
CHIMPS
1310 -1
1310 -2
1310 -3
SDK
SDK
SDK
Interpreted Script
Interpreted Script
Interpreted Script
End User Device Type
End User Device Type
End User Device Type
1320-1
1320-2
1320-3

FIG. 13

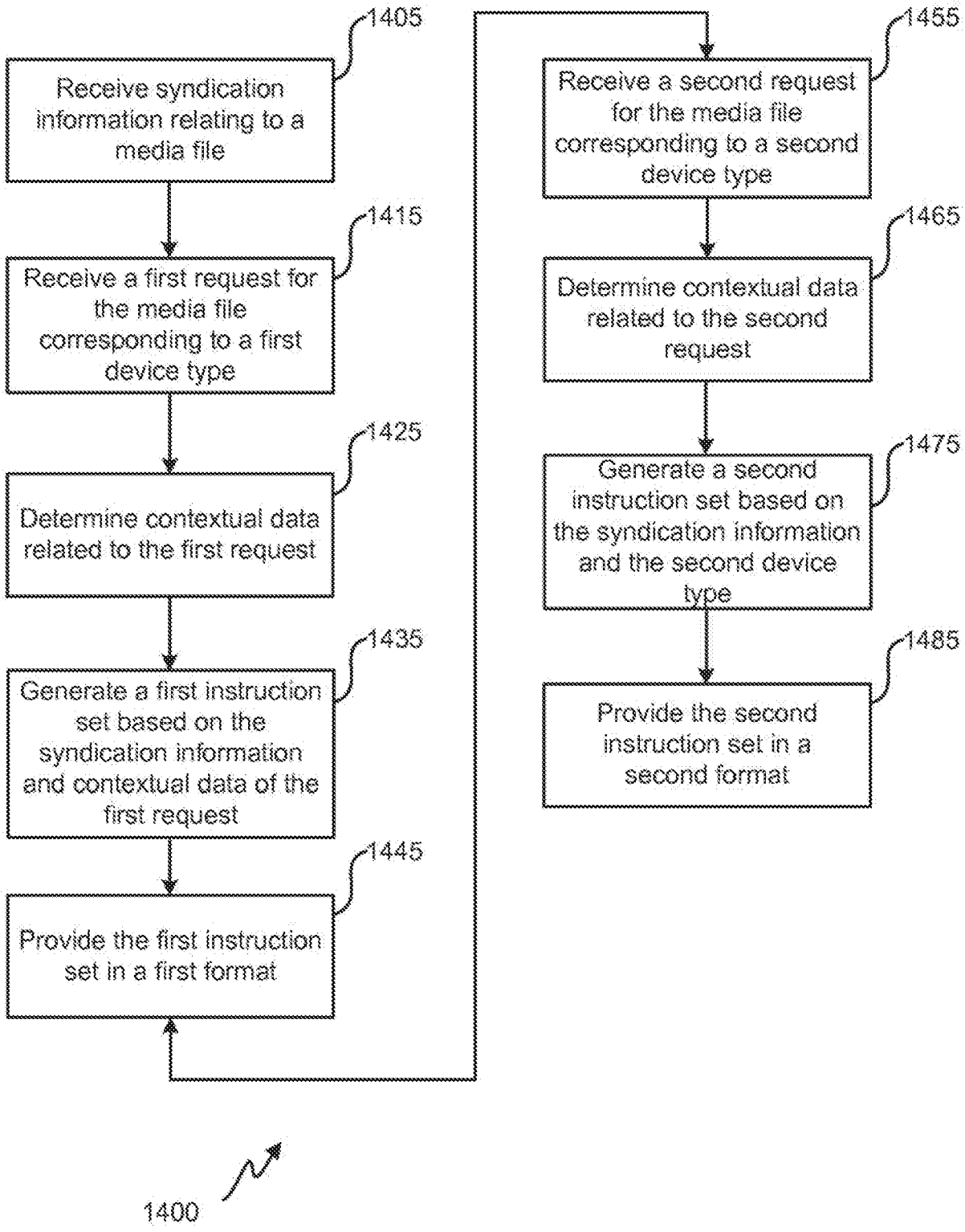

1405
Receive syndication information relating to a media file
1415
Receive a first request for the media file corresponding to a first device type
1425
Determine contextual data related to the first request
1435
Generate a first instruction set based on the syndication information and contextual data of the first request
1445
Provide the first instruction set in a first format
1455
Receive a second request for the media file corresponding to a second device type
1465
Determine contextual data related to the second request
1475
Generate a second instruction set based on the syndication information and the second device type
1485
Provide the second instruction set in a second format
1400

FIG. 14

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/071669

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F17/30
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010 (2010-12-23) abstract paragraph [0001] - paragraph [0008] paragraph [0023] - paragraph [0034] paragraph [0036] - paragraph [0037] paragraph [0047] - paragraph [0053] paragraph [0054] - paragraph [0061] paragraph [0067] - paragraph [0074] claims 1,10,18 ----- -/--	1-15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 March 2013	05/04/2013

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

Form PCT/ISA/210 (second sheet) (April 2005)

Petitioner Disney Ex-1004, 0575

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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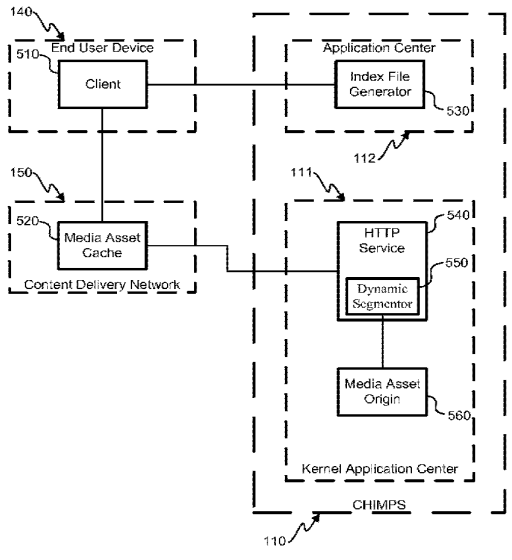
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[Continued on next page]

(54) Title: DYNAMIC AUDIO TRACK SELECTION FOR MEDIA STREAMING



500-1

FIG. 5A

(57) Abstract: Systems and methods for providing index files for dynamic audio track selection for media streaming can include receiving requests for media file segments (e.g., "chunks") with a certain audio track and responding to the requests by dynamically generating the corresponding media file segment with the requested audio track. The generated media file segment can then be provided to the requesting entity.

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DYNAMIC AUDIO TRACK SELECTION FOR MEDIA STREAMING

BACKGROUND OF THE INVENTION

[0001[The delivery of media over networks such as the Internet can be accomplished in many ways, including progressive downloading or streaming. Streaming is often preferred to progressive downloading because it offers additional features such as content protection and the ability to seek to undownloaded parts of a media file. The process of preparing a media file for streaming typically involves "chunking" the file, or dividing files up into smaller segments for delivery. Information including where chunks may be accessed can be stored in an index file. This index file can be delivered to a client, such as a media player application, for use in streaming.

[0002[The processes of chunking and indexing files for streaming present challenges to a content delivery network or content provider desiring to host media files for streaming. For example, a significant amount of preprocessing is required to prepare media for streaming. Media content may be encoded into several different files to accommodate several different sub-streams. Each of these files typically are chunked, stored, and indexed before the media content is available for streaming. This preprocessing leaves little flexibility for dynamically selecting an audio track during streaming and can require a large amount of storage space to store the preprocessed chunks of media.

BRIEF SUMMARY OF THE INVENTION

[0003[Systems and methods are disclosed provide a technical solution for enabling customized media file delivery by dynamically creating media segments, or chunks, having an appropriate audio track. The generated media file segment can then be provided to the requesting entity. Because media file segments are created dynamically, and an appropriate audio track is included, the systems and methods provided herein can reduce the required bandwidth for streaming a media file by removing unused audio tracks.

[0004[An example server providing audio track selection for media streaming via a data network, according to the description, includes an interface for communicating with the data network, a memory configured to store a media file, and a dynamic segmentor coupled with the memory and the interface. The dynamic segmentor is configured to obtain, via the

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interface, a request for a first segment of the media file, determine, based on the request for the first segment of the media file, a starting point and an ending point of the requested first segment of the media file, and retrieve a first portion of the media file from the memory, the first portion of the media file having a video component and at least one audio track. The dynamic segmentor is further configured to generate, without transcoding the first portion of the media file, the requested first segment of the media file such that the requested first segment of the media file has a single audio track, and send, via the interface, the requested first segment of the media file.

[0005[An example method of providing audio track selection for media streaming via a data network, according to the description, includes obtaining a request for a first segment of a media file, determining, based on the request for the first segment of the media file, a starting point and an ending point of the requested first segment of the media file, and retrieving at least a portion of the media file, the at least a portion of the media file having a video component and at least one audio track. The method further includes generating, without transcoding the at least a portion of the media file, the requested first segment of the media file such that the requested first segment of the media file has a single audio track, and sending providing the requested first segment of the media file.

[0006[Another example server providing audio track selection for media streaming via a data network, according to the description, includes means for obtaining a request for a first segment of a media file, means for determining, based on the request for the first segment of the media file, a starting point and an ending point of the requested first segment of the media file, and means for retrieving at least a portion of the media file, the at least a portion of the media file having a video component and at least one audio track. The server further includes means for generating, without transcoding the at least a portion of the media file, the requested first segment of the media file such that the requested first segment of the media file has a single audio track, and means for sending providing the requested first segment of the media file.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007[The present disclosure is described in conjunction with the appended figures:

[0008[FIG. 1 illustrates a block diagram of a media servicing system.

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[0009[FIG. 2A illustrates a block diagram of an embodiment of a kernel application center connected with application centers.

[0010[FIG. 2B illustrates a block diagram of an alternative embodiment of a kernel application center.

[0011[FIG. 3 illustrates a block diagram of an embodiment of an application center.

[0012[FIG. 4 illustrates a block diagram of processes and objects utilized by a cloud-hosted integrated multi-node pipelining system for media ingestion.

[0013[FIG. 5A illustrates a simplified block diagram of an embodiment of a system configured to provide dynamic indexing and chunking for media streaming.

[0014[FIG. 5B illustrates a simplified block diagram of another embodiment of a system configured to provide dynamic indexing and chunking for media streaming.

[0015[FIG. 5C illustrates a simplified block diagram of another embodiment of a system configured to provide dynamic indexing and chunking for media streaming, utilizing a redirector.

[0016[FIG. 6 illustrates a simplified flowchart of an embodiment of a method for implementing a dynamic index for media streaming.

[0017[FIG. 7 illustrates a simplified flowchart of an embodiment of a method for dynamically chunking a media file for streaming.

[0018[FIG. 8 illustrates a simplified swim lane flowchart describing the interaction of components in a system configured to provide dynamic indexing and chunking for media streaming, according to one embodiment.

[0019[FIGS. 9A-9C are illustrations of embodiments of how media file chunks can be generated to provide for dynamic audio track selection for media streaming.

[0020[FIG. 10 is a flow diagram illustrating a method for providing dynamic audio track selection for media streaming, according to one embodiment.

[0021[In the appended figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the

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description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

DETAILED DESCRIPTION OF THE INVENTION

[0022[The ensuing description provides preferred exemplary embodiment(s) only, and is not intended to limit the scope, applicability or configuration of the disclosure. Rather, the ensuing description of the preferred exemplary embodiment(s) will provide those skilled in the art with an enabling description for implementing a preferred exemplary embodiment. It is understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope as set forth in the appended claims.

[0023[The increased availability of media content over data communications networks such as the Internet has mirrored the increased bandwidth for these networks. Because media has recently taken a more prominent role in data communications, the distribution of media and the data associated with such distribution has become increasingly important, particularly to media content providers. Media streaming has become a widely-used method of media distribution, but the preprocessing associated with streaming can be burdensome. Certain protocols, including forms of Hypertext Transfer Protocol (HTTP) streaming, require chunking and storing media assets, and generating a corresponding index files. These requirements can deprive a content provider of the ability to dynamically insert additional media such as advertisements into a media stream, and can consume a large amount of storage space to store chunks of media for a media asset, including chunks for any alternative sub-streams (e.g., streams with alternative bitrates, captions, alternative languages, etc.). Certain systems and methods can be utilized, however, to introduce the desired functionality back into the system.

[0024[A traditional approach to preprocessing media for streaming involves chunking and storing media assets, then creating corresponding index files to indicate where chunks may be located to download for streaming. Streaming protocols often provide for frequently updating an index file for instances where the corresponding media is frequently updated, such as during live streaming. Thus, an index file does not need to contain all chunks for a requested media asset. In addition, because media files are frequently stored in a format that requires little additional processing to chunk, the chunks can be created in real time, during

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the streaming of a media file. The systems and methods disclosed herein take advantage of these features to enable dynamic index file creation and dynamic media file chunking.

[0025[For instance, rather than preprocess media assets for streaming by chunking and indexing all files with relevant sub-streams prior to streaming the media, a server can dynamically create and update an index file during streaming. The dynamically-created index file can contain information regarding a next chunk of media in the various available sub-streams. The next chunk of media may not be cached at a location specified in the index file, in which case a chunk may be dynamically created by pulling all or part of the media file of interest from a media file origin, chunking it, and making it available for download. The chunk also may be cached, thereby eliminating the need to create the chunk again if it is requested at some later time.

[0026[Because the chunks are created during streaming, a content provider and/or media distributer can have more information and control during the streaming process. Rather than generate single index file for a given media asset, an instance of the index file generator may be created at the beginning of the media streaming to provide individualized media content to a particular end user and unique information regarding the streaming session to a content provider. The file index generator can vary the length of each chunk by, for example, indicating starting and ending points in the index file. Thus, the file index generator may determine a uniform chunk length for a media asset, varying the length of the chunks for different media assets, or the file index generator may adjust the length of the chunks within a single media asset. The index file generator can further insert additional media, such as an advertisement, at any time during the streaming by specifying the location of the additional media in the index file. The determination to insert advertisements can be based on any information, including data collected during the streaming session.

[0027[As the index file generator receives requests for and generates index files, it can further gather data regarding the streaming session for reporting to a content provider. Content providers often rely on beaconing data collected from media player applications to determine when an end user stops, plays, pauses, skips, etc., the streaming media content. Such information can be vital in determining the value of the media.

[0028[Because not all media player applications provide this beaconing data, the data gathered by the index file generator can serve as a substitute for or complement to the beaconing data. For example, if a request is made for a chunk that does not immediately

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follow a previously-requested chunk, a skip was made. If the amount of time elapsed between a previous request and a subsequent request exceeds the time for playback of the previously-requested chunk, a pause was made. If a request is not received within a certain time since a prior request, it can be determined that a stop was made.

[0029[As illustrated above, the state of a client may be determined from a variety of factors. This can include when the request for the index file is received, when the index file is provided, a length of time to play back the segment of media for streaming, and/or the starting and/or ending point of the segment of media for streaming. The determined state of a client may also be based on whether the request for the index file has been received within a certain amount of time since receipt of a previous request for an index file, whether the segment of media for streaming includes media other than the media file, and more. The state of a client and/or the data from which it was determined, may be used to create reporting data to serve as a substitute or complement to beaconing data from a client media player application. Because the index file generator can determine the length of the chunks, it therefore can determine the frequency of subsequent index file requests and the resolution of the reporting data based on the requests. The index file generator may log the reporting data and/or transmit the reporting data over a network during streaming.

[0030[The determined state of a client may be used by the index file generator and/or other services for various purposes. For example, it may be used in behavioral advertisement targeting and enforcement of session advertisement behavior, adjusting advertisement content and playback based on the behavior of a user as determined by the stated of a client. The state of a client further may be used to support resume features on a per client basis, allowing a user to continue playback of a media asset from a point at which the user had previously stopped playback. The state of a client also may be used to support individual encryption keys in an encryption scheme and allow the index file generator to return secure URLs (e.g., time expiring or Internet Protocol (IP) allowed) for chunks to support functions such as payment services.

[0031[Additionally or alternatively, the tasks of generating the index file and providing a location a requested chunk can be split up, thereby enabling the system to determine which chunks are actually requested. For example, a system may be configured to dynamically create an index file having links to one or more redirectors on the system. These redirectors can be configured to issue the location of the chunk, which can be created dynamically. The

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redirectors can further determine which chunk is actually requested, thereby enabling, among other things, calculation of Quality of Service (QOS) metrics, an increase the accuracy of reporting data, a decrease the frequency of index file generation if efficient to do so, and the ability to more easily handle keys of an encryption scheme.

[0032[While the above embodiments may be implemented in a variety of different systems, some particular embodiments may be implemented as part of a media service system. **FIG. 1** is a block diagram illustrating a media servicing system 100, according to some embodiments of the present invention. The system may deliver media content to the end user device 140 through a network such as the Internet 120. The end user device 140 can be one of any number of devices configured to receive media over the Internet 120, such as a mobile phone, tablet computer, personal computer, portable media device, etc. A media asset provided by a content provider 130 can be processed and indexed by cloud-hosted integrated multi-node pipelining system (CHIMPS) 110, and further stored on content delivery network (CDN) 150. Additionally or alternatively, the CHIMPS 110 may also be adapted to store the media asset.

[0033[The media servicing system further enables a content provider 130 or other entity to gather information regarding user behavior during media playback. For example, a content provider 130 can be provided with data indicating that end users tend to stop watching a video at a certain point in playback, or that users tended to follow links associated with certain advertisements displayed during playback. With this data, a content provider 130 can adjust factors such as media content, advertisement placement and content, etc., to increase revenue associated with the media content and provide the end user device 140 with a more desirable playback experience.

[0034[End user device 140 can request a media asset to stream with a client program executed by the end user device 140. The client program can be, for example, a media player, browser, or other application adapted to request and/or play media assets. In response to a request for a media asset, the CHIMPS 110 can utilize any number of application centers 112 and/or kernel application center(s) 111 to provide the client program with a data object concerning the requested media asset. The data object can include information about the media asset, including where the media asset can be located, such as within the CDN 150 or within the CHIMPS 150 itself. Location information may be provided by Universal Resource Indicator (URI), a Universal Resource Locator (URL) or other indicator. During playback of

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the media asset, the CHIMPS 150 can collect data regarding the playback through beaconing provided by a client program executed by the end user device 140 and/or indexing service from within the CHIMPS and/or CDN. The CHIMPS 150 can subsequently provide the data and/or any analytics information derived from the data to the content provider 130.

[0035[**FIG. 2A** is a block diagram illustrating an embodiment of a kernel application 111-1 center connected with application centers from within the CHIMPS 110-1. The kernel application center 111-1 and application centers 112 can be geographically distant and can be connected via the Internet 120, wide area network (WAN), and/or other data communication network. Because application centers can be geographically separated, DNS services (not shown) can be used to allow an end user device 140 to connect to the nearest available application center 112. The kernel application center 111-1 can connect with application centers 112 within the CHIMPS 110-1 through an internal interface 270, thereby enabling the application centers 112 access to the various components within the kernel application center 111-1.

[0036[Components within the kernel application center 111-1 can communicate through network 260 such as a local area network (LAN) and can include one or more origin servers 240 and a storage array 230 with which data objects and/or media assets may be stored and distributed. The storage array 230 may also be utilized by services running on processing server(s) 220 and/or transcoding server(s) 250 that may require temporary or long-term storage. Kernel server 210 can utilize processing server(s) 220, transcoding server(s) 250 to provide various functional capabilities to the CHIMPS 110.

[0037[For example, as described in more detail below, the CHIMPS 110-1 can provide transcoding service for media assets provided by a content provider 130 for syndication. Such a service can allow a content provider 130 to upload a media asset to an application center 112, after which the application center 112 would notify the kernel server 210 that the media asset has been uploaded. The kernel server can then notify services running on the processing server(s) 220 of the upload. These services can utilize transcoding server(s) to transcode the media asset, which can then be moved to a CDN and/or stored locally by storage array 230 and origin server(s) 240. Services running on the processing server(s) 220 can also update the associated data object stored by the storage array 230 and origin server(s) 240.

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[0038[FIG. 2B is a block diagram illustrating an alternative embodiment of a kernel application center 111-2. In addition to the components of the embodiment of FIG. 2A, this embodiment incorporates an application center 112 within the kernel application center 111-2. The application center 112 incorporated within kernel application center 111-2 may be located at or near the other components of the kernel application center 111-2, and can be communicatively connected to the other components via network 260. The incorporated application center 112 can therefore have faster access to kernel application center functionality because it does not need to communicate over long distances. In consideration of this advantage, it will be understood that the CHIMPS 110 can include multiple kernel centers with one or more application centers incorporated therein. Additionally or alternatively, components of the kernel application center may be incorporated into one or more application centers 112 in the CHIMPS 110 to provide quicker access to certain functionality.

[0039[FIG. 3 is a block diagram illustrating an embodiment of an application center 112. The application center 112 can include caching server(s) 330 and a storage array 310 for storing and distributing data objects of media assets requested by end user devices through end user interface 360. Caching server(s) 330 and storage array 310 can also be used to collect, process, and/or store metrics information from beaconing data, media chunk requests, and/or other data sources, including data collected through end user interface 360. The application center can further include ingest server(s) 320 for ingesting uploaded media assets from a content provider 130 through a content provider interface 370. The media assets may be stored on the storage array 310. As with the kernel application center 111, the components of the application center 112 can be communicatively linked through a network 340, such as a LAN. The application center can further include an internal interface 350, providing a communication link from the application center to the rest of the CHIMPS. It is through internal interface 350, for example, that media assets stored on storage array 310 can be made available to a kernel application center 111 for services such as transcoding.

[0040[FIG. 4 is a block diagram 400 of processes and objects utilized by the CHIMPS 110 for media ingestion, according to some embodiments. Although FIG. 4 further indicates the physical systems in which my execute or store these processes and objects, it will be understood that the processes and objects disclosed may be executed or stored on more than one system, including systems not disclosed in FIG. 4. In other words, the processes and

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objects shown in FIG. 4 allow for a variety of implementations through one or more of hardware, software, firmware, microcode, etc.

[0041[Media can be ingested into the CHIMPS 110 when a content provider 130 uploads a media asset to ingestion server(s) 410 in an application center 112 by utilizing a client 405. The client 405 can be a stand-alone application or browser based, for example, and can communicate with ingest server(s) 410 through an application programming interface (API) configured for the ingestion of media assets.

[0042[Ingest server(s) 410 can communicate with devices in the kernel application center 111 executing programs such as kernel server 425 and file replication service 430. The kernel server 425 can be configured organize the workflow among services such as transcoding 440 file system manager 435, and other services 445 (e.g., analytics, dynamic API, etc.) Upon a particular event, for example, the kernel server can be configured to notify the relevant services of the event, causing the services to process tasks associated with the event.

[0043[The file replication service 430, under direction of the kernel server 425, can coordinate the movement of the media assets between services. For example, retrieving the uploaded media asset from the ingest server(s) 410 and storing it on the file archive 450, or retrieving transcoded media assets from transcoding server(s) 460 and storing them in the media asset origin.

[0044[The data object updater 420 keeps the data object origin 415 up to date in response to any changes in the system. When, for example, a file is uploaded, transcoded, and stored in media asset origin 455, the location and other metadata concerning the transcoded media assets need to be created or updated in the data object origin 415 to ensure an end user device that accesses the object in the data object origin 415 has the correct information regarding the related media asset. Because the data object updater 420 receives updates from the kernel server 425 (which is notified when a transcoded media asset is stored in the media asset origin 455, the system ensures the data objects in the data object origin are constantly up to date.

[0045[The upload of a media asset to the ingest server(s) 410, as described above, can provide an example of how the kernel server 425 may coordinate workflow. For instance, in response to the upload, the ingest server(s) 410 can notify the kernel server 425 that a media

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asset has been uploaded. The kernel server 425 informs the file replication service 430 of the uploaded media asset, and the file replication service 430 moves the uploaded media asset into the file archive 450 and notifies the kernel server 425 of the move. In response, the kernel server 425 notifies the file replication service 430, the file system manager 435, and the transcoding master 440 of the move. The file replication service 430 then will know it can delete the uploaded media asset from the ingest server(s) 410, the file system manager 435 will update the file system accordingly, and the transcoding master 440 will notify transcoding service(s) 460 of different transcoding tasks to be performed. The transcoding service(s) 460 can then retrieve the uploaded media asset from the file archive 450 to create transcoded media assets. The transcoding service(s) 460 notify the kernel server 425 once transcoding is complete, and the kernel server 425 relays this information to the file replication service 430. The file replication service 425 then takes the transcoded media assets from the transcoding services 460 and moves them to the media asset origin 455. Once the file replication service 430 notifies the kernel server 425 of the move, the kernel server 425, in turn, notifies the file replication service 430 and the data object updater 420. The data object updater 420 which updates the data object origin 415 accordingly, and the file replication service 430 deletes the transcoded media assets from the transcoding services 460.

[0046[The modular nature of the system enables all tasks associated with an event to be completed quickly. As illustrated in the example above, workflow relating to a particular event, such as a media asset upload, can be spread among the various services simultaneously. Moreover, because the system's modularity enables it to be scaled to accommodate differing hardware capacities, and because the system can be configured to dynamically allocate hardware to different services according to the needs of the system, the speed of completing tasks relating to a particular event can further be increased. For example, a server of the CHIMPS 110 can be configured to dynamically switch its purpose based on external conditions such as load and overall system performance, providing functions such as transcode, upload, metrics collection, application web service, and more, on an as-needed basis.

[0047[Embodiments of such systems may include other systems that manage various requests from end users. For example, a system for dynamic index file generation and media file chunking. Referring to **FIG. 5A**, shows an embodiment of such a system 500-1. Media may be streamed to end user device 140 though a client 510. As mentioned above, the client

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510 can be stand-alone media player, a plug-in, a browser, or other application, which can be executed on a personal computer or other electronic device.

[0048[An index file generator 530, as discussed previously, can be a program instantiated for media streaming to a particular client 510. The index file generator 530 can be executed on a server or other computing device within an application center 112 of the CHIMPS 110. Index files generated by the index file generator can include a wide variety of information such as starting, ending, and or run times for media chunks and locations for media chunks. This information can be embedded in a single string of data, such as a URI or a URL. If media includes various sub-streams (e.g., streams with alternative bitrates, captions, alternative languages, etc.) the index file can include data for chunks corresponding to each of the alternative sub-streams, as well as information regarding the bitrate and/or other unique information for each stream. Alternatively or in addition, index files indicating alternative sub-streams may be separate from index files indicating one or more media chunks for streaming.

[0049[It should be understood that the index file can further comprise a wide variety of formats, which can depend on the particular protocol. HTTP streaming may, for example, require index files to comprise one or more of M3U, M3U8, XML, and XML-based formats. Of course, other formats can be used in accordance with relevant streaming protocols.

[0050[**Table 1** illustrates a simplified example of a generated index file in M3U9 format, indicating chunk of media for streaming. The index file in this example provides a URI for a chunk of media. The URI indicates the chunk is to be generated by dynamic segmentor 550, the chunk being 10 seconds long, starting at 9 seconds into the media file and ending 19 seconds into the media file.

Table 1: Example Index File Contents

```
#EXTM3U
#EXT-X-MEDIA-SEQUENCE:1
#EXT-X-TARGETDURATION:10
#EXTINF:10,
http://video.example.com/seg/9/19/seg1.ts
```

[0051[Referring again to FIG. 5A, the index file generator 530 can also include an indicator within an index file to indicate whether a chunk of media is to be dynamically created. If, for example, it is determined that a requested media asset has not been chunked

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and that the asset will be chunked dynamically, the index file generator can include the indicator in data corresponding to a chunk of media to be created. The indicator, which can be as simple as including the term "/seg/" in a URL, will indicate that a requested chunk of media needs to be generated.

[0052[The chunks of media can be generated during media streaming by a dynamic segmentor 550, which can be incorporated into an HTTP service 540. The HTTP service 540, as well as the media asset origin 560 can be located within a kernel application center 111 of the CHIMPS 110 on, for example, a media asset origin server. The system 500-1 can be configured such that the kernel application center 111 provides dynamically-created chunks of media to a CDN 150 for delivery to client 510. The CDN 150 can store the chunks locally in, for example, a media asset cache 520, thereby forgoing the need to dynamically create a chunk again if the same chunk is requested in the future.

[0053[In sum, the system for dynamic index file generation and media asset chunking 500-1 can, after receiving a request for an index file from a client 510, dynamically generate an index file with an index file generator 530. The index file can, among other things, indicate where a next chunk of media may be located. A client can then request the chunk from the location indicated by the index file, which can comprise a media asset cache 520 in a CDN 150. If the chunk is not found in the media asset cache 520, the cache miss can redirect the request to a segmentor 550 of an HTTP service 540, which can dynamically generate the requested chunk of media by accessing the corresponding media asset in the media asset origin 560. The requested media chunk can then be provided to the CDN 150 for storage in the media asset cache 520 and delivery to the client 510. If the same chunk is requested at a later point in time, the CDN 150 can deliver the chunk from the media asset cache 520, thereby forgoing the need to redirect the request to the segmentor 550 to regenerate the chunk.

[0054[**FIG. 5B** illustrates an alternative embodiment 500-2 of a system for dynamic index file generation and media file chunking. Rather than utilize a CDN, this embodiment 500-2 includes a media caching server within an application center 112 of the CHIMPS 110. The media caching server can receive chunk requests from and provide the corresponding chunks to a client. It will be understood that such a media caching server(s) or similar device(s) can be located anywhere within the CHIMPS and/or in a system(s) communicatively linked to the CHIMPS.

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[0055[**FIG. 5C** illustrates an embodiment 500-3 of a system for index file generation used in conjunction with a redirector 590. As discussed above, an index file generator 530 may create an index file having one or more URIs or other location information directing the client 510 to one or more redirectors 590. Redirector 590, can then provide the URI of the requested chunk with a redirect, such as a redirect under HTTP status code 302. The URI can be located on a CDN 520 or other location (such as a media caching server 570) and/or dynamically created by the dynamic segmentor 550. It will be understood that there can be any number of redirectors 590, which can be at any location, including locations of the CHIMPS 110 such as the application center 112 (as shown in FIG. 5C) or the kernel application center 111. It also will be understood that the URI or other location information provided by redirector 590 can be generated by or provided to the redirector 590 in any number of ways. The URI can be generated, for example, based on the request received by redirector 590 from client 510. Finally, it will be understood that the CHIMPS 110 can be configured to dynamically implement any combination of embodiments 500-1, 500-2, and 500-3, further choosing whether to utilize one or more redirectors based on factors such as, for example, a detected type of client 510.

[0056[Embodiments utilizing one or more redirectors can have several advantages. For example, and not by way of limitation, if a certain client were implemented in such a way that it "reads ahead" to request chunks, it could result in incorrect reporting data. Thus, it would be advantageous to determine which chunk is actually requested by the client. Additionally or alternatively, where chunks are available in various sub-streams with different bitrates, determining the actual requested chunk can be useful in calculating Quality of Service (QOS) metrics. Furthermore, it there may be scenarios in which it is more efficient to create larger index files having many chunks comprising large segments of media, reducing the number of index files required to stream a media asset, and thereby reducing the processing requirements to create the index files. If encryption is used having, for example, a rotating key or a per client key encryption scheme in which a valid key might change during playback of a media asset, it also may be advantageous to incorporate redirector(s) for handling legacy keys for some period of time.

[0057[**FIG. 6** illustrates a simplified flowchart of an embodiment of a method 600 for implementing a dynamic index for media streaming. The method 600, which can be executed by the index file generator 530, begins at block 610, where a request for an index file is

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received from a client 510. According to media streaming protocols contemplated by this embodiment, if data regarding a chunk of media is not provided in an initial index file, the client will continue to request or refresh an index file until it reaches an indicator in the index file that signals the end of a stream. Thus, the method can be assured to receive more than one request for an index file from a client provided that an initial index file does not include an indicator signaling the end of the stream.

[0058[At block 615, the method 600 additionally provides for receiving input from an advertising service. According to some embodiments, this input could be the availability of an advertisement, and can be provided by a service inside or outside the CHIMPS. In other embodiments, the input could come from a service that factors in any of a variety of factors to indicate that a specific advertisement or type of advertisement should be shown. Or that any advertisement should be shown.

[0059[At block 620, a determination is made whether to include an advertisement in the next chunk. According to some embodiments, this determination can be made with or without input from an advertisement service. It should be known that this determination can include the factors used by an advertisement service to provide the input of block 615. Whether the determination includes input from an advertisement service of block 615 or not, the determination can still include factors such as information about an end user collected before or during streaming of the media. This can include behavior of the end user during streaming of the media (as determined, for example, by machine-based logic through beaconing data and/or requested chunks of media provided by a client 510). Factors can also include information regarding the media asset used for streaming (such as type of content or preferred points within the media for an advertisement), preference(s) and/or selection(s) of an end user, when a previous advertisement was shown, time of day, and more. It can further include information regarding the source of a media asset, such as who created and/or provided the asset for viewing by an end user. It will be understood that other embodiments contemplate include secondary media, other than advertisements into the media stream in this manner. Moreover, the secondary media and/or advertisement can be of any length and also may be chunked. Thus, it may be determined that the next chunk includes all, or a select portion, of an advertisement of any specific length.

[0060[An index file is created based on the request as well as the determination of whether media, such as an advertisement, should be streamed, indicated by block 625. As discussed

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above, the index file can assume a variety of formats and include any amount of information regarding a next chunk of media for streaming. For example, HTTP streaming can utilize index files having the URLs of available chunks of media. Information can be embedded in these URLs to indicate a location to download the corresponding chunk of media, starting point and/or ending point of a chunk of media, an indicator to indicate whether the chunk is to be dynamically created by a segmentor 550, a location of an advertisement to be streamed, and more. This information is included in the index file and sent to the client at block 630.

[0061[At block 635, reporting data can be created based on information included in the index file. As previously discussed, information included in an index file and/or index file request can indicate the behavior of an end user device 140 during streaming, such as a pause, stop, skip, play, etc. of the media. According to some embodiments, this information can be extracted from requests for an index file and/or providing the requested index file. The information can be gathered in addition to or as a substitute for beaconing data provided by a client 510. Moreover, if beaconing data is provided, the creation of reporting data may be omitted altogether.

[0062[Reporting data can include any amount of information regarding end user behavior, as indicated through index file requests and/or provided index files. This can include a particular action and when it was performed. Additionally or alternatively, the data may be kept in a more rudimentary form, depending on the application or embodiment, indicating the data included in an index file request and/or an index file. This reporting data may be stored in a log file for reporting after streaming and/or transmitted during streaming to a relevant service that collects such metrics.

[0063[As indicated by block 640, the reporting data may be sent to a metrics collector for analytics. A metrics collector, according to certain embodiments, may be an application executed by a server from within the application center 112 in which the index file generator 530 is executed, or it may be executed elsewhere, such as in a kernel application center 111 or in a system outside the CHIMPS 110. Depending on the form of the reporting data, the metrics collector can further process and store the information.

[0064[**FIG. 7** illustrates a simplified flowchart of an embodiment of a method for dynamically chunking a media file for streaming 700. This method can be employed by a variety of systems and/or programs. For example, it may be executed by a dynamic

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segmentor 550 of an HTTP service 540 running on a server located in a kernel application center 111 of the CHIMPS 110.

[0065[The method 700 can begin at block 710, when a request for a chunk of media is received from a CDN 150. As discussed above, this request may be made in response to a cache miss at the CDN 150 and/or because an indicator was included in the request for the chunk of media that the chunk was to be created dynamically. As discussed herein, if the CDN 150 has the requested chunk cached from a prior request, the CDN 150 can provide the requested chunk and preclude the need to send the request to a dynamic segmentor 550 to generate the chunk. It should be understood that the request may come from sources other than a CDN 150 according to alternative embodiments. One such source includes the media caching server 570 of embodiment 500-2, as shown in FIG. 5B.

[0066[The starting and ending points of a requested chunk of media are then determined at block 715. This information can be included directly in the request or derived from the request, a previous request, and/or other sources. At block 720, the information, as well as information identifying the requested chunk of media, can be used to retrieve all or part of the relevant media asset from a media asset origin 560. The retrieved portion will include at least the relevant media from the starting point to the ending point of the requested chunk of media.

[0067[At block 725, the requested media chunk is generated by converting the relevant portion of the media asset into a deliverable chunk. The media asset, as stored in the media asset origin, may not be chunked; it may be stored in its entirety as a media file (or group of alternative files corresponding to alternative sub-streams). Generating the chunk therefore can require determining the starting and ending points from the retrieved portion of the media asset and converting the resulting segment of media into a deliverable chunk.

[0068[Although the generation of the deliverable chunk may involve transcoding, it may not. The media asset can be stored in a format where transcoding may not be needed, thereby reducing the processing requirements for creating chunks of media during streaming. For example, media assets may be stored such as H.264 or MPEG-4 video format and/or AAC, HE-AAC, or MP3 audio format. According to some streaming protocols, such as some forms of HTTP streaming, chunks of media in these formats would not need transcoding before being wrapped in an MPEG-2 transport stream container format. Instead, such a conversion essentially would require the addition of metadata to create the streaming format from the

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format of the stored media asset. In other words, generating a deliverable chunk of media may only require identifying the stored media asset, extracting the relevant segment of the media from the media asset, and adding certain metadata in accordance with a container format. This process requires little processing power and can be easily performed on the fly during streaming. Once the deliverable chunk of media is generated, it is sent to the CDN 150 or other requesting entity, at block 730.

[0069[**FIG. 8** illustrates a simplified swim lane flowchart describing the interaction of components in a system configured to provide dynamic indexing and chunking for media streaming, according to one embodiment. In this embodiment, a client can send a request for an index file 805, the request received by an index file generator 810. A particular request may be made to initiate the streaming of a media asset, or it may be during streaming. Depending on the streaming protocol, the request may be made while a client plays a chunk of media previously downloaded during streaming.

[0070[The index file generator generates an index file to indicate the next chunk of media 815. As described above, this chunk may include an advertisement, and the index file can include any amount of information about a chunk of media, including information regarding alternative sub-streams for streaming. The dynamic index file generator can include information regarding existing chunks of media, and, when used in conjunction with a dynamic segmentor may also include information regarding chunks of media that may need to be created. As detailed above, if a chunk of media is to be generated dynamically, the index file generator may indicate this by including an indicator in the generated index file, such as in a URL for one or more chunks described within the index file. Once the index file is generated, the index file generator sends the index file 820, which is received by the client 825.

[0071[Alternative embodiments may provide for the generation of index files containing more than a next chunk of media. For example, an index file generator may generate an index file containing information regarding several chunks of media, in which case the chunks of media can be dynamically generated by a dynamic segmentor when requested by the client. The determination of whether to include information regarding more than a next chunk of media can include factors such as whether the index generator is generating reporting data, the desired frequency of such reporting data, and more.

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[0072[Using information contained in the index file, the client can then request the next chunk of media 830, and this request can be received by a CDN 835. The CDN then checks to see if the chunk is already stored in the cache 840. If so, the CDN can provide the requested chunk to the client, blocks 845 and 850. The requested chunk may be found in a CDN's cache if the chunk was created and stored in the CDN during preprocessing or if the chunk was dynamically created and stored in the CDN from an earlier request.

[0073[If the chunk is not found on the CDN, the chunk can be requested of the dynamic segmentor, which receives the request 855 and retrieves the corresponding media asset from an asset origin server 860. As discussed above, the entirety of the relevant media asset does not need to be retrieved as long as at least the portion containing the relevant segment for the requested chunk is retrieved. It will be understood that alternative embodiments can provide for the media asset being stored in a variety of locations accessible, directly or indirectly, to the dynamic segmentor.

[0074[The dynamic segmentor can then generate the requested chunk by converting the retrieved media into a deliverable chunk. That is, the dynamic segmentor converts the retrieved media into an acceptable format for streaming, which can vary depending on the streaming protocol utilized. The dynamic segmentor can then return the requested chunk 870 to the CDN, which can cache the chunk and return it to the client 875. Once the chunk is received by the client 880, the client can play the chunk to an end user.

[0075[The ability to dynamically generate chunks can enable the CHIMPS 150 to provide dynamic audio track selection for media streaming. Traditional chunking methods typically require media file chunks to be created and stored beforehand, in which case separate chunks must be created and stored for each audio track (causing storage inefficiencies by storing chunks with each audio track separately) or each chunk must include a plurality of audio tracks (causing bandwidth inefficiencies by transmitting chunks with audio tracks that will not be used). The dynamic segmentor's ability to create chunks of a media file in real time, however, can enable the CHIMPS 150 to avoid these inefficiencies by creating requested chunks on demand, having only the requested audio track.

[0076[FIGS. 9A-9C illustrate some examples of how audio and video components of a media file can be stored and combined to provide for dynamic audio track selection for media streaming. In the embodiment shown in **FIG. 9A**, for example, the video and audio components of a media asset are stored in separate video 910 and audio chunks 920. The

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dynamic segmentor can create media file chunks 930 on demand by selecting, for a requested media asset, the corresponding video 910 and audio 920 chunks, and combining the video and audio into one or more deliverable media file chunks 930 having a the requested audio track.

[0077[The URL (or other type of request) received by the dynamic segmentor can include information indicating a requested audio track. According to certain embodiments, this audio track information can be inserted into the URL by the client and/or index file generator. For example, a client media player application may have a user interface that enables a user to select an audio track from a list of available audio tracks. Audio tracks can include different languages, audio channels (e.g., stereo, surround sound, etc.), and/or other options the like. The client can then include, in a URL requesting a chunk for media playback, an indication of the selected audio track. (In alternative embodiments, the media player can indicate the audio track selection in a request for an index file, in which case an index file generator can include an indicator of selected audio track in the URLs included in the index file.) The URL is then provided to the dynamic segmentor, which retrieves the video chunks 910 and the audio chunks 920 corresponding to the selected audio track, and creates media file chunks 930 having the selected audio track. Because the dynamic segmentor can create the media file chunks 930 in real time, this process can accommodate audio track selection changes during playback of the media file. Furthermore, although URLs are used in the examples provided herein, requests of other types can be used additionally or alternatively.

[0078[**FIG. 9B** illustrates another embodiment that includes combining a video file 940 with an audio file (having the selected audio track) into a media file. Although the video chunks 910 and audio chunks 920 of FIG. 9A can be stored in separate files as well, FIG. 9B illustrates how a video file 940 and audio files 950 can be combined in a media file 960, which is then chunked into the media file chunks 930. Thus, the video file 940 and audio files 950 can include larger portions (e.g., all video/audio content) of the requested media file. Although FIGS. 9A and 9B illustrate multiple audio files 950 and audio chunks 920, it will be understood that some embodiments may include a single audio file/chunk having multiple audio tracks, or multiple audio files/chunks having one or more audio tracks.

[0079[**FIG. 9C** illustrates an embodiment utilizing a master file 970. In this embodiment, the master file 970 includes both video 980 and audio components (tracks) 990. In this embodiment, the dynamic segmentor can, after receiving a request for a chunk, retrieve and

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chunk the master file 970. In instances where the master file has a plurality of audio tracks 990, the dynamic segmentor can combine the requested audio track with the video component 980 while ignoring the other audio tracks. Thus, the resulting media file chunks 930 can contain only the requested audio track.

[0080[**FIG. 10** is a flow diagram illustrating a method 1000 for providing dynamic audio track selection for media streaming, according to one embodiment. The some or all of the method 1000 can be performed by any of a variety of systems, such as a dynamic segmentor of the CHIMPS 150 discussed previously, or other computer and/or processing system. Moreover, the method 1000 can be utilized to provide chunks and/or other segments of a media file for media streaming.

[0081[At block 1010, a request is received for a segment (e.g., chunk) of the media file. As indicated previously, the request can come from a media player client, CDN, or another requesting entity, in the form of a URL or other resource indicator. The request can include information regarding a requested segment (e.g., start time, end time, audio track, etc.). This enables a starting point and ending point of the requested segment of the media file to be determined, at block 1020.

[0082[At block 1030, a portion of the media file is retrieved from memory. This can be done in several ways, as shown in FIGS. 9A-9C. For example, the portion of the media file can include separate video and audio chunks and/or files. For embodiments in which audio tracks are stored in different files, a requested audio track can be identified and only the file with the requested audio track may be retrieved. Alternatively, the portion of the media file can include a master file with both video and audio components. To be clear, the portion of the media file can also include video and/or audio components of all or a large portion of the entire media file, in which case multiple segments can be created from the same media file portion retrieved from memory. Alternatively, as shown in FIG. 9B, the portion of the media file can comprise a media file with a single audio track, which can be generated and stored previously or generated after upon receipt of the request for the media file segment.

[0083[At block 1040, the requested segment of the media file with a single audio track is generated. For embodiments in which the portion of the media file retrieved at block 1030 includes more than one audio track, generating the requested segment of the media file may include selecting the requested audio track and/or ignoring other audio tracks. In other embodiments, generating the requested segment of the media file may simply involve

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chunking a media file or combining audio and video chunks. Once the requested segment of the media file is generated, it can be provided at block 1050.

[0084[It should be appreciated that the specific method 1000 illustrated in FIG. 10 shows an example of providing dynamic audio track selection for media streaming. Alternative embodiments may include alterations to the embodiments shown. For example, alternative embodiments may include including more than one audio track onto the requested segment of the media file. Furthermore, additional features may be added, removed, or combined depending on the particular applications. One of ordinary skill in the art would recognize many variations, modifications, and alternatives.

[0085[It should be noted that the methods, systems, and devices discussed above are intended merely to be examples. It must be stressed that various embodiments may omit, substitute, or add various procedures or components as appropriate. For instance, it should be appreciated that, in alternative embodiments, the methods may be performed in an order different from that described, and that various steps may be added, omitted, or combined. Also, features described with respect to certain embodiments may be combined in various other embodiments. Different aspects and elements of the embodiments may be combined in a similar manner. Also, it should be emphasized that technology evolves and, thus, many of the elements are examples and should not be interpreted to limit the scope of the invention.

[0086[Specific details are given in the description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, well-known circuits, processes, algorithms, structures, and techniques have been shown without unnecessary detail in order to avoid obscuring the embodiments. This description provides example embodiments only, and is not intended to limit the scope, applicability, or configuration of the invention. Rather, the preceding description of the embodiments will provide those skilled in the art with an enabling description for implementing embodiments of the invention. Various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the invention.

[0087[Also, it is noted that the embodiments may be described as a process which is depicted as a flow diagram or block diagram. Although each may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be rearranged. A process may have additional steps

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not included in the figure. Furthermore, embodiments of the methods may be implemented by hardware, software, firmware, middleware, microcode, hardware description languages, or any combination thereof. When implemented in software, firmware, middleware, or microcode, the program code or code segments to perform the necessary tasks may be stored in a computer-readable medium such as a storage medium. Processors may perform the necessary tasks.

[0088[Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without departing from the spirit of the invention. For example, the above elements may merely be a component of a larger system, wherein other rules may take precedence over or otherwise modify the application of the invention. Also, a number of steps may be undertaken before, during, or after the above elements are considered. Accordingly, the above description should not be taken as limiting the scope of the invention.

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WHAT IS CLAIMED IS:

1. A server providing audio track selection for media streaming via a data network, the server comprising:

an interface for communicating with the data network;

a memory configured to store a media file; and

a dynamic segmentor coupled with the memory and the interface, the dynamic segmentor configured to:

obtain, via the interface, a request for a first segment of the media file;

determine, based on the request for the first segment of the media file, a starting point and an ending point of the requested first segment of the media file;

retrieve a first portion of the media file from the memory, the first portion of the media file having a video component and at least one audio track;

generate, without transcoding the first portion of the media file, the requested first segment of the media file such that the requested first segment of the media file has a single audio track; and

send, via the interface, the requested first segment of the media file.

2. The server recited in claim 1 wherein the dynamic segmentor is configured to generate the requested first segment of the media file during playback of the media file.

3. The server recited in claim 1 wherein the dynamic segmentor is configured to:

obtain, via the interface, a request for a second segment of the media file;

determine, based on the request for the second segment of the media file, a starting point and an ending point of the requested second segment of the media file;

retrieve a second portion of the media file from the memory;

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generate, without transcoding, the requested second segment of the media file such that the requested second segment of the media file has a single audio track different than the single audio track of the requested first segment of the media file; and

send, via the interface, the requested second segment of the media file.

4. The server recited in claim 1, wherein the server is configured to store the video component and the at least one audio track in separate files.

5. The server recited in claim 1, wherein the dynamic segmentor is configured to:

generate a file comprising the media file with the single audio track; and

store the generated file in the memory;

wherein the first portion of the media file comprises the generated file.

6. The server recited in claim 5, wherein generating the file comprises combining audio from a first file and video from a second file.

7. The server recited in claim 1, wherein:

the at least one audio track comprises two or more audio tracks; and

the dynamic segmentor is configured to cause the server to select the single audio track from the two or more audio tracks based on information received in the request for the first segment of the media file.

8. A method of providing audio track selection for media streaming via a data network, the method comprising:

obtaining a request for a first segment of a media file;

determining, based on the request for the first segment of the media file, a starting point and an ending point of the requested first segment of the media file;

retrieving at least a portion of the media file, the at least a portion of the media file having a video component and at least one audio track;

generating, without transcoding the at least a portion of the media file, the requested first segment of the media file such that the requested first segment of the media file has a single audio track; and

sending providing the requested first segment of the media file.

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9. The method recited in claim 8, further comprising:

obtaining a request for a second segment of the media file;

determining, based on the request for the second segment of the media file, a starting point and an ending point of the requested second segment of the media file;

generating the requested second segment of the media file, wherein the requested second segment of the media file has a single audio track different than single the audio track of the requested first segment of the media file; and

providing the requested second segment of the media file.

10. The method recited in claim 8, wherein retrieving the at least a portion of the media file includes retrieving the video component and the at least one audio track from separate files.

11. The method recited in claim 8, further comprising:

generating a file comprising the media file with the single audio track; and

storing the generated file;

wherein the at least a portion of the media file comprises the generated file.

12. The method recited in claim 11 wherein generating the file comprises combining audio from a first file and video from a second file.

13. The method recited in claim 8 wherein the at least one audio track comprises a plurality of audio tracks, the method further comprising selecting the single audio track from the plurality of audio tracks based on information received in the request for the first segment of the media file.

14. A server providing audio track selection for media streaming via a data network, the server comprising:

means for obtaining a request for a first segment of a media file;

means for determining, based on the request for the first segment of the media file, a starting point and an ending point of the requested first segment of the media file;

means for retrieving at least a portion of the media file, the at least a portion of the media file having a video component and at least one audio track;

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means for generating, without transcoding the at least a portion of the media file, the requested first segment of the media file such that the requested first segment of the media file has a single audio track; and

means for sending providing the requested first segment of the media file.

15. The server recited in claim 14 wherein the at least one audio track comprises a plurality of audio tracks, the server further comprising means for selecting the single audio track from the plurality of audio tracks based on information received in the request for the first segment of the media file.

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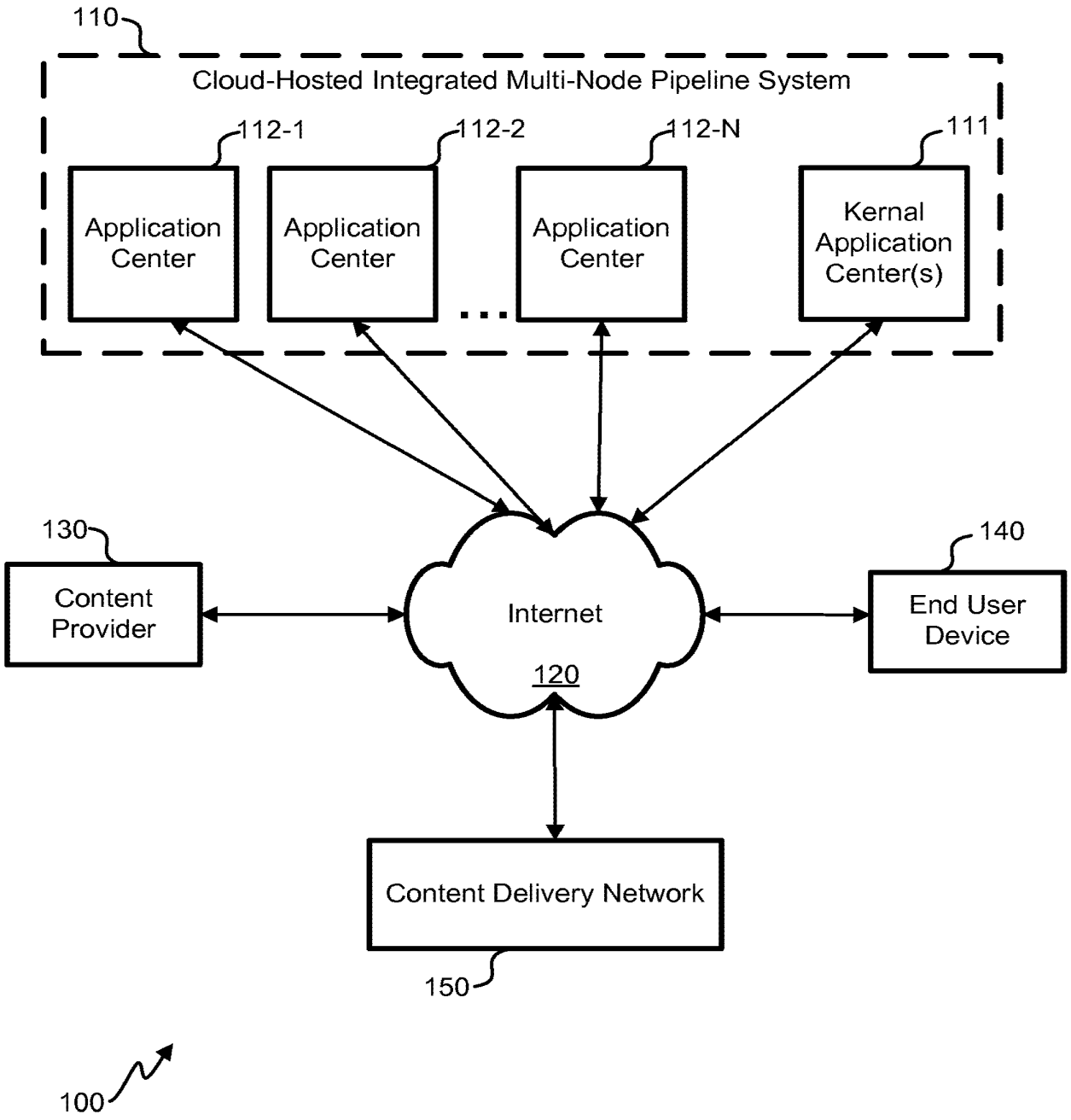

110
Cloud-Hosted Integrated Multi-Node Pipeline System
112-1
112-2
112-N
111
Application Center
Application Center
Application Center
Kernal Application Center(s)
130
Content Provider
Internet
120
140
End User Device
Content Delivery Network
150
100

FIG. 1

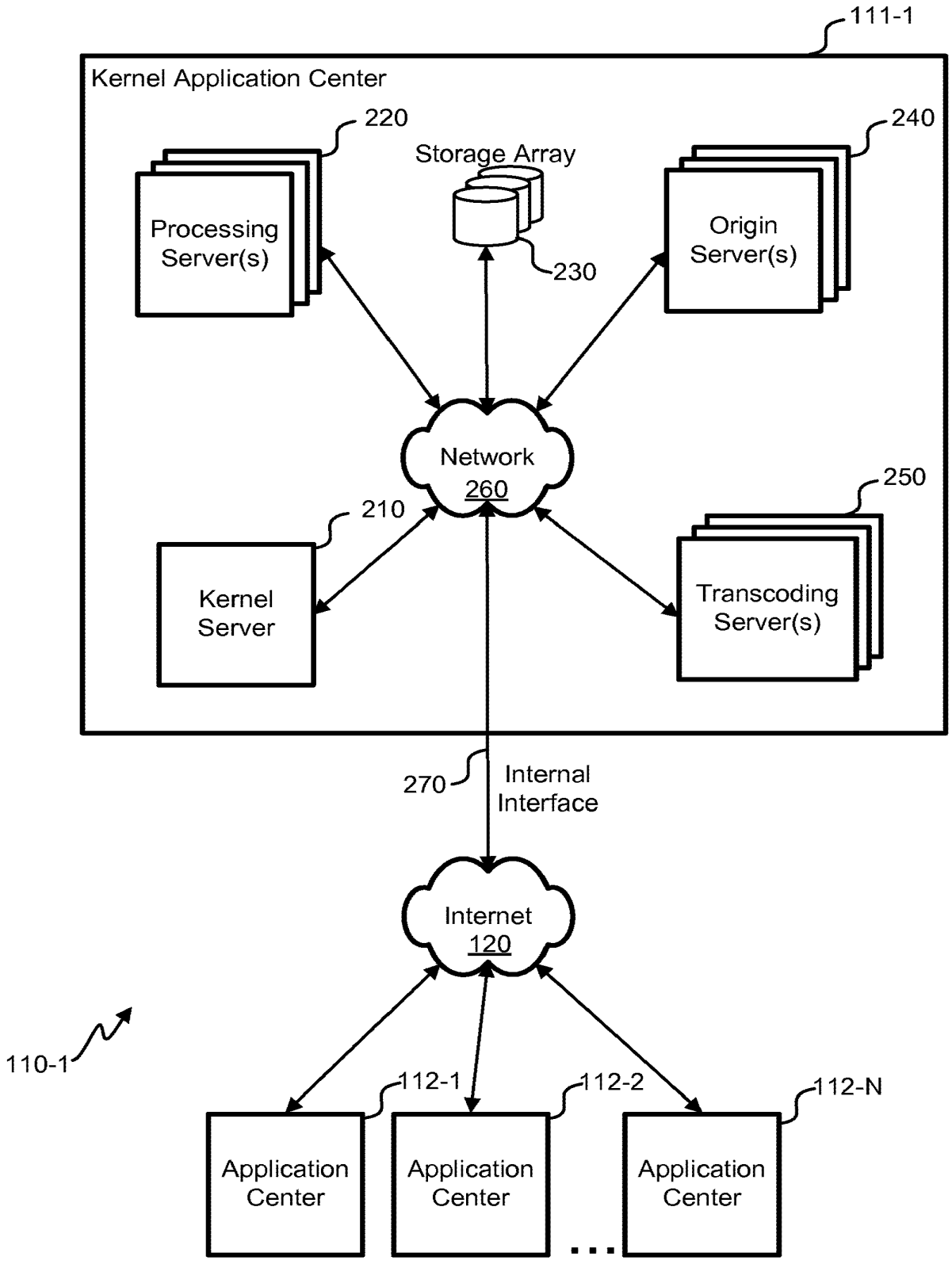

111-1
Kernel Application Center
220
Storage Array
240
Processing Server(s)
230
Origin Server(s)
Network
260
250
210
Kernel Server
Transcoding Server(s)
270
Internal Interface
Internet
120
110-1
112-1
112-2
112-N
Application Center
Application Center
Application Center
...

FIG. 2A

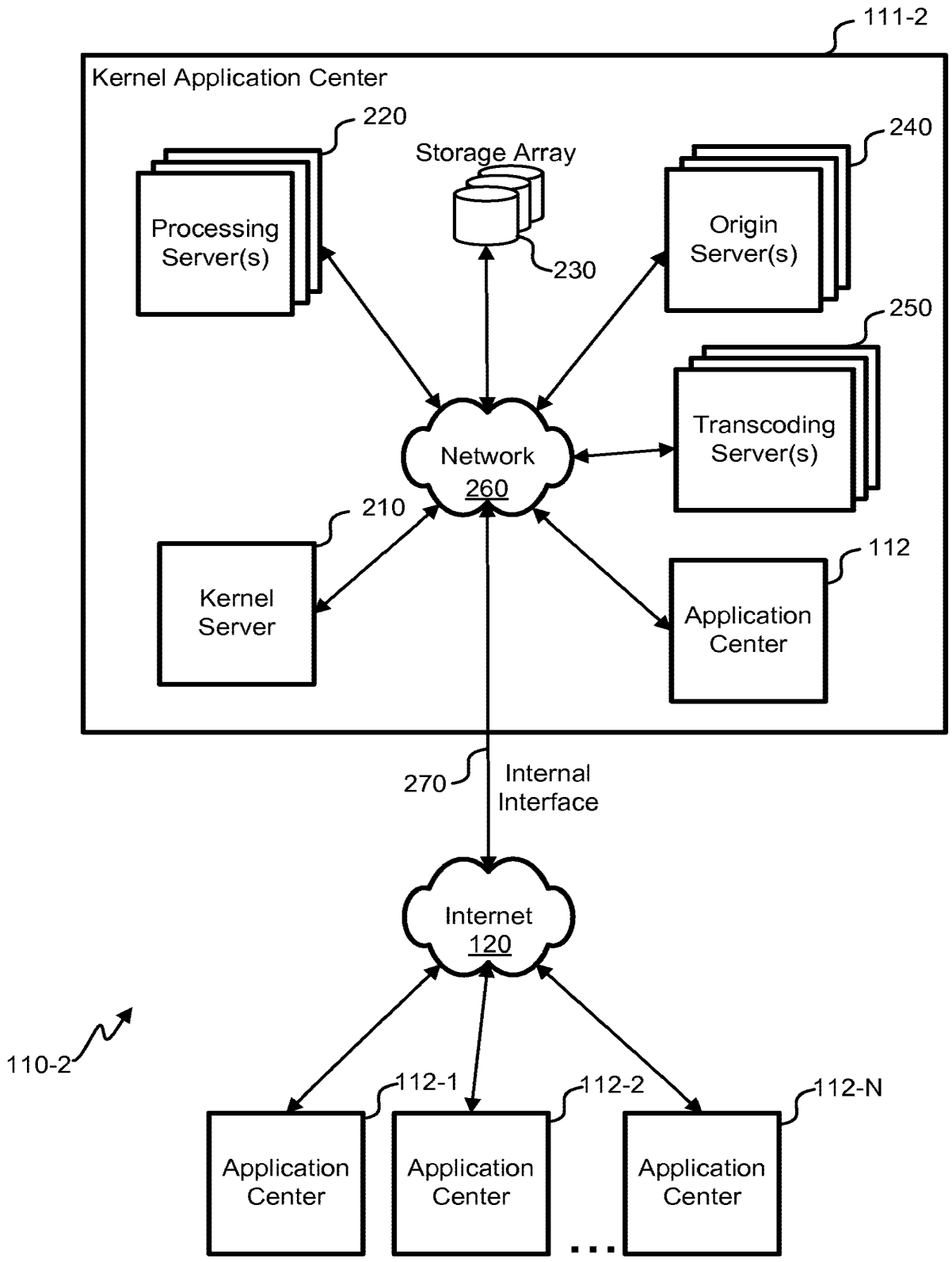

111-2
Kernel Application Center
220
Processing Server(s)
Storage Array
230
240
Origin Server(s)
250
Transcoding Server(s)
Network
260
210
Kernel Server
112
Application Center
270
Internal Interface
Internet
120
110-2
112-1
112-2
112-N
Application Center
Application Center
Application Center
...

FIG. 2B

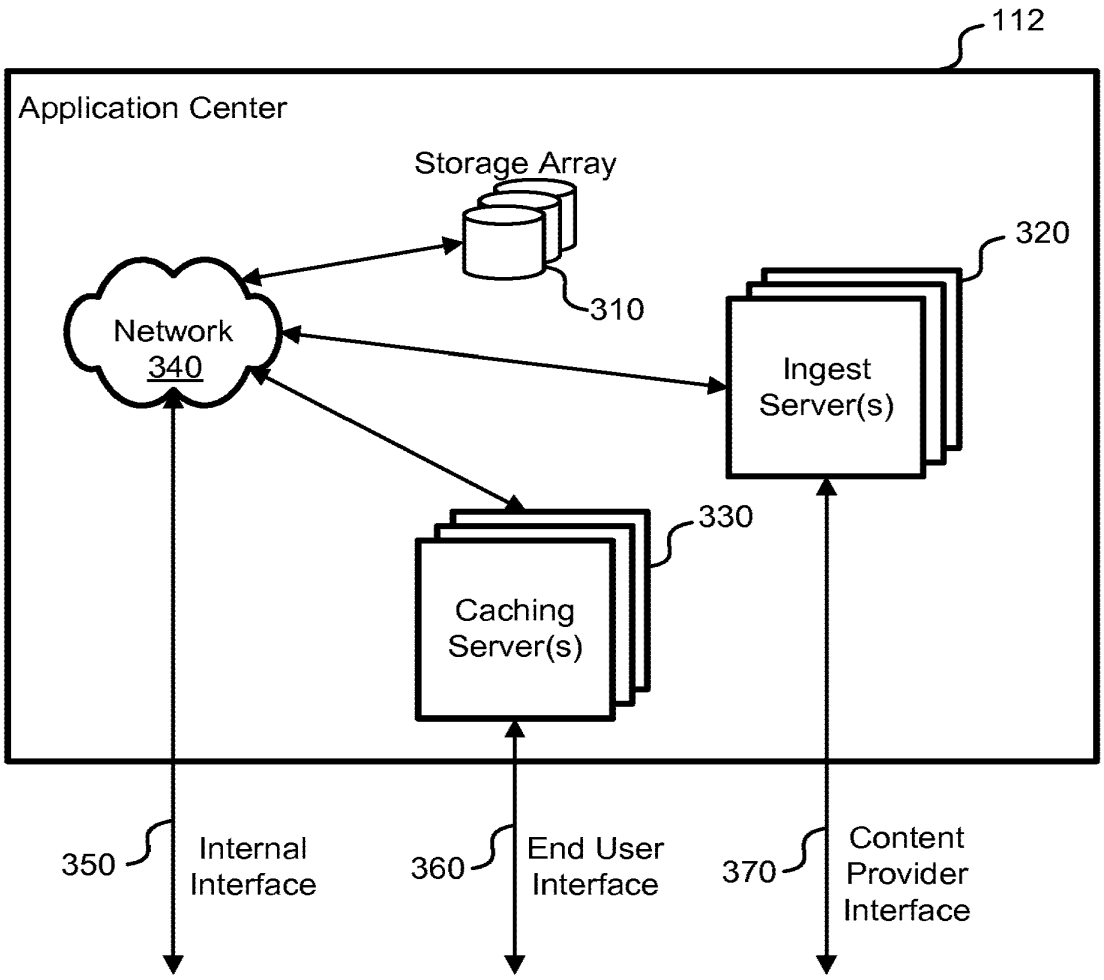

112
Application Center
Storage Array
310
320
Network
340
Ingest
Server(s)
330
Caching
Server(s)
350
Internal
Interface
360
End User
Interface
370
Content
Provider
Interface

FIG. 3

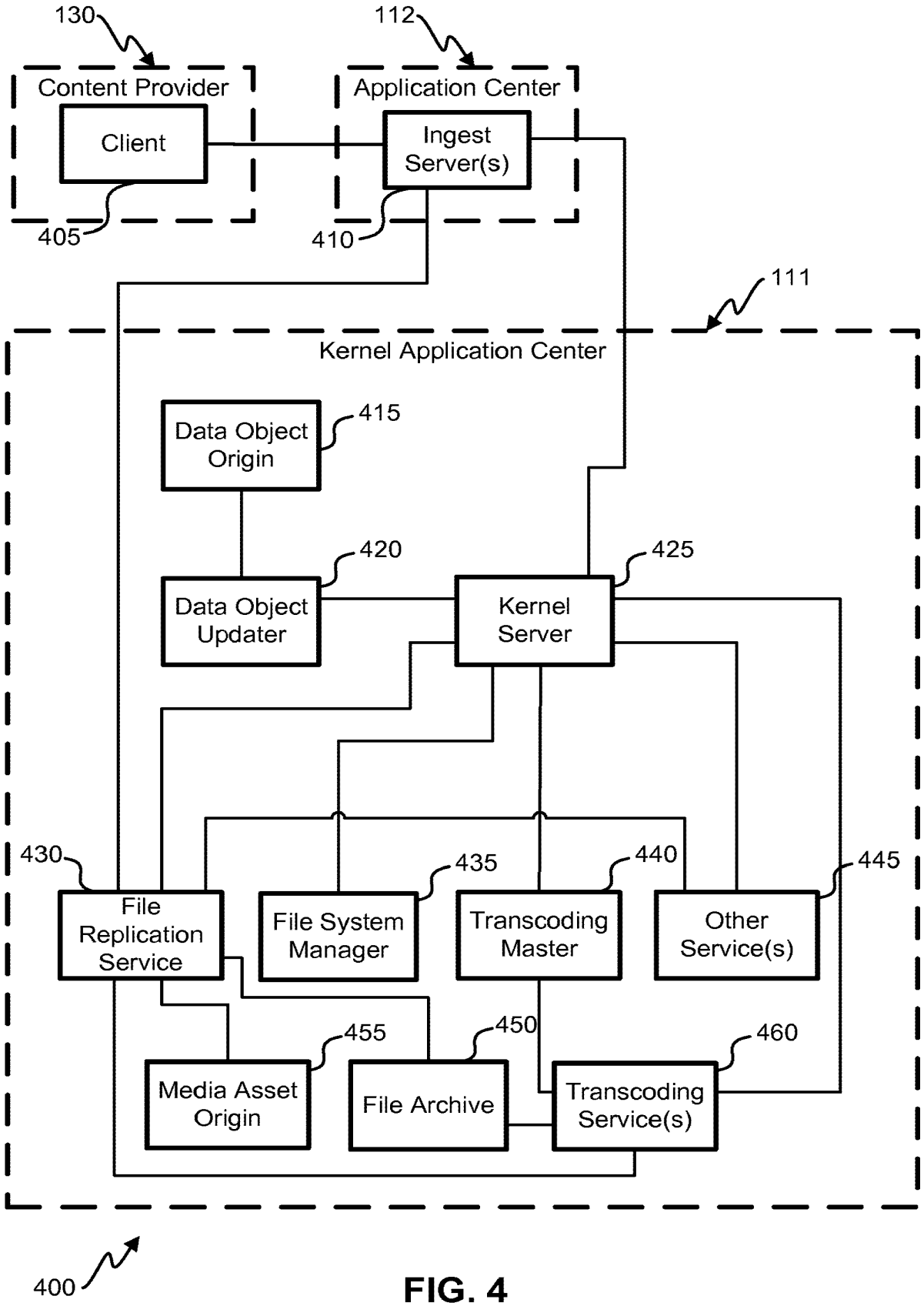

130
112
Content Provider
Application Center
Client
Ingest Server(s)
405
410
111
Kernel Application Center
Data Object Origin
415
420
425
Data Object Updater
Kernel Server
430
435
440
445
File Replication Service
File System Manager
Transcoding Master
Other Service(s)
455
450
460
Media Asset Origin
File Archive
Transcoding Service(s)
400

FIG. 4

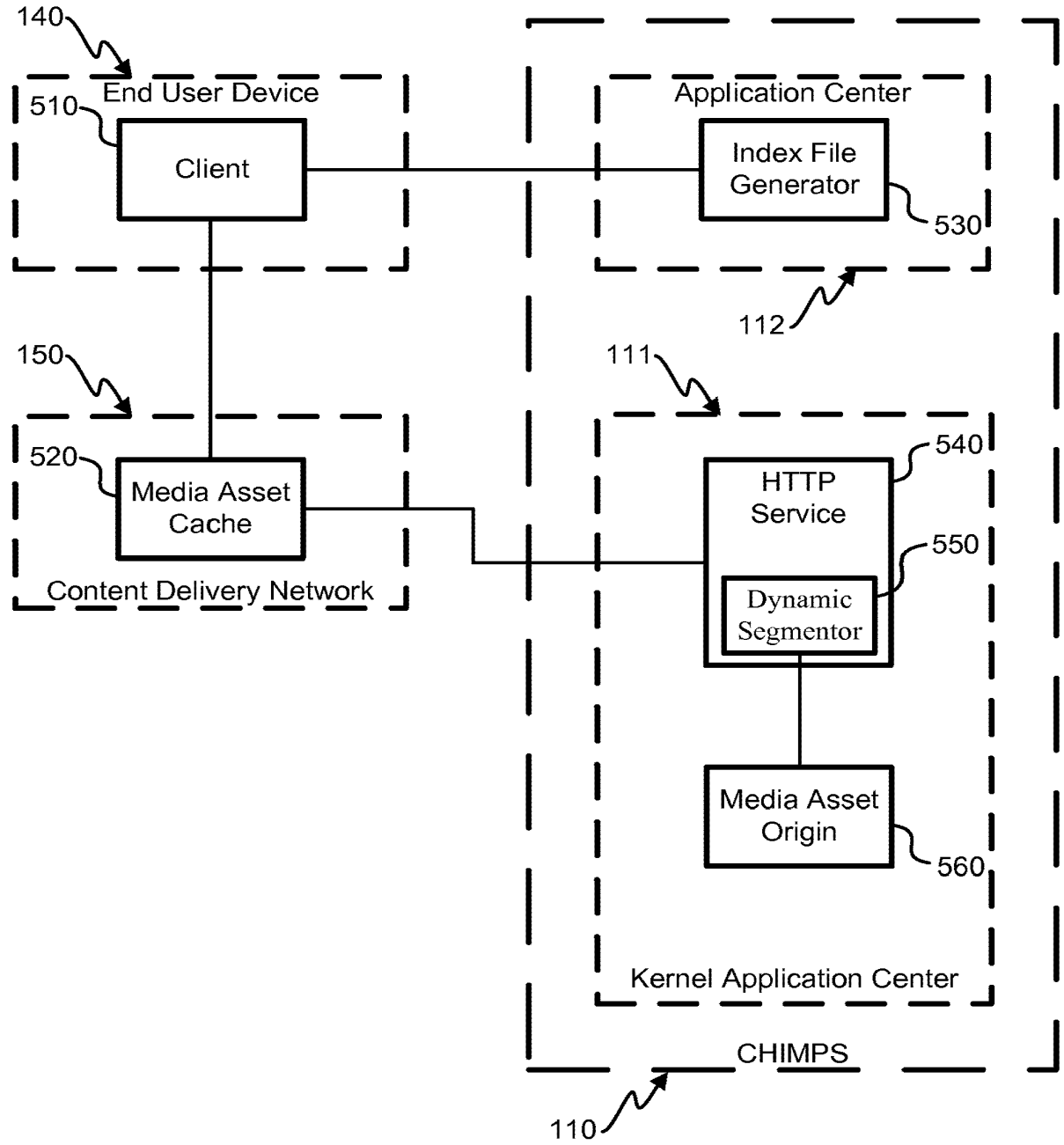

140
End User Device
510
Client
Application Center
Index File Generator
530
112
150
111
520
Media Asset Cache
Content Delivery Network
540
HTTP Service
550
Dynamic Segmentor
Media Asset Origin
560
Kernel Application Center
CHIMPS
110
500-1

FIG. 5A

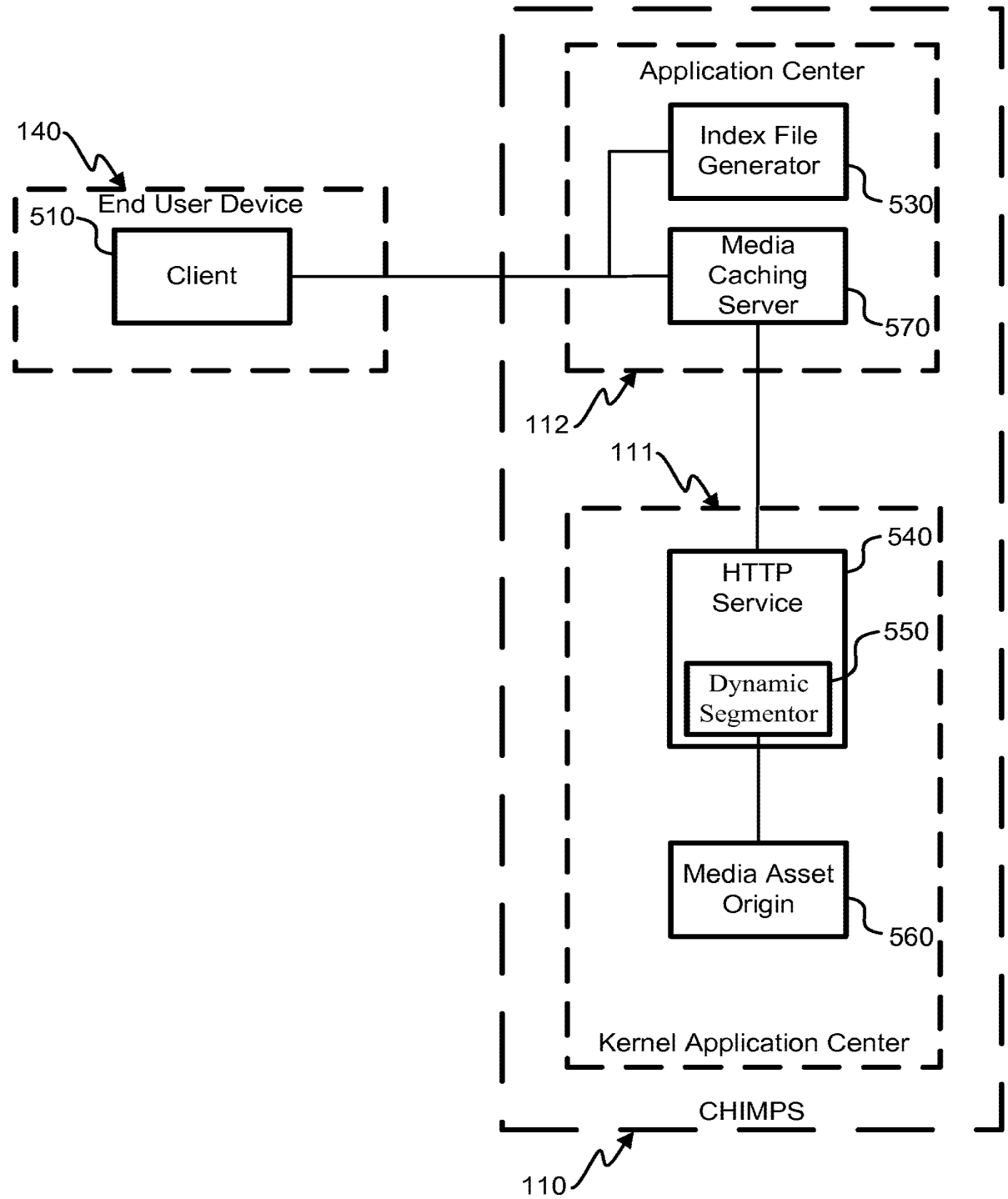

Application Center
Index File Generator
530
Media Caching Server
570
140
End User Device
510
Client
112
111
540
HTTP Service
550
Dynamic Segmentor
Media Asset Origin
560
Kernel Application Center
CHIMPS
110
500-2

FIG. 5B

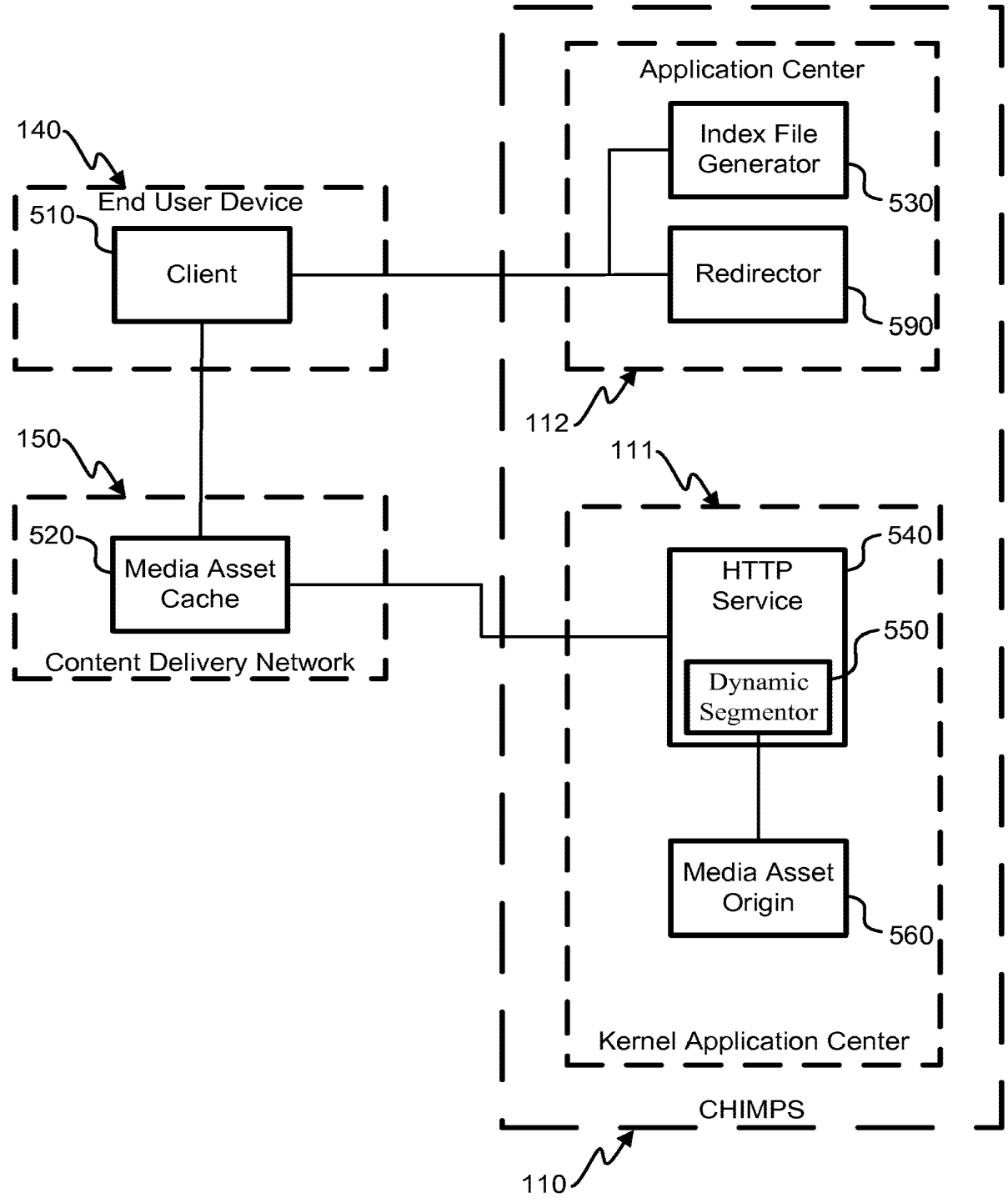
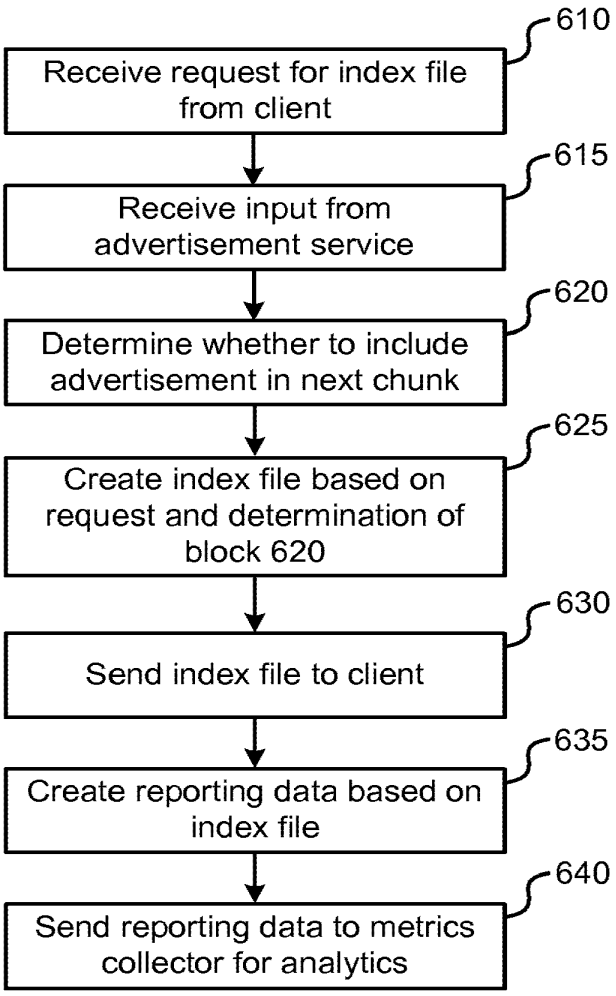
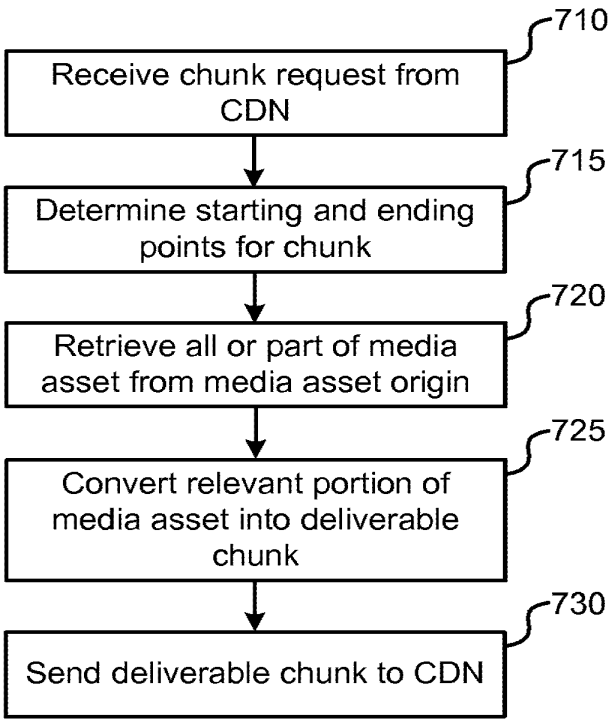

Application Center
Index File Generator
530
Redirector
590
140
End User Device
510
Client
112
150
111
520
Media Asset Cache
540
HTTP Service
550
Dynamic Segmentor
Content Delivery Network
Media Asset Origin
560
Kernel Application Center
CHIMPS
110
500-3

FIG. 5C


610
Receive request for index file from client
615
Receive input from advertisement service
620
Determine whether to include advertisement in next chunk
625
Create index file based on request and determination of block 620
630
Send index file to client
635
Create reporting data based on index file
640
Send reporting data to metrics collector for analytics

600

FIG. 6


710
Receive chunk request from CDN
715
Determine starting and ending points for chunk
720
Retrieve all or part of media asset from media asset origin
725
Convert relevant portion of media asset into deliverable chunk
730
Send deliverable chunk to CDN

700

FIG. 7

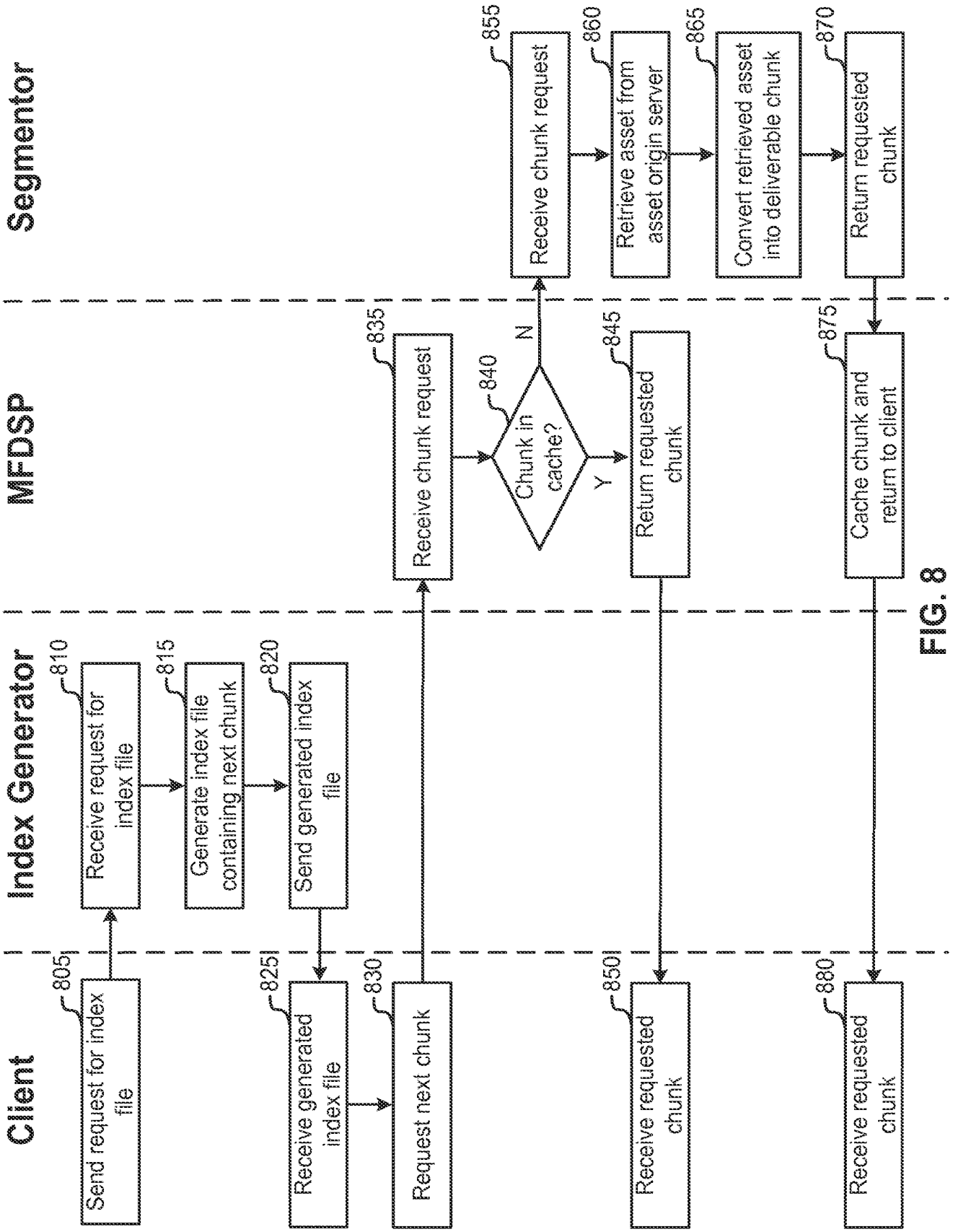


FIG. 8

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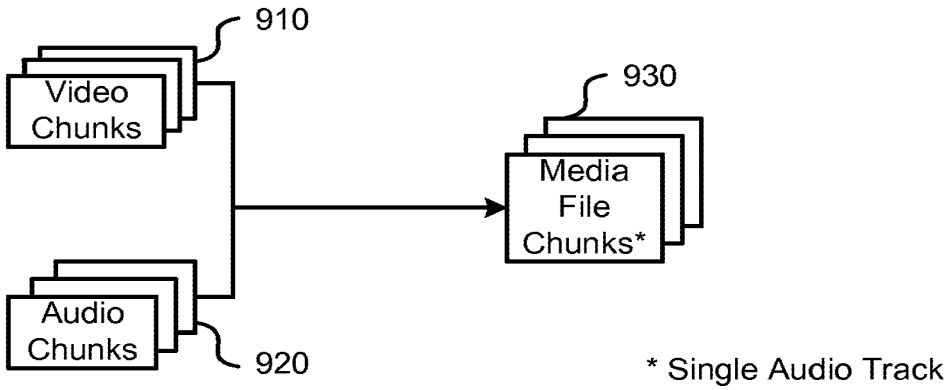


FIG. 9A

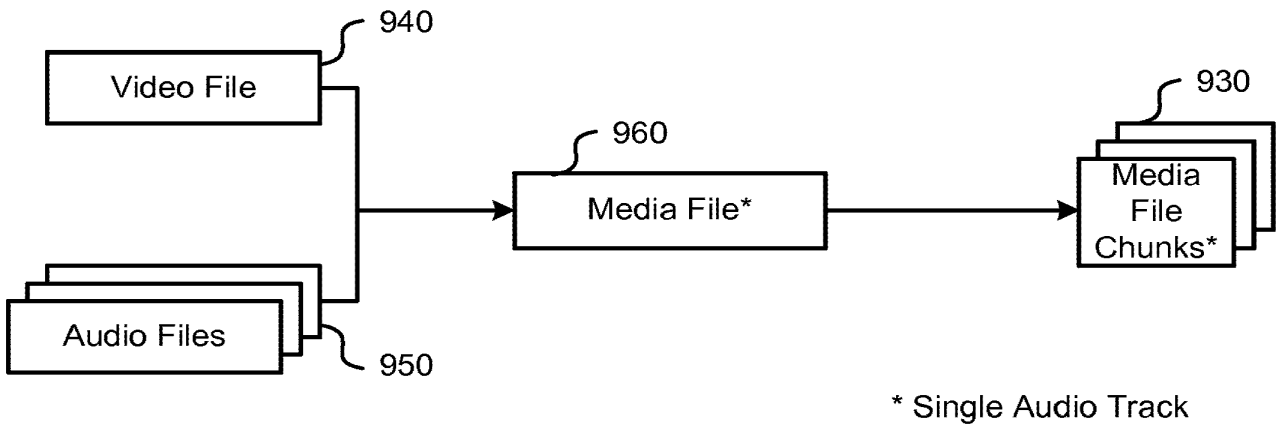


FIG. 9B

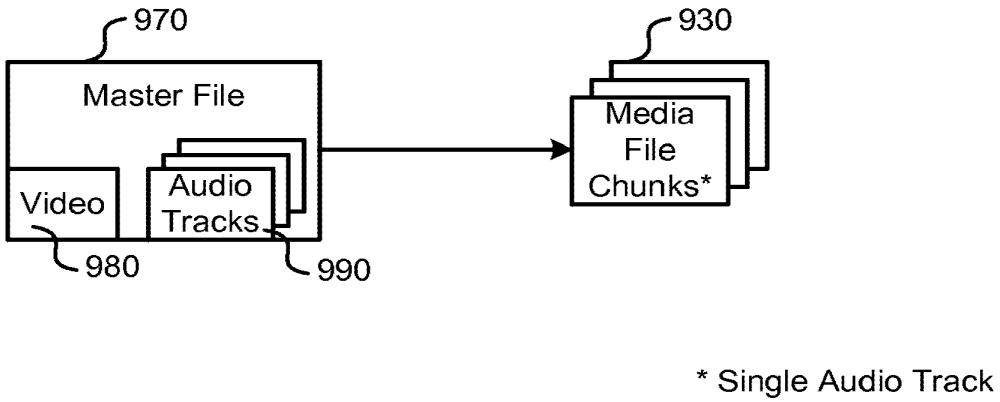


FIG. 9C

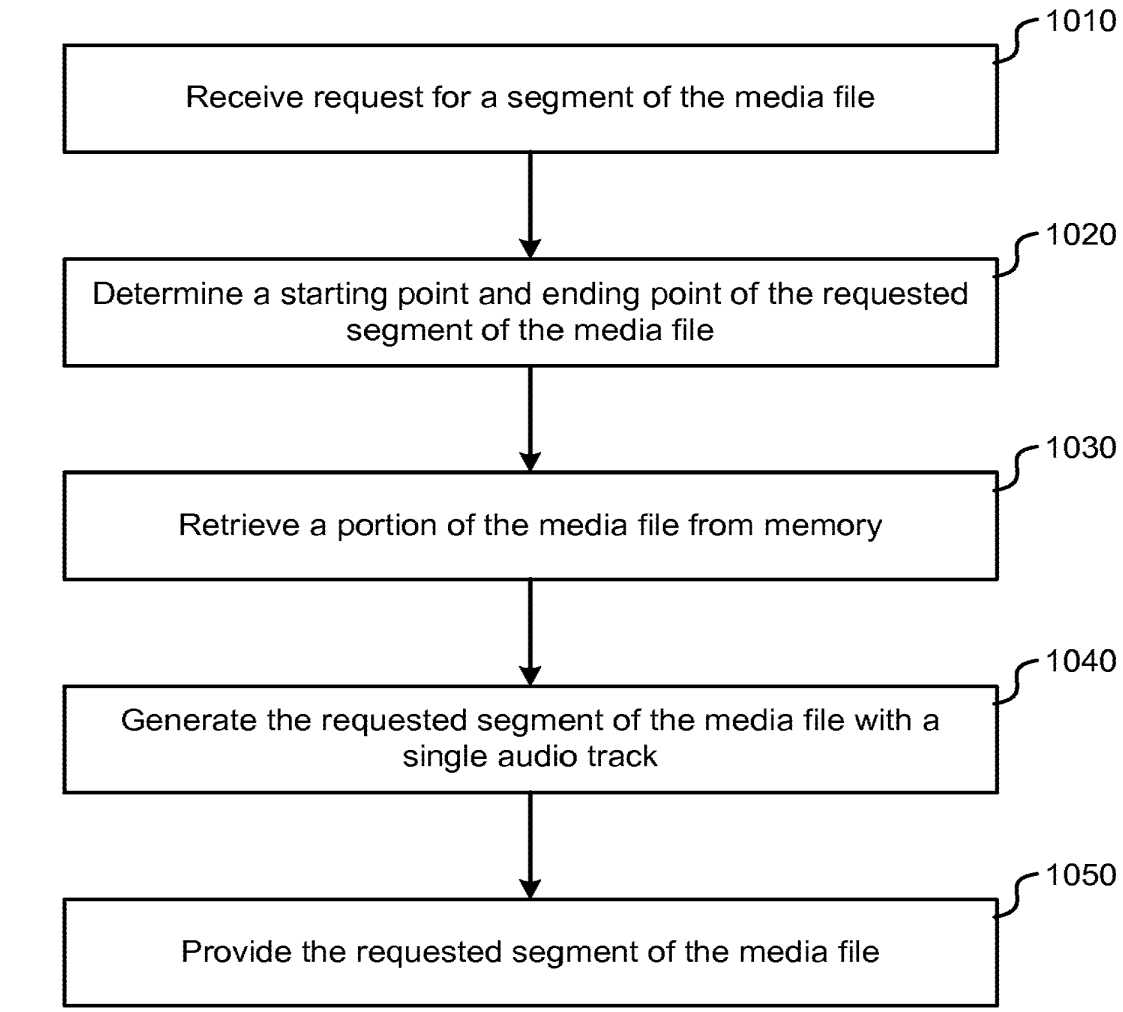

1010
Receive request for a segment of the media file
1020
Determine a starting point and ending point of the requested segment of the media file
1030
Retrieve a portion of the media file from memory
1040
Generate the requested segment of the media file with a single audio track
1050
Provide the requested segment of the media file
1000

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/025180

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06
ADD. H04N21/845

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L H04N

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

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

EPO-Internal, WPI Data, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/039617 A1 (NOKIA CORP [FI]; BOUAZIZI IMED [FI]) 7 April 2011 (2011-04-07) page 5, line 25 - page 8, line 21 page 13, line 29 - page 14, line 5 page 16, line 3 - page 28, line 2 figures 1, 3-6	1-15
X	US 2012/023253 A1 (RHYU SUNG-RYEUL [KR] ET AL) 26 January 2012 (2012-01-26) paragraph [0020] - paragraph [0087]; figures 1-3	1-15

-/--

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

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 May 2013	05/06/2013

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

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/025180

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GABIN F ET AL: "3GPP Mobile Multimedia Streaming Standards [Standards in a Nutshell]", IEEE SIGNAL PROCESSING MAGAZINE, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 27, no. 6, 1 November 2010 (2010-11-01), pages 134-138, XP011317684, ISSN: 1053-5888 page 135 - page 137	1-15
A	US 2012/005312 A1 (MCGOWAN ALBERT JOHN [US] ET AL) 5 January 2012 (2012-01-05) the whole document	1-15

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/025180

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011039617 A1	07-04-2011	CN 102577309 A	11-07-2012
		EP 2484090 A1	08-08-2012
		KR 20120080214 A	16-07-2012
		TW 201123795 A	01-07-2011
		US 2011246659 A1	06-10-2011
		WO 2011039617 A1	07-04-2011
US 2012023253 A1	26-01-2012	US 2012023253 A1	26-01-2012
		WO 2012011735 A2	26-01-2012
US 2012005312 A1	05-01-2012	AU 2010202741 B1	23-12-2010
		US 2012005312 A1	05-01-2012
		US 2012185608 A1	19-07-2012

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WIPO | PCT

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22 September 2014 (22.09.2014)

(25) Filing Language: English

(26) Publication Language: English

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14/086,801 21 November 2013 (21.11.2013) US
14/086,822 21 November 2013 (21.11.2013) US

(71) Applicant: **CACTI ACQUISITION LLC** [US/US]; 290 Congress Street, 4th Floor, Boston, Massachusetts 02210 (US).

(72) Inventors: **MCGOWAN, Albert John**; 4201 E. Camelback Rd., #101, Phoenix, Arizona 85018 (US). **MAULTSBY, Nicholas**; 19239 N. 30th Pl., Phoenix, Arizona 85050 (US). **MARSHALL, Jared**; 21 E. 6th Street, #414, Tempe, Arizona 85281 (US).

(74) Agents: **MCMILLAN, Scott, L.** et al.; Kilpatrick Townsend & Stockton LLP, Two Embarcadero Center, Eighth Floor, San Francisco, California 94111 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: DYNAMIC CHUNK MANIPULATION FOR STREAMING MIXED LIVE AND ON-DEMAND MEDIA: APPLICATION PROGRAMMING INTERFACE

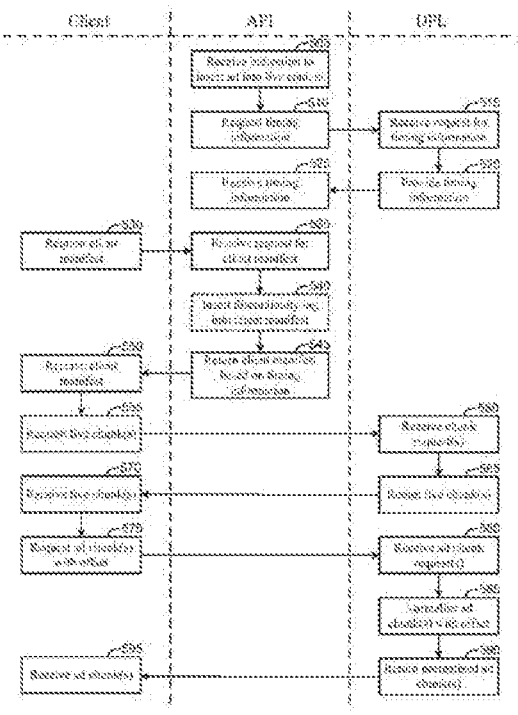


FIG. 5

(57) Abstract: Timestamps for streams of media that transition from one media source to another (such as from live content to on-demand content, and vice versa) can be rewritten by a server to help ensure error-free streaming by the client. Embodiments can coordinate the creation of a client manifest with the dynamic creation of a requested segment of media (i.e., "chunk") to determine how to rewrite timestamps of requested chunks such that they are continuous through the transition.

WO 2015/047959 A1

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Declarations under Rule 4.17:

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*
- *with amended claims (Art. 19(1))*

DYNAMIC CHUNK MANIPULATION FOR STREAMING MIXED LIVE AND ON-DEMAND MEDIA: APPLICATION PROGRAMMING INTERFACE

BACKGROUND OF THE INVENTION

[0001] The delivery of media over data networks such as the Internet is in high demand. This is due, in large part, to much of the media being advertisement ("ad") supported. This even applies to streamed live content.

[0002] The insertion of ads and other on-demand content into a stream of live content can be difficult. The unpredictable nature of live content can result in corresponding unpredictability of points in the live content at which ads may be shown. Furthermore, because live content can be generated for hours, weeks, or longer, the timestamps associated with live will not be synchronized with the timestamps of ads (or other on-demand content) inserted into the stream of live content. This can cause problems for some clients during playback.

BRIEF SUMMARY OF THE INVENTION

[0003] Techniques disclosed herein provide for dynamically rewriting the timestamps in streams of media that transition from one source to another (such as from live content to on-demand content, and vice versa). Embodiments can coordinate the creation of a client manifest with the dynamic creation of a requested segment of media (i.e., "chunk") to determine how to rewrite timestamps of requested chunks are continuous through the transition.

[0004] An example method of providing media streaming via a data communications network, according to the disclosure, includes receiving a stream of data representing live media content, obtaining timing information of the stream of data, and receiving, via the data communications network, a request to stream the live media content. The method further includes creating, with a processing unit, a manifest file where the manifest file includes information for streaming one or more segments of the live media content via the data communications network, the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and the manifest file further includes offset information for streaming the one or more segments of the media file,

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the offset information based on the timing information of the stream of data. The method further includes and sending, via the data communications network, the manifest file.

[0005] The method of providing media streaming via a data communications network can include one or more of the following features. The method can include providing an application programming interface (API), where request to stream the live media content is received via the API. Creating the manifest file further can include providing, in the manifest file, an indication of a discontinuity in the stream of the live media content. The method can also include determining a type of client associated with the request to stream the live media content, where providing the indication of the discontinuity is based on the determination of the type of client. Obtaining the timing information of the stream of data can include sending a request for the timing information, and receiving a response to the request, the response including the timing information. The method can also include receiving an indication of a period of time in the live media content designated for advertising, where sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising. The timing information of the stream of data can include one or more timestamps associated with one or more segments of the stream of data.

[0006] An example server for providing media streaming via a data communications network, according to the disclosure, includes a communications interface, a memory, and a processing unit coupled to the communications interface and the memory. The processing unit is configured to cause the server to receive a stream of data representing live media content, obtain timing information of the stream of data, and receive, via the communications interface, a request to stream the live media content. The processing unit is further configured to create a manifest file where the manifest file includes information for streaming one or more segments of the live media content via the data communications network, the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data. The processing unit is also configured to send, via the communications interface, the manifest file.

[0007] The server for providing media streaming via a data communications network can include one or more of the following features. The processing unit can be further configured to cause the server to provide an application programming interface (API), wherein request to

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stream the live media content is received via the API. The processing unit can be configured to cause the server to create the manifest file by providing, in the manifest file, an indication of a discontinuity in the stream of the live media content. The processing unit can be further configured to cause the server to determine a type of client associated with the request to stream the live media content where providing the indication of the discontinuity is based on the determination of the type of client. The processing unit can be configured to cause the server to obtain the timing information of the stream of data by sending a request for the timing information, and receiving a response to the request, the response including the timing information. The processing unit can be further configured to cause the server to receive an indication of a period of time in the live media content designated for advertising where sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising. The timing information of the stream of data can include one or more timestamps associated with one or more segments of the stream of data.

[0008] An example non-transitory computer-readable medium, according to the disclosure, has instructions embedded thereon for providing media streaming via a data communications network. The instructions, when executed by a computer, cause the computer to perform functions including: receiving a stream of data representing live media content, obtaining timing information of the stream of data, and receiving a request to stream the live media content. The functions further include creating a manifest file, where the manifest file includes information for streaming one or more segments of the live media content via the data communications network, the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data. The functions also include sending the manifest file.

[0009] The computer-readable medium can include one or more of the following features. The computer-readable medium can include instructions for causing the computer to provide an application programming interface (API), wherein request to stream the live media content is received via the API. The instructions for creating the manifest file can further include instructions for providing, in the manifest file, an indication of a discontinuity in the stream of the live media content. The computer-readable medium can include instructions for causing the computer to determine a type of client associated with the request to stream the

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live media content, where providing the indication of the discontinuity is based on the determination of the type of client. The instructions for obtaining the timing information of the stream of data can further include instructions for causing the computer to send a request for the timing information, and receive a response to the request, the response including the timing information. The computer-readable medium can include instructions for causing the computer to receive an indication of a period of time in the live media content designated for advertising where sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising.

[0010] An example method of providing media streaming via a data communications network, according to the disclosure, includes receiving, via the data communications network, a request for a segment of media. The request includes offset information for the segment of the media. The method further includes determining, based on the request for the segment of the media, one or more files to use for creating the segment of media, obtaining the one or more files from a data storage, and creating, with a processing unit, the segment of media from the one or more files. Creating the segment of media further includes providing a timestamp for the segment of media based on the offset information included in the request for the segment of media. The method also includes sending, via the data communications network, the segment of media.

[0011] The method of providing media streaming via a data communications network, can include one or more of the following features. The method can include receiving a request for timing information related to a stream of data representing live media content, obtaining the timing information by examining one or more segments of the stream of data, and sending, in response to the request for the timing information, the timing information. The timing information can include the offset information and/or a presentation timestamp (PTS) value. The data storage can include an advertising server.

[0012] An example server for providing media streaming via a data communications network, according to the disclosure, includes a communications interface, a memory, and a processing unit coupled to the communications interface and the memory. The processing unit is configured to cause the server to receive, via the communications interface, a request for a segment of media, where the request includes offset information for the segment of the media. The processing unit is further configured to determine, based on the request for the segment of the media, one or more files to use for creating the segment of media, obtain the one or more files from a data storage, and create the segment of media from the one or more

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files. Creating the segment of media further includes providing a timestamp for the segment of media based on the offset information included in the request for the segment of media. The processing unit is also configured to send, via the communications interface, the segment of media.

[0013] The server for providing media streaming via a data communications network can include one or more of the following features. The processing unit can further be configured to receive a request for timing information related to a stream of data representing live media content, obtain the timing information by examining one or more segments of the stream of data, and send, in response to the request for the timing information, the timing information. The timing information can include the offset information and/or a presentation timestamp (PTS) value. The processing unit can be configured to obtain the one or more files from a data storage by communicating with an advertising server.

[0014] An example non-transitory computer-readable medium, according to the disclosure, has instructions embedded thereon for providing media streaming via a data communications network. The instructions, when executed by a computer, cause the computer to perform functions including receiving a request for a segment of media, where the request includes offset information for the segment of the media. Functions also include determining, based on the request for the segment of the media, one or more files to use for creating the segment of media, obtaining the one or more files from a data storage, and creating the segment of media from the one or more files. Creating the segment of media further includes providing a timestamp for the segment of media based on the offset information included in the request for the segment of media. Functions also include sending the segment of media.

[0015] The computer readable medium can further include one or more of the following features. The computer readable medium may include instructions for causing the computer to receive a request for timing information related to a stream of data representing live media content, obtain the timing information by examining one or more segments of the stream of data, and send, in response to the request for the timing information, the timing information. The timing information comprises the offset information. The instructions for obtaining the timing information can include instructions for obtaining the offset information and/or a presentation timestamp (PTS) value. The instructions obtaining the one or more files from the data storage comprise obtaining the one or more files from an advertising server

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[0016] Items and/or techniques described herein may provide one or more of the following capabilities, as well as other capabilities not mentioned. Techniques allow for a client to transition from one source of streaming media to another without incurring errors due to inconsistencies in the timestamps of chunks between the two sources of media. Techniques can be dynamically executed on the fly and customized for each client. These and other embodiments, along with many of its advantages and features, are described in more detail in conjunction with the text below and attached figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The present disclosure is described in conjunction with the appended figures:

[0018] FIG. 1 is a block diagram illustrating a media servicing system, according to some embodiments of the present invention.

[0019] FIG. 2 is a functional block diagram illustrating a system configured to provide dynamic chunk manipulation according one embodiment.

[0020] FIG. 3 is a functional block diagram of a system, similar to the system of FIG. 2, incorporating ad server(s).

[0021] FIG. 4 is a simplified block diagram illustrating an example of how timestamps can be rewritten.

[0022] FIG. 5 is a swim-lane diagram illustrating example interactions between a client, API, and DPL.

[0023] FIG. 6 is a simplified flow chart illustrating an example method of providing a manifest file in accordance techniques described herein.

[0024] FIG. 7 is a simplified flow chart illustrating an example method of creating media chunks using offset information included in a request, in accordance with techniques described herein.

[0025] FIG. 8 illustrates an embodiment of a computer system.

[0026] In the appended figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the

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description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

DETAILED DESCRIPTION OF THE INVENTION

[0027] The ensuing description provides preferred exemplary embodiment(s) only, and is not intended to limit the scope, applicability or configuration of the disclosure. Rather, the ensuing description of the preferred exemplary embodiment(s) will provide those skilled in the art with an enabling description for implementing various embodiments of the invention. It is understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope as set forth in the appended claims.

[0028] The terms "ad" and "advertisement," including alternate forms thereof, refer to marketing content distinct from user-requested media content. Although the techniques described herein discuss obtaining and providing advertising data, they also can be applied to data for content other than advertising, such as other on-demand content. Furthermore, although techniques described herein are often provided in the context of video streaming, they can be applied to other forms of media content (e.g., audio streaming) as well. A person of ordinary skill in the art will recognize many alternate applications.

[0029] It can be noted that, although embodiments disclosed herein describe techniques as implemented by a cloud-hosted integrated multi-node pipelining system (CHIMPS), embodiments are not so limited. Other systems may be configured to implement the techniques disclosed.

[0030] The increased availability of media content over data communications networks such as the Internet has mirrored the increased bandwidth for these networks. Because media has recently taken a more prominent role in data communications, the distribution of media and the data associated with such distribution has become increasingly important, particularly to media content providers. Much of this media is ad-supported, allowing media content providers to receive advertising revenue from media content, while often allowing end users to consume the media content free of charge.

[0031] Advertisements are often stored and maintained separate from the primary media content. The distribution of ad-supported media via the Internet can therefore involve a variety of entities. **FIG. 1** is a block diagram illustrating a media servicing system 100, according to some embodiments of the present invention. The system may deliver media content to a client 145, executed by an end user device 140 providing media playback to an

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end user. The client 145 can be, for example, a media player, browser, or other application adapted to request and/or play media files. The media content can be provided via a network such as the Internet 170 and/or other data communications networks, such as a distribution network for television content. The end user device 140 can be one of any number of devices configured to receive media over the Internet 170, such as a mobile phone, tablet, personal computer, portable media device, set-top box, video game system, etc. Although only one client 145 and one end user device 140 are shown in FIG. 1, it will be understood that the media servicing system 100 can provide media to many (hundreds, thousands, millions, etc.) of clients 145 on many (hundreds, thousands, millions, etc.) of end user devices 140.

[0032] For on-demand content (e.g., requested media that is stored in its entirety), a media file provided by one or more media providers 130 can be processed and indexed by cloud-hosted integrated multi-node pipelining system (CHIMPS) 110. The media file may be stored on media file delivery service provider (MFDSP) 150, such as a content delivery network, media streaming service provider, cloud data services provider, or other third-party media file delivery service provider. Additionally or alternatively, the CHIMPS 110 may also be adapted to store the media file. On-demand content can be provided to the client 145 via progressive downloading and/or streaming.

[0033] For purposes of this disclosure, advertising content can be considered a form of on-demand content that is distributed much the same way. (As previously mentioned, techniques for interleaving live and on-demand content apply not only to inserting ads into live content, but can apply to inserting any form of on-demand content, including non-advertisement content as well.) Rather than media providers, however, ad content can come from ad networks 160. Furthermore, the ad networks 160 may determine what ads to provide at a given point in time for a given client 145 by implementing business rules.

[0034] For live content (e.g., requested content that is sent to one or more end user devices 140 as it is received from media provider(s) 130, that is, in real time or near-real time, depending on processing times and/or other buffer times), a similar process can take place. For example, media provider(s) 130 can provide a media stream (e.g., live video), which is processed and indexed by the CHIMPS 110. Encoded segments of the media stream can be stored as files (i.e., "chunks"), on the media file delivery service provider (MFDSP) 150 and/or the CHIMPS 110. Embodiments may have a delay from the time the media stream is received to the time the associated content is stored and available for streaming to the one or more end user devices 140. The delay can be due to transcoding and/or other types of

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processing for making the received media stream available for downloading. This delay can create a buffer period of time in which one or more of the techniques described herein can take place, such as processing cue tones and/or placing ads in the content. (These techniques are described in greater detail below.)

[0035] Both on-demand and live content can utilize any of a variety of forms of streaming media. One such method is chunk-based media streaming in which a media file or live stream is processed into smaller chunks and stored (e.g., in a server of the CHIMPS 110 or Media File Delivery Service Provider 150) for serving to a client 145. The client 145 can make a URL request to the CHIMPS 110, which can provide a manifest file (also known as an index file) indicating the locations of each of the chunks of media using, for example, Uniform Resource Indicators (URIs) (e.g., Universal Resource Locators (URLs)) or other indicators. The client 145 can then use the information in the manifest file to stream the media content, following one location after the other to download each chunk of media. The client may sequentially request and receive multiple manifest files to stream requested media content. This is especially true for live media, where the live stream might still be received and processed by the CHIMPS 110 when the client makes the request for the manifest file. Additional detail regarding such chunking and indexing, as well as techniques for dynamically creating chunks and manifest files, can be found in U.S. Patent Nos. 8,327,013 entitled "Dynamic Index File Creation for Media Streaming" and 8,145,782, entitled "Dynamic Chunking For Media Streaming," both of which are incorporated by reference herein in their entirety.

[0036] The CHIMPS 110 can further manage the processing and syndication of media (live or on-demand) received from the media provider(s) 130. For example, the CHIMPS 110 can provide transcoding and other services to enable media provided by the media provider(s) to be distributed in a variety of formats to a variety of different device types in a variety of locations. Furthermore, the CHIMPS 110 provide feedback to the media provider(s) 130 regarding the media's syndication, including user behavior during media playback. For example, the CHIMPS 110 can provide a media provider 130 with information indicating that end users tend to stop watching a video at a certain point in playback, or that users tend to follow links associated with certain advertisements displayed during playback. With this data, media provider(s) 130 can adjust factors such as media content, advertisement placement and content, etc., to increase revenue associated with the media content and provide the end user device 140 with a more desirable playback experience. Additionally or

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alternatively, the CHIMPS 110 can dynamically provide a customized playback experience on the end user device 140 according to aspects of the context associated with the content at the time of the request, aspects of the content request itself, or both. It can be noted that although embodiments herein may utilize media files and live streams explicitly, other embodiments may utilized other forms of media assets, such as dynamic web pages, and may incorporate multiple media elements, including players, user interface components, user controls and control components, images, and other media content, objects, or types. Additionally, it can be noted that various functions, operations, processes, or other aspects that are described in this example, and other examples, as being performed by or attributable to the CHIMPS 110 can be performed by another system operating in conjunction with the CHIMPS 110, loosely or tightly synchronized with the CHIMPS 110, or independently; for example, collecting data from other digital services to be combined and reported with data collected by the CHIMPS 110 can, in some implementations, be performed by a system other than the CHIMPS 110. Additional detail regarding the functionality of the CHIMPS 110 can be found in in U.S. Patent No. 8,301,733, entitled "Dynamic Chunking for Delivery Instances," which is incorporated by reference herein in its entirety.

[0037] A content owner 120 can utilize one or more media provider(s) 130 to distribute media content owned by the content owner 120. For example, a content owner 120 could be a movie studio that licenses distribution of certain media through various media providers 130 such as television networks, Internet media streaming websites and other on-demand media providers, media conglomerates, and the like. In some configurations, the content owner 120 also can operate as a media provider 130.

[0038] The content owner 120 and/or media provider(s) 130 can enter into an agreement with one or more ad network(s) 160 to provide advertisements to numerous clients 145 on numerous end user devices 140. In this manner, the ad network(s) 160 allow companies to show advertisements to end users viewing the media content from the media provider(s) 130. Because ad network(s) 160 can maintain advertisements and/or advertisement data separate from media content, the advertisements can be updated and—as previously indicated—subject to business rules such that, two users viewing the same media content at different times and/or in different locations may see different advertisements.

[0039] Advertisements may be inserted directly into content consumed by the client, depending on the streaming techniques utilized. In such cases, a Live Advertising Processing Engine Service (APES) can be utilized to provide the client with advanced functionality for

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advertising during the consumption of live content by a client. Additional details regarding Live APES can be can be found in in U.S. Patent App. No. 14/069,961 entitled "Live Advertising Processing Engine Service," which is incorporated by reference herein in its entirety.

[0040] The insertion of ads directly into content consumed by the client can cause playback issues in at least some types of clients. One such issue can arise from the mismatch between timestamps of the live media (e.g., presentation timestamp (PTS) values) and those of the ad. Some clients will incur playback errors when encountering such mismatches. Techniques disclosed herein can provide for dynamically re-writing timestamps for on-demand (e.g., ad) content into stream of live content, which can prevent these playback errors from occurring.

[0041] Although embodiments provided herein discuss dynamically re-writing timestamps for inserting on-demand media into live content, embodiments are not so limited. Principles provided herein can be extended to embodiments that insert live content into on-demand media, a first on-demand media into a second on-demand media, first live content into second live content, and so forth. A person of ordinary skill in the art will recognize many substitutions, additions, omissions, and other variations to the embodiments provided herein.

[0042] **FIG. 2** is a functional block diagram illustrating a system 200 configured to provide dynamic chunk manipulation, including timestamp rewriting techniques provided herein, according one embodiment. The system 200 can comprise a client 145, MFDSP 150, application programming interface (API) 260, dynamic permutation layer (DPL) 270 origin 240, transcode module 230, clock 250, ingest module 220, and encoder 210, and one or more ad servers 310. As shown, these components can be executed by and/or incorporated into larger systems, such as the end user device 140, CHIMPS 110, and/or media provider(s) 130 as shown in FIG. 1. In other embodiments, however, the illustrated components may be incorporated differently into a larger system and/or may be stand-alone components. Furthermore, other embodiments may combine, separate, add, omit, substitute, and/or modify components of the system 200, while providing the same overall functionality as described herein. A person of ordinary skill in the art will recognize many substitutions, additions, omissions, and other variations to the embodiments provided herein.

[0043] In this embodiment, a live stream is provided by the encoder 210 in chunks (i.e., segments), each of which can each have a PTS value and/or other timing information as dictated by the encoder. Because live media can vary widely in duration, PTS values for the

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live stream can vary correspondingly. To help keep track of PTS values of the live stream received by the ingest module 220, a local clock 250 can be used. For example, a "source manifest" can be created by recording the times at which chunks (having unique PTS values) of the live stream are received from the live stream source (i.e., the encoder 210). This source manifest can then be used by other components, such as the API 260, to determine which chunk was received at a given local time.

[0044] Ingested chunks are then provided to the transcode module 230, which transcodes the chunks into various formats according to a variety of different media profiles. Media profiles can determine bit rate, resolution, frame rate, and other media characteristics that can accommodate the various types of networks, clients, and/or end user devices used to stream the live content. For example, chunks with lower bit rates are generally used to stream the live content to an end user device 140 that has a poor network connection or low-resolution display, whereas chunks with higher bit rates are generally used to stream the live content to an end user device 140 that has a good network connection or high-resolution display.

[0045] The various chunks are stored in the origin 240. The origin 240 can be a data storage comprising one or more physical storage devices, which can be distributed geographically, and may be local to and/or remote from the transcode module 230 and/or DPL, depending on desired functionality. The origin 240 can further store and/or manage an "origin manifest" that records information regarding the available media profiles of the stored chunks and their corresponding PTS values. Thus, together with the source manifest, the origin manifest can be used to track the time at which each chunk of the live stream is received and determine the available media profiles of the corresponding chunks stored in the origin 240.

[0046] The client 145 can request to stream content of the live stream from the API 260 by, for example, following a URL received from the media provider(s) 130. (This URL, or other URI, may be provided to the media provider(s) 130 by the CHIMPS 110, indicating an Internet location at which the live stream may be accessed.) The API 260, upon receiving the client's request, can create a client manifest (also known as an index file), comprising a list of links (e.g., URLs) to chunks of the live content. Once it receives the client manifest from the API 260, the client 145 can request the chunks from the MFDSP 150. If a chunk is not already cached at the MFDSP 150, the chunk request can be relayed to the DPL, which can dynamically create the requested chunk (e.g., at runtime) by retrieving one or more corresponding chunks stored at the origin 240, relaying it back to the MFDSP 150, which can

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then provide the requested chunk to the client 145. Because the DPL can create requested chunks on the fly, the requested chunks can be customized according to each request. For example, although chunks stored at the origin 240 may comprise a five-second segment of the live content, a client may request a 20-second chunk, in which case the DPL 270 can retrieve a plurality of five-second chunks from the origin corresponding to the requested 20-second chunk and dynamically create the requested chunk and provide the requested chunk to the MFDSP 150. (Additional detail regarding such chunking can be found in in U.S. Patent No. 8,145,782, which is incorporated herein above.) Because the API 260 creates the client manifest used by the client 145 to request chunks, it is the API 260 that determines which chunks are requested and when. The API 260 can therefore craft client manifests to dictate at what point in the live content clients will begin streaming and the length of the chunks each client requests.

[0047] This ability to dynamically create both client manifests and requested chunks can also enable the system 200 to rewrite timestamps on the requested chunks to help ensure a client 145 receives a stream of chunks with continuous time stamps when streaming live content containing interleaved on-demand content, such as advertisements.

[0048] **FIG. 3** illustrates how a system 300, similar to the system 200 of FIG. 2, can incorporate ad server(s) 310 to determine which ads to insert into a stream of live content. Here, the ad server(s) 310 can be maintained by one or more ad network(s) 160, which may have an agreement with the media provider(s) 130 regarding which ads to run during an ad break of a live stream. In some embodiments, the DPL 270 may communicate with the ad server(s) 310 to obtain the ad content for the ads to run.

[0049] A typical live stream can consist of continuous data including one or more "content" segments (e.g. a sporting event, a news report, etc.), followed by a first advertising "break" during which advertising is intended to be shown. After the first advertising break, there can be a second set of one or more content segments, a second advertising break, and so forth. Advertising breaks can be determined by the media provider(s) 130 and indicated by "cue tones," which are analog or digital signals which indicate in a first form that a break is about to begin. Cue tones can also indicate in a second form that the break is about to end. These cue tones can occur at any point in the stream, and in many circumstances the timing of the breaks is not known before the live stream is initiated.

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[0050] The API 260 can determine when advertisements are needed (e.g., by receiving a cue tone) and generate a manifest file accordingly. As previously indicated, the processing of a live stream (e.g., ingest and transcode) can take time, causing a buffer period between when a live stream is ingested to when the live content is provided to the client. This buffer period can provide the API 260 with enough time to determine that a cue tone has been detected at a certain point in the live stream and generate the client manifest which inserts advertisements at corresponding points in the live content provided to the client 145. Ad server(s) 310 can indicate to the API 260 which ad(s) to insert and, optionally, provide additional metadata regarding the ad(s). The ad content may also be provided by the ad server(s) 310 and previously stored as chunks at the origin 240 and/or other data storage, enabling the DPL 270 to dynamically manipulate requested ad chunks.

[0051] In some embodiments, when the API 260 determines an ad is to be inserted into live content provided to the client 145, it can request timing information from the DPL 270 for a corresponding chunk, such as a PTS value. The API 260 can therefore determine what PTS value corresponds to the point in the live stream at which an ad is to be inserted, and include offset information in the client manifest. When using the client manifest to request a chunk, the request provided by the client 145 to the MFDSP 150 (relayed to the DPL 270) can include metadata, including the offset information, signaling to the DPL 270 to rewrite the timestamps of the requested ad chunks so that the chunks provided to the client have continuous timestamps, despite changes between the live content and ad chunks.

[0052] **FIG. 4** is a simplified block diagram provided to help illustrate an example of how timestamps can be rewritten. In this illustration, the chunks of the live stream 410 have PTS (timestamp) values of 11111, 11112, etc. Cue tones associated with the live stream may be received, indicating to the API 260 a starting point 412 and ending point 413 for an advertisement. To replace the chunks of live content 415 between the starting point 412 and ending point 413 with ad chunks 420 (or other on-demand content), the API 260 can request information from the DPL 270 regarding the PTS value of the chunk 411 before the starting point 412, for example. (In other embodiments, the API 260 may receive timing information regarding other chunks.)

[0053] Using this timing information, the API 260 can create a client manifest with URLs that include offset information in parameter strings that reflects this timing information. For example, the offset information can include an indication of the PTS value and/or an indication of a number by which ad chunks 420 should be offset to match the PTS values of

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the live stream 410. When these URLs are used by the client 145 to request ad chunks from the DPL 270 (via the MFDSP 150), the DPL 270 can then determine, from the parameter strings, the offset information. The DPL 270 can then, each time an ad chunk is requested, retrieve the ad chunk from the origin 240, dynamically offset the ad chunks according to the offset information (as shown by chunk sequence 430) and provide the requested chunk to the client 145 (via the MFDSP 150). This ultimately results in the client 145 receiving a mixed stream of chunks 440 with continuous timestamps that includes both live and on-demand (e.g., ad) content.

[0054] It can be noted that the example provided in FIG. 4 is a simplified one. In practice, systems may employ variations on this basic technique to accommodate different scenarios. For example, ad chunks 420 may differ in length the chunks of the live stream 410. However, because the DPL 270 is able to dynamically create requested chunks from the ad chunks 420, it is also able to provide chunks of a requested length. The API 260 can ensure that the client manifest provided to the client 145 indicates the proper length of requested chunks so that they match the chunk length of the live stream 410.

[0055] Also, although an ending point 413 in the example of FIG. 4 is known at the time the API 260 creates the corresponding client manifest, this may not always be the case. Depending on ad break length, client manifest size, buffer times, and/or other factors, the client manifest may not include a transition back from ad content to live content. However, this information may simply be provided in a subsequent client manifest.

[0056] Additionally, although the example of FIG. 4 suggests matching PTS values of chunks of a live stream 410 as received from an encoder 210, this may not always be the case. PTS values may be modified (or replaced entirely) when transcoded by the transcode module 230. However, because the DPL 270 can provide timing information regarding the transcoded chunks as they are stored in the origin 240, this is not an issue. The chunks of the live stream 410 with modified PTS values are provided to the client 145, and the timestamp values of the ad chunks 420 are rewritten to match these modified PTS values.

[0057] In some embodiments, the API 260 may additionally include a discontinuity tag (or other indicator) in the client manifest to flag the transition from live to on-demand content (and/or vice versa). This can indicate to the client 145 to clear their video buffer, enabling the client 145 to make the transition without any playback errors. Because some clients may require the discontinuity tag while others may not, the API 260 can first determine the type of

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client 145 consuming the live content and provide a discontinuity tag if the determined client is of a type that would need such a tag.

[0058] **FIG. 5** is a swim-lane diagram illustrating example interactions between a client, API, and DPL, such as the client 145, API 260, and DPL 270 illustrated in FIGS. 2 and 3. As with all other figures provided herein, FIG. 5 is provided as a non-limiting example. Embodiments of the invention may employ entities other than the client, API, and/or DPL, and/or may add, omit, substitute and/or otherwise alter the interactions illustrated in FIG. 5.

[0059] At block 505, the API receives an indication to insert an ad into a live content. The indication can be, for example, a cue tone in and/or related to a live stream of media and/or an indication that such a cue tone has been detected by another component (e.g., an ingest module). As described in previous embodiments, the API may maintain and/or have access to a database, list, or other data structure, enabling the API to determine a time in the live media an ad break in the live content begins.

[0060] At block 510, the API requests timing information from the DPL, and the request is received at block 515. Timing information can include information regarding the PTS value of a chunk and/or other information that can be used to determine an offset needed to ensure continuity in the timestamps of chunks when transitioning to and from live content to ad content. The timing information is provided by the DPL at block 520 and received at block 525.

[0061] At block 530 the client request a client manifest. Due to the nature of live content, which is being received and processed by a CHIMPS or other system at the same (or substantially the same) time it is being sent to the client, the client manifest typically contains only a portion of the live content available. Thus, in order to consume all or a larger portion of the live content, a client can request multiple client manifests in succession, requesting a new client manifest when the live content corresponding to a previous manifest is or soon will be completely consumed. Thus, the client manifest requested by the client at block 530 may be one of a series of client manifests requested by the client over a period of time while consuming the live content.

[0062] At block 535, the request for the client manifest is received by the API. Because the DPL is capable of dynamically manipulating chunks to accommodate chunk requests, the API can provide URLs (or other URIs) in the client manifest with parameter strings and/or other information that can be relayed to the DPL to dictate how the DPL manipulates the

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chunks that are ultimately provided to the client. Thus, the API can utilize the timing information received at block 525 to provide offset information in the client manifest to cause the DPL to rewrite timestamps of ad chunks inserted into the live content to ensure the timestamps received by the client are continuous. At block 545, the API can then return client manifest based on the timing information, which is received by the client at block 550.

[0063] Optionally, the API may insert a discontinuity tag into the client manifest, as shown at block 540. The location of the discontinuity tag may vary, depending on factors such as the streaming protocol and/or format of the client manifest. In some embodiments, for example, the discontinuity tag may simply be placed in between URLs on a sequential list of URLs in the client manifest that correspond to chunks to be consumed by a client. Thus, for transitions from live content to ad content, the discontinuity tag can follow URLs for chunks of live content and precede URLs for chunks of ad content. Depending on the needs of the client a discontinuity tag may additionally or alternatively be used in the transition back from ad content to live content, in a similar manner.

[0064] At block 555, the client uses the client manifest at block 550 to send a request for live chunk(s) (i.e., chunks of live content) from the DPL, which is received by the DPL at block 560. The DPL then prepares the live chunk(s), as detailed herein above, and returns the live chunk(s) at block 565, which are received by the client at block 570. (It will be understood that, where multiple chunks are requested, the process shown in blocks 555-570 is repeated for each chunk. That is, the client sends a separate request for each chunk requested.)

[0065] At block 575 the client uses the client manifest to send a request for ad chunk(s) (i.e., chunks of ad content) from the DPL, which is received by the DPL at block 580. (Again, It will be understood that, where multiple chunks are requested, the process shown in blocks 575-595 is repeated for each requested ad chunk.) Here, each chunk request can include offset information provided in the client manifest to indicate to the DPL how the timestamps should be rewritten to ensure the timestamps of the ad chunks provided to the client are continuous with the timestamps of the live chunks previously received by the client at block 570. At block 585, the DPL normalizes ad chunks accordingly, using the offset information to rewrite the timestamps of the ad chunks. At block 590 the DPL returns the normalized ad chunks, which are received by the client at block 595.

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[0066] It can be noted that the manifest file provided by the API can accommodate various other scenarios. For example, a manifest file may cause the client to initially request ad chunk(s), rather than live chunk(s).

[0067] **FIG. 6** is a simplified flow chart illustrating an example method 600 of providing a manifest file in accordance with the techniques described above. The method 600 can be implemented, for example, by an API 260 and/or other components shown in FIGS. 2 and 3 above. As with all other figures provided herein, FIG. 6 is provided as an example and is not limiting. Various blocks may be combined, separated, and/or otherwise modified, depending on desired functionality. Furthermore, different blocks may be executed by different components of a system and/or different systems. Such systems can include the computer system, described herein below with regard to FIG. 8.

[0068] At block 605, a stream of data representing live media content is received. The stream of data can include a live stream received by an encoder of a media provider, and may be processed according to previously-described techniques.

[0069] At block 615, timing information of the stream of data is obtained. The timing information can include a PTS value or other information sufficient to determine offset information for timestamps of chunks of on-demand content inserted into the live media content.

[0070] At block 625 a request to stream the live media content is received. A request can include, for example, a request for a manifest file (e.g., a "client manifest" as described above).

[0071] The manifest file is created at block 635. Here, the manifest file includes information for streaming one or more segments of live media content via a data communications network, such as the Internet. Such information can include, for example, a list of URLs that can be used to request chunks of the live media content. The manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content. The media file can include, for example, an advertisement or other on-demand content with timestamps that differ from the timestamps of the live media content. The manifest file further includes offset information for streaming the one or more segments of the media file. This offset information can be embedded in or otherwise associated with the URLs themselves, and can relay offset information to an entity, such as a DPL, when used by a client. Finally, the manifest file is sent at block 645.

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[0072] **FIG. 7** is a simplified flow chart illustrating an example method 700 of creating media chunks using offset information included in a request, in accordance with the techniques described above. The method 700 can be implemented, for example, by a DPL 270 and/or other components shown in FIGS. 2 and 3 above. Different blocks may be executed by different components of a system and/or different systems. Such systems can include the computer system, described herein below with regard to FIG. 8.

[0073] At block 705, a request for a segment of media is received. The request includes offset information for the requested segment of media. As indicated above, the offset information can be any information that enables the timestamp of a requested chunk (i.e., segment of media) to be rewritten, allowing for continuity in the timestamps of chunks of the media being streamed.

[0074] Block 715 includes determining one or more files to use for creating the segment of media, based on the request for the segment of media. As described above, chunks may be dynamically crafted to accommodate requests. Because the contents (e.g., start/end times, lengths, etc.) of requested chunks may vary from the content of files (e.g., stored chunks) used to create the requested chunks, more than one files may be used to create the requested chunk.

[0075] At block 725, the one or more files are obtained from a data storage. The files may be stored at a local system, or may be retrieved from a remote system, such as an advertisement server, for example.

[0076] Block 735 includes creating the segment of media from the one or more files by providing at least one timestamp for the segment of media based on the offset information. Rewriting timestamps in this manner allows for continuity in the timestamps of chunks of the media being streamed when transitioning from one type of media (e.g., live) to another (e.g., on-demand). The segment of media is then sent at block 745.

[0077] **FIG. 8** illustrates an embodiment of a computer system 800, which may be configured to execute various components described herein using any combination of hardware and/or software. For example, one or more computer systems 800 can be configured to execute components of the CHIMPS 110 shown in systems 200 and 300 if FIGS. 2 and 3, including the API 260 and DPL 270, as well as the encoder 210, end user device 140, and/or other components of the systems described in relation to FIGS. 1-3. FIG. 8 provides a schematic illustration of one embodiment of a computer system 800 that can

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perform the methods provided by various other embodiments, such as the methods described in relation to FIGS. 5-7. It should be noted that FIG. 8 is meant only to provide a generalized illustration of various components, any or all of which may be utilized as appropriate. FIG. 8, therefore, broadly illustrates how individual system elements may be implemented in a relatively separated or relatively more integrated manner. In addition, it can be noted that components illustrated by FIG. 8 can be localized to a single device and/or distributed among various networked devices, which may be disposed at different physical locations.

[0078] The computer system 800 is shown comprising hardware elements that can be electrically coupled via a bus 805 (or may otherwise be in communication, as appropriate). The hardware elements may include processing unit(s) 810, which can include without limitation one or more general-purpose processors, one or more special-purpose processors (such as digital signal processors, graphics acceleration processors, and/or the like), and/or other processing structure, which can be configured to perform one or more of the methods described herein, including the methods described in relation to FIGS. 5-7, by, for example, executing commands stored in a memory. The computer system 800 also can include one or more input devices 815, which can include without limitation a mouse, a keyboard, and/or the like; and one or more output devices 820, which can include without limitation a display device, a printer, and/or the like.

[0079] The computer system 800 may further include (and/or be in communication with) one or more non-transitory storage devices 825, which can comprise, without limitation, local and/or network accessible storage. This can include, without limitation, a disk drive, a drive array, an optical storage device, a solid-state storage device, such as a random access memory ("RAM"), and/or a read-only memory ("ROM"), which can be programmable, flash-updateable, and/or the like. Such storage devices may be configured to implement any appropriate data stores, including without limitation, various file systems, database structures, and/or the like.

[0080] The computer system 800 can also include a communications interface 830, which can include wireless and wired communication technologies. Accordingly, the communications interface can include a modem, a network card (wireless or wired), an infrared communication device, a wireless communication device, and/or a chipset (such as a Bluetooth™ device, an IEEE 802.11 device, an IEEE 802.15.4 device, a WiFi device, a WiMax device, cellular communication facilities, UWB interface, etc.), and/or the like. The

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communications interface 830 can therefore permit the computer system 800 to be exchanged with other devices and components of a network.

[0081] In many embodiments, the computer system 800 will further comprise a working memory 835, which can include a RAM or ROM device, as described above. Software elements, shown as being located within the working memory 835, can include an operating system 840, device drivers, executable libraries, and/or other code, such as one or more application programs 845, which may comprise computer programs provided by various embodiments, and/or may be designed to implement methods, and/or configure systems, provided by other embodiments, as described herein. Merely by way of example, one or more procedures described with respect to the method(s) discussed above, such as the methods described in relation to FIGS. 5-7, might be implemented as code and/or instructions executable by a computer (and/or a processing unit within a computer); in an aspect, then, such code and/or instructions can be used to configure and/or adapt a general purpose computer (or other device) to perform one or more operations in accordance with the described methods.

[0082] A set of these instructions and/or code might be stored on a non-transitory computer-readable storage medium, such as the storage device(s) 825 described above. In some cases, the storage medium might be incorporated within a computer system, such as computer system 800. In other embodiments, the storage medium might be separate from a computer system (e.g., a removable medium, such as an optical disc), and/or provided in an installation package, such that the storage medium can be used to program, configure, and/or adapt a general purpose computer with the instructions/code stored thereon. These instructions might take the form of executable code, which is executable by the computer system 800 and/or might take the form of source and/or installable code, which, upon compilation and/or installation on the computer system 800 (e.g., using any of a variety of generally available compilers, installation programs, compression/decompression utilities, etc.), then takes the form of executable code.

[0083] It will be apparent to those skilled in the art that substantial variations may be made in accordance with specific requirements. For example, customized hardware might also be used, and/or particular elements might be implemented in hardware, software (including portable software, such as applets, etc.), or both. Further, connection to other computing devices such as network input/output devices may be employed.

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[0084] As mentioned above, in one aspect, some embodiments may employ a computer system (such as the computer system 800) to perform methods in accordance with various embodiments of the invention. According to a set of embodiments, some or all of the procedures of such methods are performed by the computer system 800 in response to processing unit(s) 810 executing one or more sequences of one or more instructions (which might be incorporated into the operating system 840 and/or other code, such as an application program 845) contained in the working memory 835. Such instructions may be read into the working memory 835 from another computer-readable medium, such as one or more of the storage device(s) 825. Merely by way of example, execution of the sequences of instructions contained in the working memory 835 might cause the processing unit(s) 810 to perform one or more procedures of the methods described herein. Additionally or alternatively, portions of the methods described herein may be executed through specialized hardware.

[0085] It should be noted that the methods, systems, and devices discussed above are intended merely to be examples. It must be stressed that various embodiments may omit, substitute, or add various procedures or components as appropriate. For instance, it should be appreciated that, in alternative embodiments, the methods may be performed in an order different from that described, and that various steps may be added, omitted, or combined. Also, features described with respect to certain embodiments may be combined in various other embodiments. Different aspects and elements of the embodiments may be combined in a similar manner. Also, it should be emphasized that technology evolves and, thus, many of the elements are examples and should not be interpreted to limit the scope of the invention.

[0086] Terms, "and" and "or" as used herein, may include a variety of meanings that also is expected to depend at least in part upon the context in which such terms are used. Typically, "or" if used to associate a list, such as A, B, or C, is intended to mean A, B, and C, here used in the inclusive sense, as well as A, B, or C, here used in the exclusive sense. In addition, the term "one or more" as used herein may be used to describe any feature, structure, or characteristic in the singular or may be used to describe some combination of features, structures, or characteristics. However, it should be noted that this is merely an illustrative example and claimed subject matter is not limited to this example. Furthermore, the term "at least one of" if used to associate a list, such as A, B, or C, can be interpreted to mean any combination of A, B, and/or C, such as A, AB, AA, AAB, AABBCCC, etc.

[0087] Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without

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departing from the spirit of the invention. For example, the above elements may merely be a component of a larger system, wherein other rules may take precedence over or otherwise modify the application of the invention. Also, a number of steps may be undertaken before, during, or after the above elements are considered. Accordingly, the above description should not be taken as limiting the scope of the invention.

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WHAT IS CLAIMED IS:

1. A method of providing media streaming via a data communications network, the method comprising:

receiving a stream of data representing live media content;

obtaining timing information of the stream of data;

receiving, via the data communications network, a request to stream the live media content;

creating, with a processing unit, a manifest file, wherein:

the manifest file includes information for streaming one or more segments of the live media content via the data communications network,

the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and

the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data; and

sending, via the data communications network, the manifest file.

2. The method of providing media streaming via a data communications network, as recited in claim 1, further comprising providing an application programming interface (API), wherein the request to stream the live media content is received via the API.

3. The method of providing media streaming via a data communications network, as recited in claim 1, wherein creating the manifest file further includes providing, in the manifest file, an indication of a discontinuity in the stream of the live media content.

4. The method of providing media streaming via a data communications network, as recited in claim 3, further comprising:

determining a type of client associated with the request to stream the live media content;

wherein providing the indication of the discontinuity is based on the determination of the type of client.

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5. The method of providing media streaming via a data communications network, as recited in claim 1, wherein obtaining the timing information of the stream of data comprises:

sending a request for the timing information; and

receiving a response to the request, the response including the timing information.

6. The method of providing media streaming via a data communications network, as recited in claim 5, further comprising:

receiving an indication of a period of time in the live media content designated for advertising;

wherein sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising.

7. The method of providing media streaming via a data communications network, as recited in claim 1, wherein the timing information of the stream of data includes one or more timestamps associated with one or more segments of the stream of data.

8. A server for providing media streaming via a data communications network, the server comprising:

a communications interface;

a memory; and

a processing unit coupled to the communications interface and the memory, the processing unit configured to cause the server to:

receive a stream of data representing live media content;

obtain timing information of the stream of data;

receive, via the communications interface, a request to stream the live media content;

create a manifest file, wherein:

the manifest file includes information for streaming one or more segments of the live media content via the data communications network,

the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and

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the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data; and

send, via the communications interface, the manifest file.

9. The server for providing media streaming via a data communications network, as recited in claim 8, wherein the processing unit is further configured to cause the server to provide an application programming interface (API), wherein the request to stream the live media content is received via the API.

10. The server for providing media streaming via a data communications network, as recited in claim 8, wherein the processing unit is configured to cause the server to create the manifest file by providing, in the manifest file, an indication of a discontinuity in the stream of the live media content.

11. The server for providing media streaming via a data communications network, as recited in claim 10, wherein the processing unit is further configured to cause the server to:

determine a type of client associated with the request to stream the live media content;

wherein providing the indication of the discontinuity is based on the determination of the type of client.

12. The server for providing media streaming via a data communications network, as recited in claim 8, wherein the processing unit is configured to cause the server to obtain the timing information of the stream of data by:

sending a request for the timing information; and

receiving a response to the request, the response including the timing information.

13. The server for providing media streaming via a data communications network, as recited in claim 12, wherein the processing unit is further configured to cause the server to:

receive an indication of a period of time in the live media content designated for advertising;

wherein sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising.

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14. The server for providing media streaming via a data communications network, as recited in claim 8, wherein the timing information of the stream of data includes one or more timestamps associated with one or more segments of the stream of data.

15. A non-transitory computer-readable medium having instructions embedded thereon for providing media streaming via a data communications network, the instructions, when executed by a computer, cause the computer to perform functions including:

receiving a stream of data representing live media content;

obtaining timing information of the stream of data;

receiving a request to stream the live media content;

creating a manifest file, wherein:

the manifest file includes information for streaming one or more segments of the live media content via the data communications network,

the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and

the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data; and

sending the manifest file.

16. The computer-readable medium, as recited in claim 15, further comprising instructions for causing the computer to provide an application programming interface (API), wherein the request to stream the live media content is received via the API.

17. The computer-readable medium, as recited in claim 15, wherein the instructions for creating the manifest file further include instructions for providing, in the manifest file, an indication of a discontinuity in the stream of the live media content.

18. The computer-readable medium, as recited in claim 17, further including instructions for causing the computer to:

determine a type of client associated with the request to stream the live media content;

wherein providing the indication of the discontinuity is based on the determination of the type of client.

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19. The computer-readable medium, as recited in claim 15, wherein the instructions for obtaining the timing information of the stream of data further include instructions for causing the computer to:

send a request for the timing information; and

receive a response to the request, the response including the timing information.

20. The computer-readable medium, as recited in claim 19 further comprising instructions for causing the computer to:

receive an indication of a period of time in the live media content designated for advertising;

wherein sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising.

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AMENDED CLAIMS

received by the International Bureau on 09 February 2015 (09.02.2015)

1. A method of providing a manifest file for media streaming via a data communications network, the method comprising:

receiving a stream of data representing live media content;

obtaining timing information of the stream of data;

receiving, via the data communications network, a request to stream the live media content;

creating, with a processing unit, a manifest file, wherein:

the manifest file includes information for streaming one or more segments of the live media content via the data communications network,

the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and

the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data and indicative of a value by which at least one timestamp of the one or more segments of the media file is to be offset; and

sending, via the data communications network, the manifest file.

2. A method of providing a manifest file for media streaming via a data communications network, as recited in claim 1, further comprising providing an application programming interface (API), wherein the request to stream the live media content is received via the API.

3. A method of providing a manifest file for media streaming via a data communications network, as recited in claim 1, wherein creating the manifest file further includes providing, in the manifest file, an indication of a discontinuity in the stream of the live media content.

4. A method of providing a manifest file for media streaming via a data communications network, as recited in claim 3, further comprising:

determining a type of client associated with the request to stream the live media content;

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wherein providing the indication of the discontinuity is based on the determination of the type of client.

5. A method of providing a manifest file for media streaming via a data communications network, as recited in claim 1, wherein obtaining the timing information of the stream of data comprises:

sending a request for the timing information; and

receiving a response to the request, the response including the timing information.

6. A method of providing a manifest file for media streaming via a data communications network, as recited in claim 5, further comprising:

receiving an indication of a period of time in the live media content designated for advertising;

wherein sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising.

7. A method of providing a manifest file for media streaming via a data communications network, as recited in claim 1, wherein the timing information of the stream of data includes one or more timestamps associated with one or more segments of the stream of data.

8. A server for providing a manifest file for media streaming via a data communications network, the server comprising:

a communications interface;

a memory; and

a processing unit coupled to the communications interface and the memory, the processing unit configured to cause the server to:

receive a stream of data representing live media content;

obtain timing information of the stream of data;

receive, via the communications interface, a request to stream the live media content;

create a manifest file, wherein:

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the manifest file includes information for streaming one or more segments of the live media content via the data communications network,

the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and

the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data and indicative of a value by which at least one timestamp of the one or more segments of the media file is to be offset; and

send, via the communications interface, the manifest file.

9. A server for providing a manifest file for media streaming via a data communications network, as recited in claim 8, wherein the processing unit is further configured to cause the server to provide an application programming interface (API), wherein the request to stream the live media content is received via the API.

10. A server for providing a manifest file for media streaming via a data communications network, as recited in claim 8, wherein the processing unit is configured to cause the server to create the manifest file by providing, in the manifest file, an indication of a discontinuity in the stream of the live media content.

11. A server for providing a manifest file for media streaming via a data communications network, as recited in claim 10, wherein the processing unit is further configured to cause the server to:

determine a type of client associated with the request to stream the live media content;

wherein providing the indication of the discontinuity is based on the determination of the type of client.

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12. A server for providing a manifest file for media streaming via a data communications network, as recited in claim 8, wherein the processing unit is configured to cause the server to obtain the timing information of the stream of data by:

sending a request for the timing information; and

receiving a response to the request, the response including the timing information.

13. A server for providing a manifest file for media streaming via a data communications network, as recited in claim 12, wherein the processing unit is further configured to cause the server to:

receive an indication of a period of time in the live media content designated for advertising;

wherein sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising

14. A server for providing a manifest file for media streaming via a data communications network, as recited in claim 8, wherein the timing information of the stream of data includes one or more timestamps associated with one or more segments of the stream of data.

15. A non-transitory computer-readable medium having instructions embedded thereon for providing a manifest file for media streaming via a data communications network, the instructions, when executed by a computer, cause the computer to perform functions including:

receiving a stream of data representing live media content;

obtaining timing information of the stream of data;

receiving a request to stream the live media content;

creating a manifest file, wherein:

the manifest file includes information for streaming one or more segments of the live media content via the data communications network,

the manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and

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the manifest file further includes offset information for streaming the one or more segments of the media file, the offset information based on the timing information of the stream of data and indicative of a value by which at least one timestamp of the one or more segments of the media file is to be offset; and

sending the manifest file.

16. The computer-readable medium, as recited in claim 15, further comprising instructions for causing the computer to provide an application programming interface (API), wherein the request to stream the live media content is received via the API.

17. (Original) The computer-readable medium, as recited in claim 15, wherein the instructions for creating the manifest file further include instructions for providing, in the manifest file, an indication of a discontinuity in the stream of the live media content.

18. The computer-readable medium, as recited in claim 17, further including instructions for causing the computer to:

determine a type of client associated with the request to stream the live media content;

wherein providing the indication of the discontinuity is based on the determination of the type of client.

19. The computer-readable medium, as recited in claim 15, wherein the instructions for obtaining the timing information of the stream of data further include instructions for causing the computer to:

send a request for the timing information; and

receive a response to the request, the response including the timing information.

20. The computer-readable medium, as recited in claim 19 further comprising instructions for causing the computer to:

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receive an indication of a period of time in the live media content designated for advertising;

wherein sending the request for the timing information is based on the receipt of the indication of the period of time in the live media content designated for advertising.

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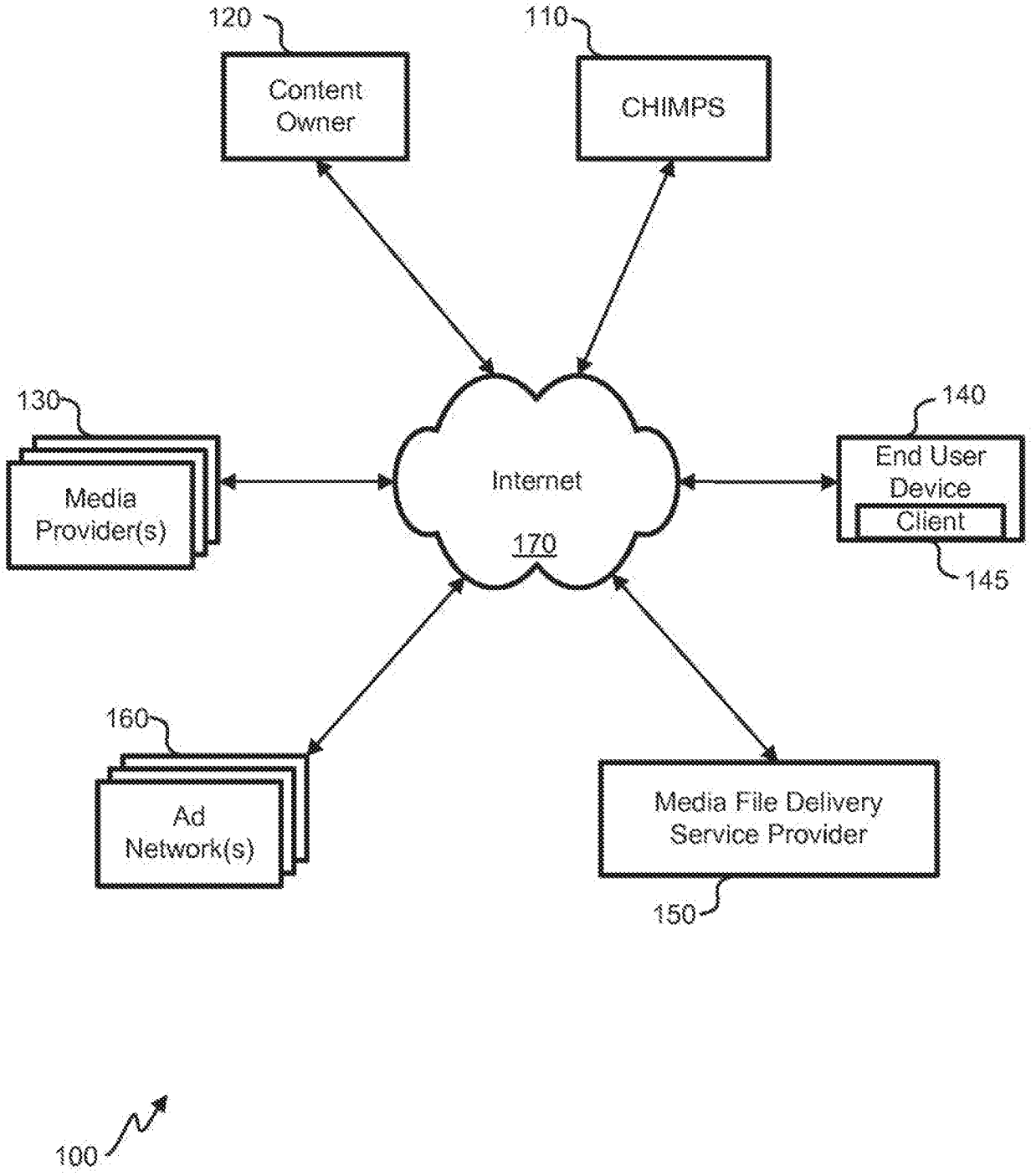

120
Content Owner
110
CHIMPS
130
Media Provider(s)
Internet
170
140
End User Device
Client
145
160
Ad Network(s)
Media File Delivery Service Provider
150
100

FIG. 1

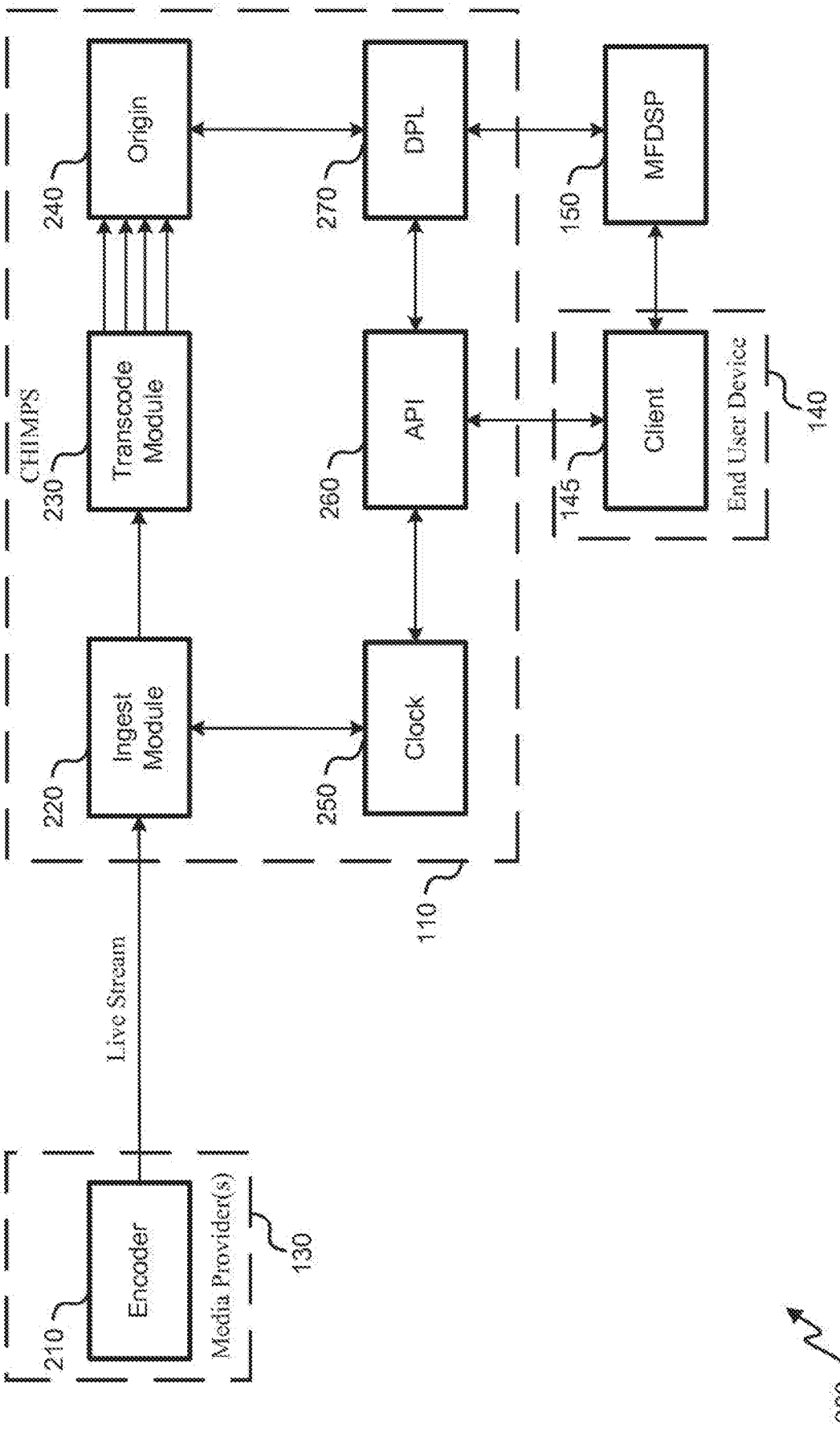

Origin
240
DPL
270
MFDSP
150
CHIMPS
Transcode Module
230
API
260
Client
145
End User Device
140
Ingest Module
220
Clock
250
110
Live Stream
Encoder
210
Media Provider(s)
130
200

FIG. 2

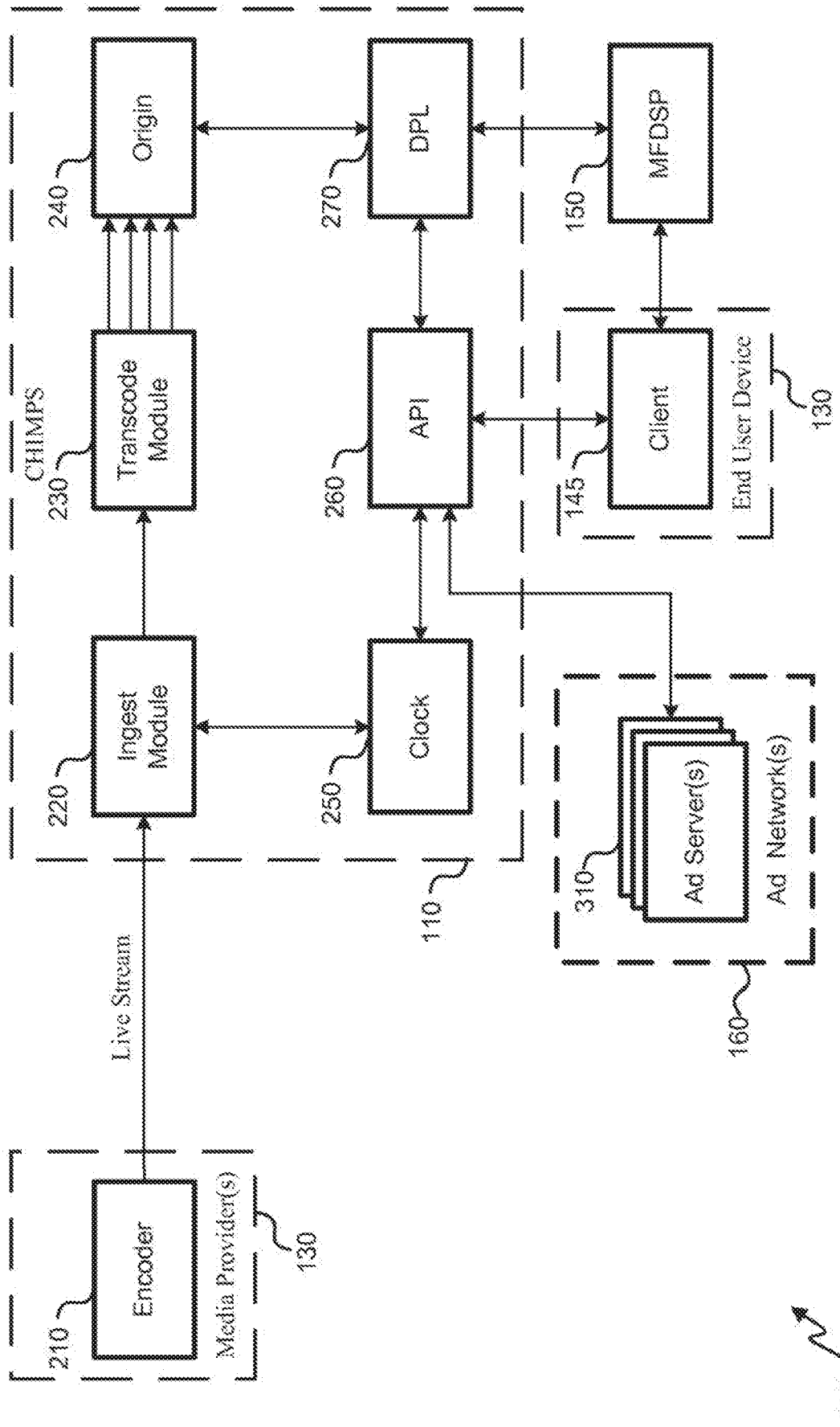


FIG. 3

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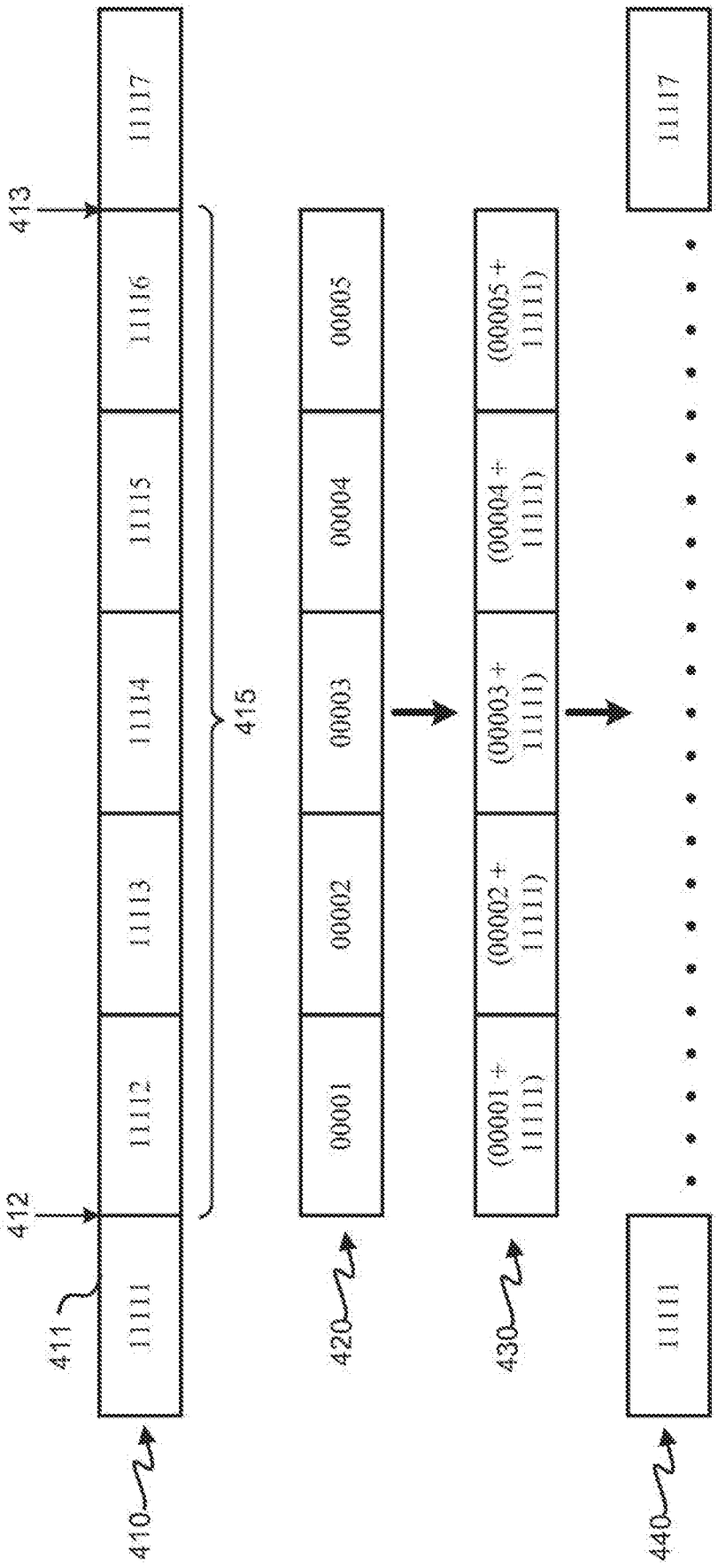


FIG. 4

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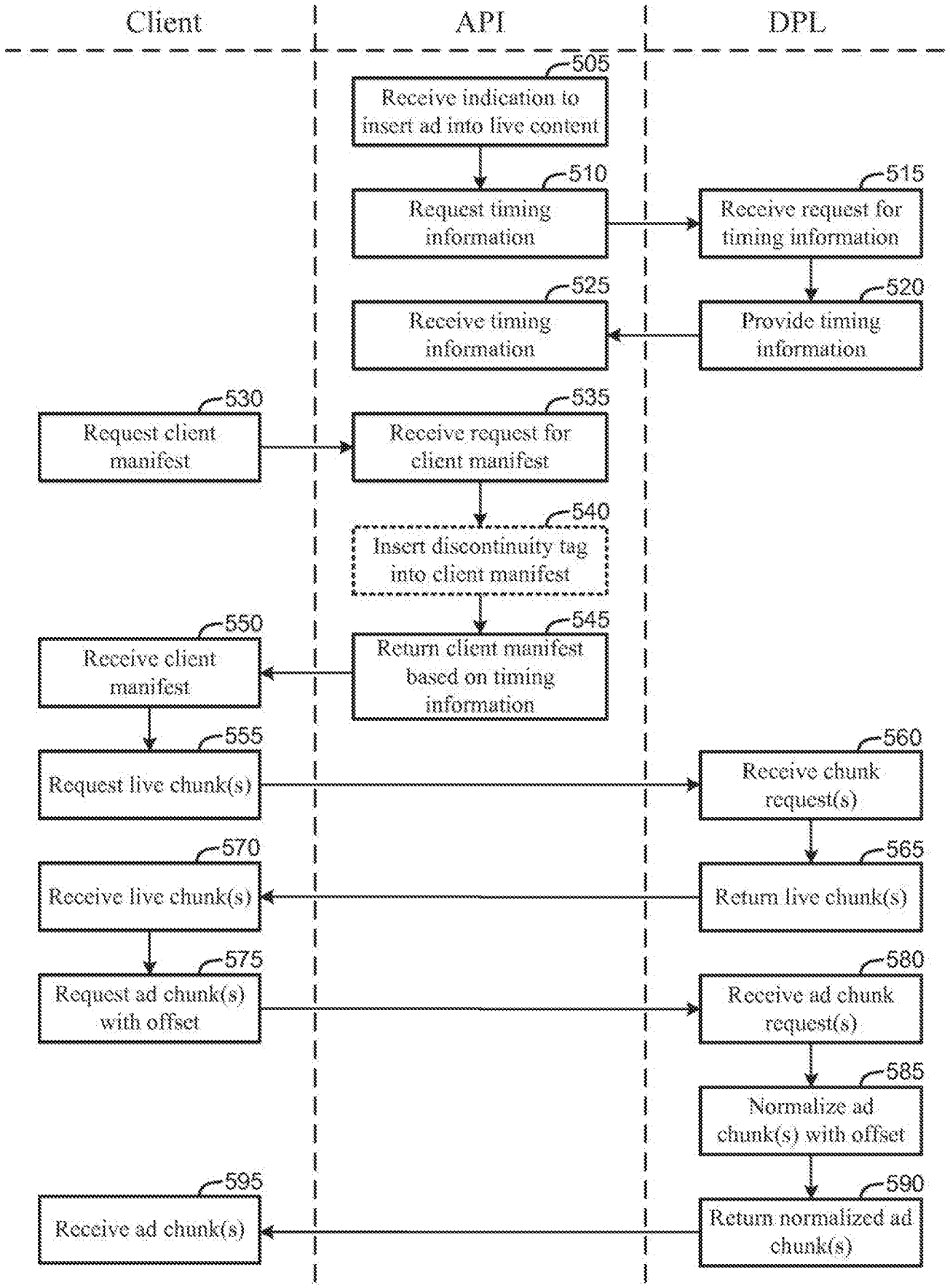

Client
API
DPL
505
Receive indication to insert ad into live content
510
Request timing information
515
Receive request for timing information
520
Provide timing information
525
Receive timing information
530
Request client manifest
535
Receive request for client manifest
540
Insert discontinuity tag into client manifest
545
Return client manifest based on timing information
550
Receive client manifest
555
Request live chunk(s)
560
Receive chunk request(s)
565
Return live chunk(s)
570
Receive live chunk(s)
575
Request ad chunk(s) with offset
580
Receive ad chunk request(s)
585
Normalize ad chunk(s) with offset
590
Return normalized ad chunk(s)
595
Receive ad chunk(s)

FIG. 5

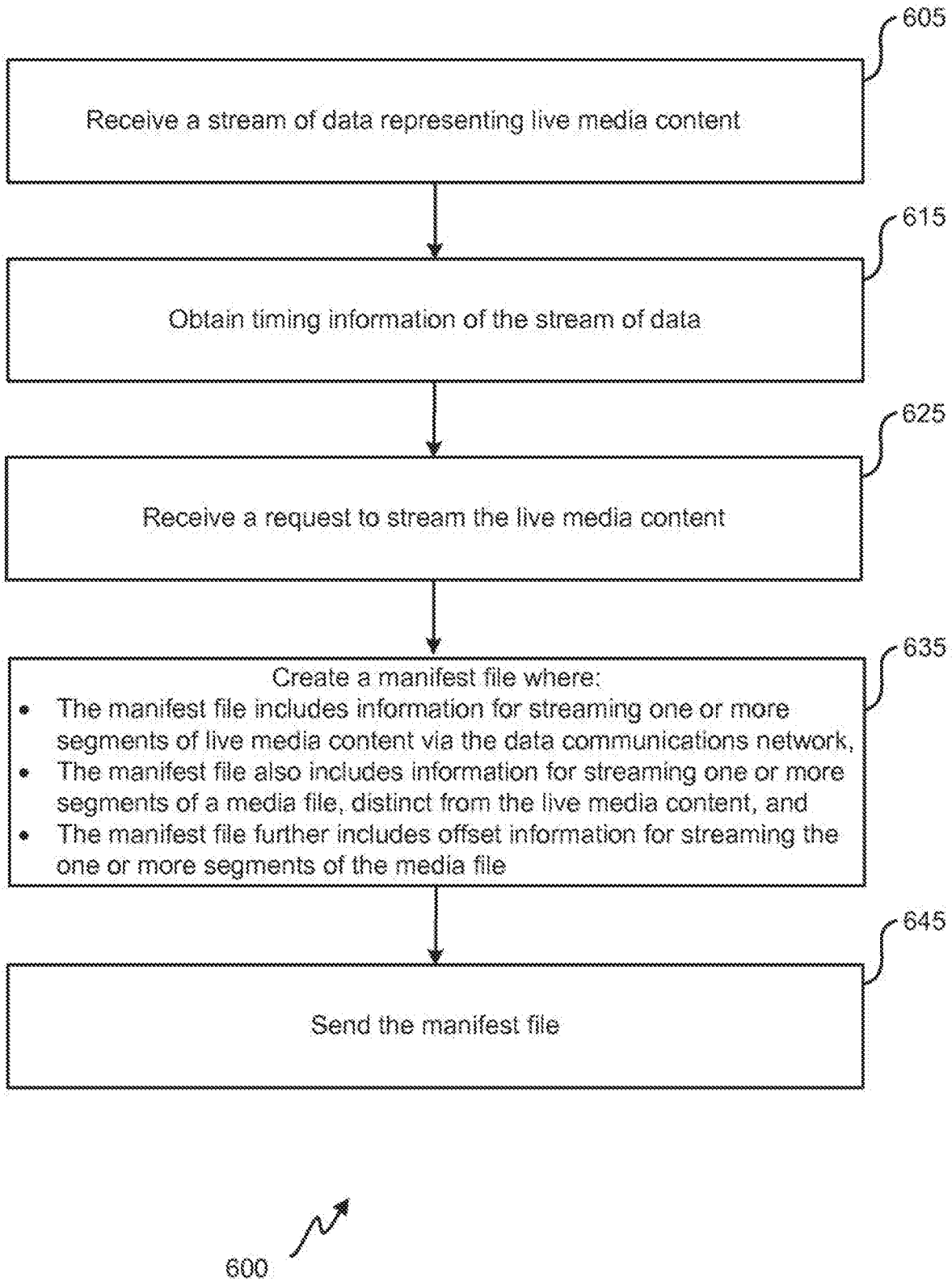

605
Receive a stream of data representing live media content
615
Obtain timing information of the stream of data
625
Receive a request to stream the live media content
635
Create a manifest file where:
• The manifest file includes information for streaming one or more segments of live media content via the data communications network,
• The manifest file also includes information for streaming one or more segments of a media file, distinct from the live media content, and
• The manifest file further includes offset information for streaming the one or more segments of the media file
645
Send the manifest file
600

FIG. 6

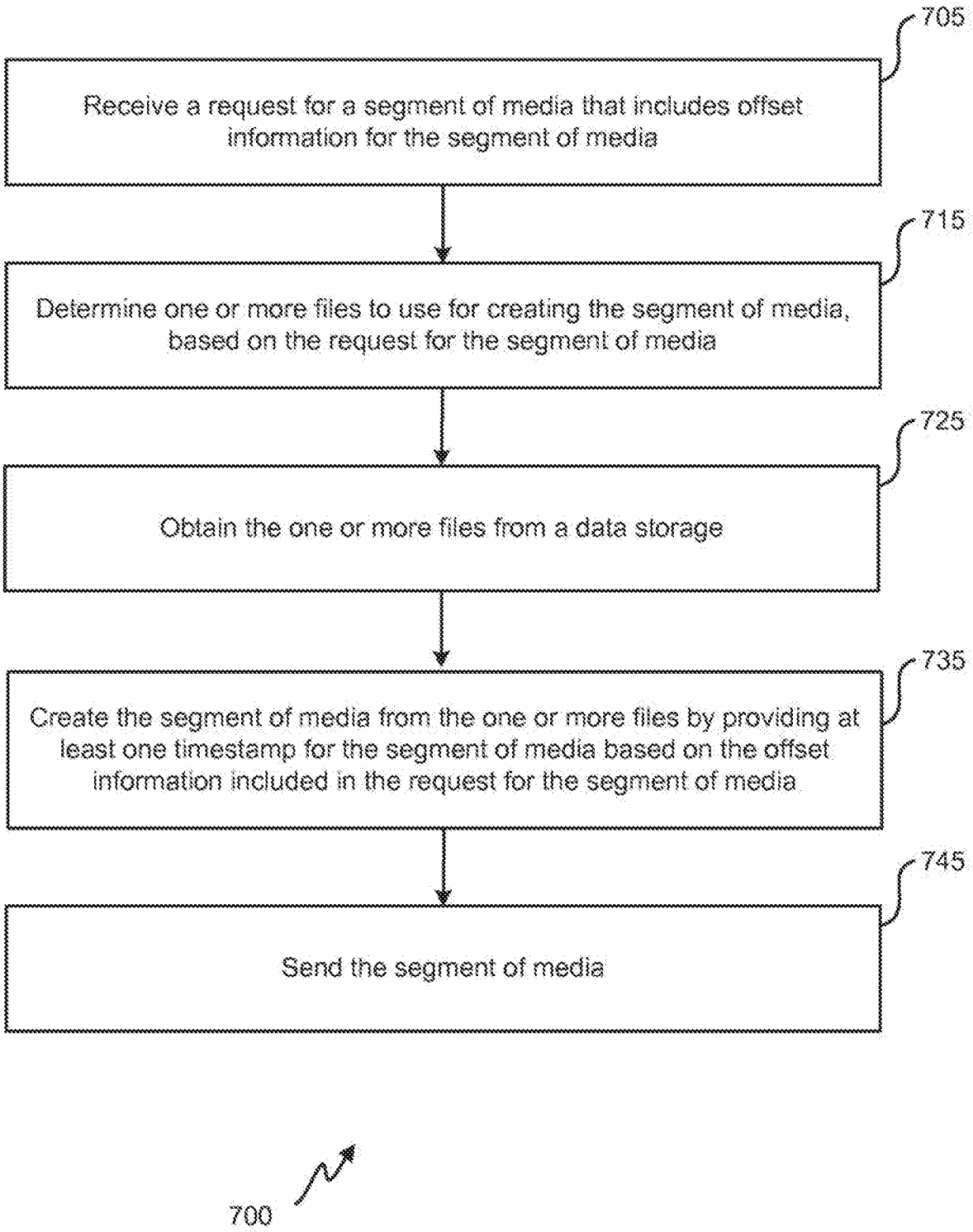

705
Receive a request for a segment of media that includes offset information for the segment of media
715
Determine one or more files to use for creating the segment of media, based on the request for the segment of media
725
Obtain the one or more files from a data storage
735
Create the segment of media from the one or more files by providing at least one timestamp for the segment of media based on the offset information included in the request for the segment of media
745
Send the segment of media
700

FIG. 7

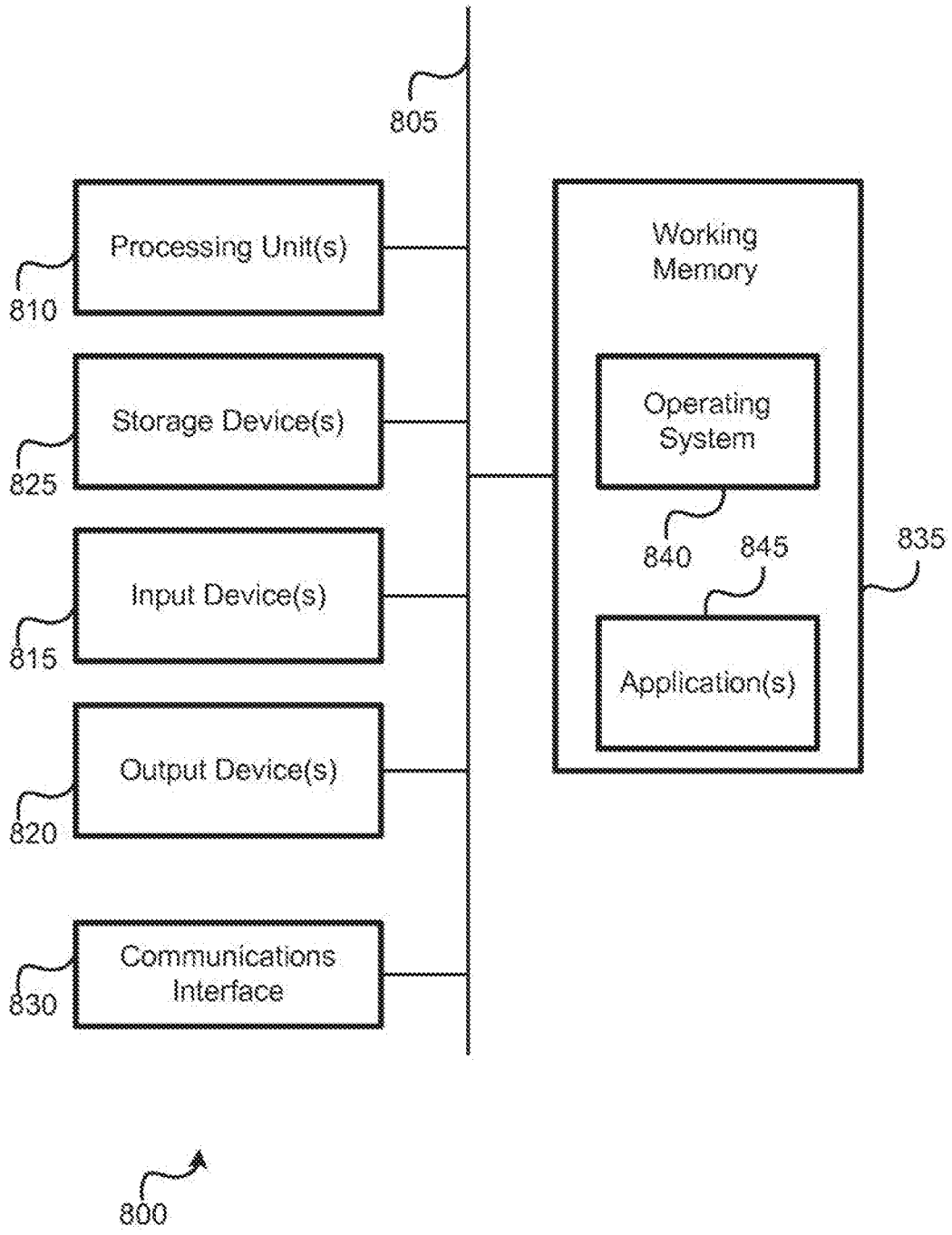

805
Processing Unit(s)
810
Storage Device(s)
825
Input Device(s)
815
Output Device(s)
820
Communications Interface
830
Working Memory
Operating System
840
845
Application(s)
835
800

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/056823

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N21/234 H04N21/44 H04N21/81
ADD.

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

B. FIELDS SEARCHED

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/080579 A1 (GORDON MICHAEL M [US] ET AL) 28 March 2013 (2013-03-28) paragraphs [0003] - [0008], [0045] - [0053], [0110] - [0121]; claims; figures	1-20
X	US 7 203 758 B2 (COOK DAVID H [US] ET AL) 10 April 2007 (2007-04-10) the whole document	1-20
X	US 2013/083859 A1 (NEMIROFF ROBERT S [US] ET AL) 4 April 2013 (2013-04-04) the whole document	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 December 2014	09/12/2014

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

1

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US 2013080579 A1	28-03-2013	AU 2012362500 A1	17-07-2014
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		US 2013083859 A1	04-04-2013
		WO 2013052265 A1	11-04-2013

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

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San Francisco, CA 94111
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 10 July 2014 (10.07.2014)	
Applicant's or agent's file reference 92853-858102	**IMPORTANT NOTICE**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/071669	26 December 2012 (26.12.2012)	29 December 2011 (29.12.2011)

Applicant
UNICORN MEDIA, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

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1211 Geneva 20, Switzerland

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Authorized officer
Simin Baharlou

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 92853-858102	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2012/071669	International filing date *(day/month/year)* 26 December 2012 (26.12.2012)	Priority date *(day/month/year)* 29 December 2011 (29.12.2011)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant UNICORN MEDIA, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 01 July 2014 (01.07.2014)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Simin Baharlou e-mail: pt09.pct@wipo.int

Form PCT/IB/373 (January 2004)

Petitioner Disney Ex-1004, 0670

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/071669	26.12.2012	29.12.2011

International Patent Classification (IPC) or both national classification and IPC
INV. G06F17/30

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Boyadzhiev, Yavor Telephone No. +31 70 340-4548

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

Petitioner Disney Ex-1004, 0672

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Petitioner Disney Ex-1004, 0673

Re Item V.

1. Reference is made to the following documents (D1-D3):

D1 AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010

D2 PRANGL M ET AL: "Towards QoS Improvements of TCP-Based Media Delivery", NETWORKING AND SERVICES, 2008. ICNS 2008. FOURTH INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 16 March 2008 (2008-03-16), pages 188-193, XP031239297

D3 US 2001/029525 A1 (LAHR NILS B [US]) 11 October 2001 (2001-10-11)

Article 33(3) PCT

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-15, as interpreted by the examiner (see §3), does not involve an inventive step in the sense of Article 33(3) PCT.

INDEPENDENT CLAIM 1

2.1 The document D1 discloses: A system for improved index files for media streaming via a data network (paragraph 5, lines 1-2, "Systems ... disclosed."; and lines 7-8, "These ... generator ..."), the system comprising:
a network interface for communicating with the data network (paragraph 5, lines 2-4, "These ... streaming; claim 1, line 3, "an interface ... network."); and an index file generator coupled to the network interface (paragraph 48, lines 2-3, "The index ... CHIMPS 110.") and configured to:
obtain, from one or more information sources, first contextual data related to a first request received by the network interface, the first request including a URL indicative of a requested media file (paragraph 34, lines 1-9, "End ... indicator."; paragraph 30, lines 1-2, "The determination ... purposes.");
generate a first index file based on the first contextual data and syndication information (paragraph 31, lines 1-3, "Additionally ... requested."; and lines 7-9, "... calculating ... scheme."; paragraph 37,lines 1-2, "For ... syndication.");
send the first index file using the network interface (paragraph 70, lines 9-10, "Once ... client 825.");
obtain, from the one or more information sources, second contextual data related to a second request received using the network interface, the second request including the same URL as the first request (paragraph 32, lines 4-10, "The system ... (CDN) 150.");
generate a second index file based on the second contextual data and the syndication information, wherein content of the second index file is different from content of the first index file (paragraph 49, lines 1-4, "It ... protocols."; paragraph 53, lines 1-3,

Petitioner Disney Ex-1004, 0674

"In ... generator 530."); and
send the second index file using the network interface (paragraph 70, lines 9-10, "Once ... client 825.").

The document D1 does not explicitly disclose that the same URL is used to obtain the first and second contextual data. However, this feature is known and has already been employed for the same purpose as exemplified in D2 (page 190, right column, lines 19-21; lines 45-46) and D3 (paragraphs 56, 57). It would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to the system/method of D1, thereby arriving at the subject-matter of claim 1 without the exercise of inventive skills.

Thus, the subject-matter of claim 1 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 in combination with the general knowledge of the person skilled in the art.

The above argumentation (§2.1) also applies to the corresponding independent claims 6 and 11 the subject-matter of which lacks an inventive step (Article 33(3) PCT) over D1 in combination with the general knowledge of the person skilled in the art.

2.2 The subject-matter of claim 2 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 49, lines 3-4).

2.3 The subject-matter of claim 3 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 8, lines 2-5; paragraph 49, lines 3-4).

2.4 The subject-matter of claim 4 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 48, lines 6-11; paragraph 56, lines 4-9).

2.5 The subject-matter of claim 5 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 56, lines 10-13).

The above objections (§2.2 - §2.5) against dependent claims 2-6 apply to the corresponding dependent claims 7-10, 12-15 the subject-matter of which also lacks an inventive step in the sense of Article 33(3) PCT.

Re Item VIII. (Clarity)

3. It appears the expression "send the second index file" instead of "send the first index file" should be used in the last feature of claim 1. The foregoing interpretation is used for the rest of this written opinion.

The above objection (§3) also applies to the use of the same expression in the corresponding independent claim 11.

Petitioner Disney Ex-1004, 0675

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
McMillan, Scott
Kilpatrick Townsend & Stockton LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
ETATS-UNIS D'AMERIQUE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 5 April 2013 (05-04-2013)
Applicant's or agent's file reference 92853-858102	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2012/071669	International filing date *(day/month/year)* 26 December 2012 (26-12-2012)

Applicant

UNICORN MEDIA, INC.

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	HUYSING-SOLLES, Henriëtte Tel: +31 (0)70 340-2585

Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
92853-858102		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2012/071669	26/12/2012	29/12/2011
Applicant		
UNICORN MEDIA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] the international application in the language in which it was filed
      [ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 12B
      [X] as suggested by the applicant
      [ ] as selected by this Authority, because the applicant failed to suggest a figure
      [ ] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

Petitioner Disney Ex-1004, 0677

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/071669

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F17/30
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010 (2010-12-23) abstract paragraph [0001] - paragraph [0008] paragraph [0023] - paragraph [0034] paragraph [0036] - paragraph [0037] paragraph [0047] - paragraph [0053] paragraph [0054] - paragraph [0061] paragraph [0067] - paragraph [0074] claims 1,10,18 ----- -/--	1-15

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

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 March 2013	05/04/2013

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

1

Form PCT/ISA/210 (second sheet) (April 2005)

Petitioner Disney Ex-1004, 0678

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/071669

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PRANGL M ET AL: "Towards QoS Improvements of TCP-Based Media Delivery", NETWORKING AND SERVICES, 2008. ICNS 2008. FOURTH INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 16 March 2008 (2008-03-16), pages 188-193, XP031239297, ISBN: 978-0-7695-3094-9 abstract page 188, left-hand column, line 22 - page 188, right-hand column, line 22 page 190, left-hand column, line 49 - page 191, left-hand column, line 38 page 192, left-hand column, line 14 - page 192, right-hand column, line 6 -----	1-15
A	US 2001/029525 A1 (LAHR NILS B [US]) 11 October 2001 (2001-10-11) abstract paragraph [0003] - paragraph [0006] paragraph [0017] - paragraph [0018] paragraph [0022] paragraph [0025] paragraph [0032] - paragraph [0033] paragraph [0053] - paragraph [0059] -----	1-15

1

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

Petitioner Disney Ex-1004, 0679

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/071669

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AU 2010202741 B1	23-12-2010	AU 2010202741 B1	23-12-2010
		US 2012005312 A1	05-01-2012
		US 2012185608 A1	19-07-2012
US 2001029525 A1	11-10-2001	AU 3657101 A	07-08-2001
		US 2001029525 A1	11-10-2001
		WO 0155913 A1	02-08-2001

Petitioner Disney Ex-1004, 0680

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/071669	26.12.2012	29.12.2011

International Patent Classification (IPC) or both national classification and IPC
INV. G06F17/30

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Boyadzhiev, Yavor Telephone No. +31 70 340-4548

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

Petitioner Disney Ex-1004, 0682

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Petitioner Disney Ex-1004, 0683

Re Item V.

1. Reference is made to the following documents (D1-D3):

D1 AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010

D2 PRANGL M ET AL: "Towards QoS Improvements of TCP-Based Media Delivery", NETWORKING AND SERVICES, 2008. ICNS 2008. FOURTH INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 16 March 2008 (2008-03-16), pages 188-193, XP031239297

D3 US 2001/029525 A1 (LAHR NILS B [US]) 11 October 2001 (2001-10-11)

Article 33(3) PCT

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-15, as interpreted by the examiner (see §3), does not involve an inventive step in the sense of Article 33(3) PCT.

INDEPENDENT CLAIM 1

2.1 The document D1 discloses: A system for improved index files for media streaming via a data network (paragraph 5, lines 1-2, "Systems ... disclosed."; and lines 7-8, "These ... generator ..."), the system comprising:
a network interface for communicating with the data network (paragraph 5, lines 2-4, "These ... streaming; claim 1, line 3, "an interface ... network."); and an index file generator coupled to the network interface (paragraph 48, lines 2-3, "The index ... CHIMPS 110.") and configured to:
obtain, from one or more information sources, first contextual data related to a first request received by the network interface, the first request including a URL indicative of a requested media file (paragraph 34, lines 1-9, "End ... indicator."; paragraph 30, lines 1-2, "The determination ... purposes.");
generate a first index file based on the first contextual data and syndication information (paragraph 31, lines 1-3, "Additionally ... requested."; and lines 7-9, "... calculating ... scheme."; paragraph 37,lines 1-2, "For ... syndication.");
send the first index file using the network interface (paragraph 70, lines 9-10, "Once ... client 825.");
obtain, from the one or more information sources, second contextual data related to a second request received using the network interface, the second request including the same URL as the first request (paragraph 32, lines 4-10, "The system ... (CDN) 150.");
generate a second index file based on the second contextual data and the syndication information, wherein content of the second index file is different from content of the first index file (paragraph 49, lines 1-4, "It ... protocols."; paragraph 53, lines 1-3,

Petitioner Disney Ex-1004, 0684

"In ... generator 530."); and
send the second index file using the network interface (paragraph 70, lines 9-10, "Once ... client 825.").

The document D1 does not explicitly disclose that the same URL is used to obtain the first and second contextual data. However, this feature is known and has already been employed for the same purpose as exemplified in D2 (page 190, right column, lines 19-21; lines 45-46) and D3 (paragraphs 56, 57). It would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to the system/method of D1, thereby arriving at the subject-matter of claim 1 without the exercise of inventive skills.

Thus, the subject-matter of claim 1 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 in combination with the general knowledge of the person skilled in the art.

The above argumentation (§2.1) also applies to the corresponding independent claims 6 and 11 the subject-matter of which lacks an inventive step (Article 33(3) PCT) over D1 in combination with the general knowledge of the person skilled in the art.

2.2 The subject-matter of claim 2 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 49, lines 3-4).

2.3 The subject-matter of claim 3 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 8, lines 2-5; paragraph 49, lines 3-4).

2.4 The subject-matter of claim 4 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 48, lines 6-11; paragraph 56, lines 4-9).

2.5 The subject-matter of claim 5 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 56, lines 10-13).

The above objections (§2.2 - §2.5) against dependent claims 2-6 apply to the corresponding dependent claims 7-10, 12-15 the subject-matter of which also lacks an inventive step in the sense of Article 33(3) PCT.

Re Item VIII. (Clarity)

3. It appears the expression "send the second index file" instead of "send the first index file" should be used in the last feature of claim 1. The foregoing interpretation is used for the rest of this written opinion.

The above objection (§3) also applies to the use of the same expression in the corresponding independent claim 11.

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Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.
Amending claims under Art. 19 PCT	Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.
Filing a demand for international preliminary examination	In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT). If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).
Filing informal comments	After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.
End of the international phase	At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).
Relevant PCT Rules and more information	Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

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Towards QoS Improvements of TCP-based Media Delivery

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Abstract—**The amount of audiovisual data available on the Internet and thus of multimedia communication over today's networks is increasing at a rapid pace. Despite the availability of specific media transport protocols like RTP, most content providers make use of the well-established and reliable TCP protocol to deliver audiovisual content over the Internet. The reason is that TCP-based data delivery in general is much less complicated for the clients to be served and over today's networks traversed (including proxies and firewalls), than making use of UDP-based RTP connections. However, in case of network bandwidth fluctuations and packet losses, TCP-based media delivery may lead to annoying jerky playback at the client side, due to retransmissions and late arrival of media data. This papers deals with TCP-based perceptual QoS improvement mechanisms for increasing the media experience for the consumer under unstable network conditions. Our approach is based on media content adaptation (transcoding) to fit the actual network bandwidth continuously monitored by the sender. The proposed mechanisms are applied at the application level at the server side, leaving the existing TCP implementation untouched and therefore enabling transparent use of existing media players. An evaluation of a realistic use case is presented which underlines the efficacy of our approach.**

I. Introduction

The transport of multimedia contents over the Internet is getting more and more popular. Video on Demand as well as live television services are distributed over the Web, enabling online consumption of a huge and rapidly growing set of media contents. However, providing an acceptable Quality of Service (QoS) level to the consumer forms a challenging problem for several reasons. In contrast to common data transfer, e.g., the exchange of documents or data files, the real time consumption of audiovisual content is sensitive to bandwidth fluctuations, delay and jitter. For solving this problem, several QoS aware network architectures like Integrated Services [1], Differentiated Services [2] or Multi-Protocol Label Switching (MPLS) [3] are proposed for reserving resources for such critical flows and prioritize them along the network chain, respectively. Nowadays such intelligent network mechanisms are rarely activated in network nodes. Guarantees on link bandwidth, delay and jitter cannot be granted for an individual end-to-end connection through the Internet, that is still a best effort network. Even Voice over IP (VoIP) services, which rely on similar QoS requirements, are becoming rapidly popular. VoIP traffic consumes much less bandwidth and is therefore less critical than traffic caused by audiovisual applications. Furthermore, the bit rates of VoIP flows can be assumed as constant, whereas video flows are characterized by variable bit rate and burstiness.

Special transport protocols were developed and standardized to support the requirements of real-time audiovisual applications. The so called Real-Time Transport Protocol (RTP) was designed on top of the UDP transport protocol that does not guarantee a reliable connection. In contrast to TCP, the design goal was to avoid end-to-end retransmissions that lead to a higher average delay and jitter. Instead, the protocol provides means for timing of the media data and a sequence number mechanism to detect lost packets. In combination with content adaptation techniques [4], RTP is well suited for supporting the vision of Universal Multimedia Access [5].

Nowadays a clear trend can be observed toward the use of wireless technologies. Modern devices like PDAs or mobile phones are connected to the Web by WLAN or UMTS carriers, enabling convenient mobile and location independent consumption of Web contents. However, the use of wireless connections is critical in case of real time applications. Delay and bandwidth are varying depending on the signal quality which is sensitive to the location of the client as well as to natural influences.

As a consequence of the extended connectivity, also the users' demand for security increased during the last years. Today, security mechanisms like firewalls are integrated along the network chain and at the client's network access (end) points. Modern operating systems are equipped with firewalling mechanisms as well. Enterprises usually separate their LANs from the Web by the use of proxy servers. This fact represents a problem for media content providers because incoming RTP traffic is blocked by such security mechanisms in most cases. Home users or small companies also often use a Network Address Translation (NAT) gateway for connecting multiple clients to a single shared Internet connection. Such popular NAT devices represent a barrier for incoming RTP traffic as well. In order to distribute media contents to a large group of users, independence of security mechanisms and network components within the whole network chain is required. For this reason, most public content providers make use of the simple and well-established TCP protocol for transporting media contents to their clients. Of course, TCP delivery is easy and uncomplicated but leads to drawbacks in case of real time media consumption. The reason is that TCP is a reliable protocol, thus lost media frames are retransmitted, and delayed

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(potentially useless) frames are delivered. Furthermore, TCP specific features like congestion control and flow control, are harmful in this use case. As a consequence of insufficient bandwidth, TCP-based on-the-fly consumption is annoying for the user because the media session may suffer from missing data periodically.

This paper focuses on how to improve the perceived QoS of TCP-based media content delivery. The aim of our work is to improve the possibly unsatisfactory behavior of the TCP-based media consumption in case of bandwidth fluctuations. In order to be independent from media player architectures and to avoid annoying player software updates at the client side, our approach is applied at the server side. In order to achieve transparency w.r.t. the player's point of view, our improvements are applied at the application level, keeping the existing TCP implementation untouched. With the help of periodical link throughput measurements, the original media content is shaped in such a way that it fits the actual network conditions.

The remainder of this work is structured as follows. Section II introduces the problems of efficient RTP-based delivery in today's network environment. Section III gives a brief introduction into TCP-based media delivery. Section IV is dedicated to our proposed adaptive server architecture for TCP-based media delivery. Subsequently two algorithms for QoS improvements are introduced. In Section V an evaluation of the proposed approach based on media delivery over a shared bottleneck link is given. Section VI finally concludes the main findings of this work.

II. Problems of RTP-based Media Delivery

Typically, multimedia content is delivered using the Real-time Transport Protocol (RTP) [6], a connectionless, unreliable communication protocol based on UDP. The main reason is that a reliable communication protocol (such as TCP) produces too much overhead because it makes no sense to retransmit lost packets. Such retransmitted, and therefore potentially late packets (containing stream information of the past) may be useless at the rendering client side and may have to be discarded. Usually, the content delivery over RTP is controlled by the server, which pushes the media content to a certain UDP port given by the client. In order to give the client the option to choose a certain content, to inform the server of the listening port(s) and to enable interactive control to the user (e.g., start, stop, pause) of the current session, another communication protocol is needed. This protocol is called Real-Time Streaming Protocol (RTSP, RFC2326) [6] and is based on TCP. The RTSP requests are always initiated by the client. Another optional protocol named Real-Time Control Protocol (RTCP) can be used to provide statistical feedback, e.g., lost packets, for QoS reactions (management) on the server side.

However, delivering multimedia data over the Internet using RTP/RTSP has drawbacks as well. First, the elementary streams have to be packetized according to specific RFCs, depending on the used media formats (e.g., one packet for one encoded frame). This is required because in case of packet loss, the lost information should be confined to have as little impact on the media presentation as possible. Furthermore, this additional task implies that the delivery module has to be extended if a new encoder is included in the system. The second, most critical drawback is the traversal of restrictive network nodes like firewalls, NAT routers or proxies in the network chain.

A. Firewalls

Assume that a client is located behind a firewall and requests content from the media server by sending a TCP-based RTSP Message. This (outgoing) message passes the firewall and consequently the media server receives the content request including the port and IP address of the client for establishing the RTP/UDP connection for content delivery. After the server receives the *RTSP PLAY* message, the server starts the RTP packetization and transmits the data via the connectionless UDP protocol to the user's terminal. The problem in this case is that the firewall blocks incoming connections from the Web (from the media server) because it does not know anything about the session (the request is coming from the user). It would be possible to configure the firewall to pass the UDP packets of the media server but the challenge is that the media servers (IP addresses) as well as the available ports on the clients are dynamically changing. Clients are usually using a set of media servers, not only one particular. Furthermore the user is in general not familiar and/or not allowed to configure the firewall according to his/her individual preferences. A solution would be to implement additional logic within the firewall, that keeps track of the exchanged RTSP messages and allows incoming UDP packets on the ports and IP addresses negotiated within the RTSP session. A novel draft of such a session awareness of firewalls for avoiding the problem of blocking incoming RTP packets is discussed at the end of this section. However, to the best of our knowledge such a session tracking logic is not implemented in current firewall products.

B. Network Address Translation (NAT)

Clients behind a NAT router are using a local IP address which is not valid in the Internet. The NAT router is translating the local requests to the Web by replacing the client's local IP address to the router's global (valid) IP address and manages/tracks the ports for forwarding the answer from the Web back to the requesting local client. From the media server's point of view, the NAT router is requesting a content for consumption. The forwarded *RTSP OK* server answer reaches the client as in the previous use case because the NAT router knows to which local client the answer belongs. The problem occurs if the media server starts sending the RTP/UDP packets to the NAT router. The NAT router does not know what to do with these packets because it does not consider the semantics of the previous RTSP/TCP communication. As a consequence, the RTP packets are rejected at the NAT router, the client does not receive the media stream.

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C. Proxy Servers

Assume that a client is connected to the Internet by a proxy server. This approach for a connection to the Internet is widely used in companies and large work groups. The proxy server receives the RTSP request and forwards it (by replacing the client IP address with the proxy IP address) to the media server. Note that this proxy server has to support an RTSP-specific TCP port. If the proxy only supports the HTTP protocol, it does not understand the RTSP message and as a consequence rejects the client request. The RTSP forwarding step is similar to the NAT router's task in the previous use case. The proxy is not able to forward the media stream reply from the server because it is not accepting and distributing UDP packets. This feature would require a special multimedia proxy [7], which is not widespread. Only a connection to the server without intermediate network nodes, that perform either NAT or act as proxy, enables the user to receive the media stream from an RTP-based media server. Nowadays, this "optimal" unsecure use case rarely exists in real life because the security awareness of the community is growing rapidly. Furthermore, modern network devices like routers as well as operating systems are equipped with firewalling mechanisms by default.

Recapitulating the previous use cases, the problem receiving the RTP stream results from two UDP protocol specific features. First, the RTP connection is initiated by the server. Such uncontrolled connection from "outside" alerts firewall mechanisms. Second, the underlying UDP protocol is connectionless, which means that NAT routers or proxies do not know to which connection the RTP packets belong.

These drawbacks of the RTP media delivery are well known in the multimedia research community. Currently, there is a draft of the so called NSIS Signaling Layer Protocol (NSLP) [8] available, which is designed to request the dynamic configuration of firewalls and NAT routers along the data path. This proposed functionality includes the dynamic configuration of firewall rules as well. Another approach is followed in the scope of the Universal Plug-and-play (UPnP) framework [9]. There, clients like a media player can make use of services offered by routers or NAT devices and can configure them to pass through the RTP stream to the player. This technology is already in use in network devices like DSL modems. However, the telecommunication industry is demanded to enforce this or similar mechanisms, otherwise the existing implementation of RTP becomes more and more unattractive.

III. TCP-based Media Delivery

Content providers like YouTube[1] usually want to broadcast their content to a huge set of clients. In order achieve this goal, TCP-based media delivery is currently seen as the best choice for the reasons already mentioned above. Furthermore, the TCP-based communication between the requesting client and the server is easy. Many multimedia players (e.g., VLC[2]) as well as Web-based plug-ins (e.g., Adobe Flash[3]) support the Hypertext Transfer Protocol (HTTP) for receiving the media stream, which is also known as *progressive download*. In principle, the media content is published by simply moving it into the documents directory of an HTTP Web server. The player at the client side downloads the requested content piecewise into its buffer and decodes and renders the media data on-the-fly.

If the client does not have enough bandwidth available or significant bandwidth fluctuations occur during the media consumption, the client's buffer is drained periodically. In such a case, the player is unable to decode the media content in time which leads to a jerky playback. A solution for keeping the session running smoothly, which consequently increases the perceptual QoS for the consuming user, is given as follows.

IV. Increasing QoS of TCP-based Media Sessions

Content adaptation is seen as a key concept to deliver media content independently of the terminal capabilities, network conditions, and user preferences. For example, content adaptation enables a client, equipped with an H.264-AVC/MP3 compatible media player, to consume an audiovisual content, originally encoded in MPEG-2/MP2 at a high bit rate. Also if the client's network link suffers from insufficient bandwidth to consume the original content (at high bit rate), the content can be adapted so that its resulting degraded version meets the given resource limitations. Audiovisual content can be adapted in many dimensions. The video part can be adapted in the spatial domain, which means to change the spatial resolution of each frame; in the temporal domain, by reducing the number of frames per second; and in the signal-to-noise ratio (SNR) domain, by modifying the encoder specific quantization value for the frame compression. A degradation of the audio part can be achieved by reducing the sample rate, the amount of bits per sample, and/or the number of audio channels.

Typically, the decision in which way the content should be adapted in order to maximize the utility for the user is complex and depends on the given resources, the individual user preferences, and the terminal capabilities. This adaptation decision taking process is usually performed initially right after the content request. The resulting decision is expressed by unique target media stream parameters like frame rate, spatial resolution, etc., which are used to configure the content adaptation engine. In our implementation, the adaptation decision is encoded into an HTTP URL which is dynamically created according to the terminal capabilities and user preferences. This URL includes the content identification as well and is used by the media player or the Web-based player plug-in for requesting the adapted media content. This work addresses the dynamic case of adaptation, where the link conditions are assumed to be changing dynamically. The initial adaptation decision for the specific request is assumed to be given (by the URL). For more information about the adaptation decision taking process, the reader is referred to [10].

[1] http://www.youtube.com
[2] http://www.videolan.org
[3] http://www.adobe.com

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The main part of our system consists of an adaptation engine and a delivery module, each running in a separate process. The delivery module implements a very slim HTTP server, which basically relies on a simple TCP socket communication. Only the *HTTP GET* command (RFC1945) handling is needed for receiving, parsing, and serving the player's media request. The simple GET request enables the player to request a specific media file by submitting a corresponding URL to the server, e.g., *http://mediaserver.com:8080/starwars.avi*. This simple request invokes (like in case of a usual HTTP server) the delivery module to open the file *starwars.avi* and to send the byte stream of the file subsequently to the client. This use case does not invoke any adaptation on the content and is used to evaluate our improvements in Section V later. In order to enable our system to perform on-the-fly content adaptation, the URL can contain adaptation parameters as discussed before. For example, a transcoding request for downscaling the video to 320x200 pixels, reducing the frame rate to 10 fps and encoding it as an H.264 video can be signaled in the URL as follows: *http://mediaserver.com:8080/starwars.avi?vc=h264&s=320x200&fr=10*. After receiving the URL from the client, the delivery module decodes the URL and parses the parameters for further use.

The adaptation engine's task is to adapt or transcode the requested content. In our framework, the well known and very powerful multimedia library *ffmpeg*[4] is used, which enables the system to support the most common video and audio codecs. As already mentioned, each client request is served by the delivery module in a separate process. If there is no need for adaptation, the delivery process transmits the media data to the client and terminates if the end of the media stream is reached or the client is terminating the session. Otherwise, if there is a need for content adaptation, the corresponding delivery process spawns an adaptation process, which is responsible for the adaptation task. The information in which way the content has to be adapted is known by the delivery process that takes the values from the parsed URL parameters. Therefore, it is able to spawn and initialize the adapting child accurately.

During the content delivery, there is a need for permanent information exchange between the parent (delivery) and the child processes (adaptation engine), as shown in Figure 1. One communication channel is needed to forward the adapted content from the child to the parent. There is a need for synchronization between these two processes because the adaptation process must not produce the adapted content faster than the delivery process can send it to the consuming client. This issue is solved by using a special communication channel, a *pipe* which is known as one of the core concepts of interprocess communication. Note, that the media flow to the client is slowed down according to the available bandwidth since the client-server communication is based on TCP. If the player pauses the session (by simply stopping reading from the socket), the delivery module pauses the delivery as well because it is writing to a blocking TCP socket. Since in this case the delivery process is blocked and does not read from the pipe anymore, the pipe will get full which causes the adaptation process to block as well. If the available link bandwidth becomes lower than the encoding media bit rate, the media flow is not continuously consumable by the client.

However, there is one fact which can be used to enable "smooth" media rendering at the client side. Because the delivery module writes the media data into a blocking TCP socket, it can estimate the real actual delivery bit rate with ease (by simply counting bytes within a time slot of one second). Based on this information the adaptation engine is able to react to the dynamic bit rate fluctuations. As shown in Figure 1 the delivery process writes the delivery bit rate statistics periodically into a shared memory segment, which is accessible by the adaptation child process as well. An efficient mechanism for avoiding media rendering problems caused by bandwidth fluctuations is given as follows.

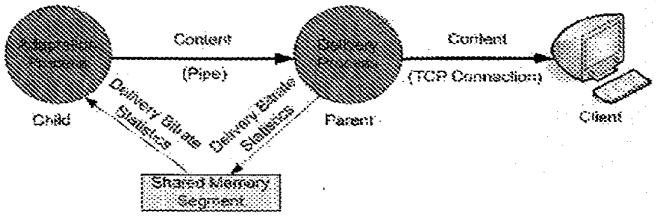


Fig. 1. Interprocess communication between delivery module and adaptation engine.

A. Handling Bandwidth Fluctuations

Figure 2 shows a bandwidth fluctuation diagram containing the available bandwidth (*bw*), the actual delivery bit rate (*dbr*) enforced by the player, and the actual media stream bit rate (*br*). If *br*, which is enforced by the encoder, is lower than *bw*, there is no problem. Let this case be the initial point (t=0). The delivery module captures the delivery bit rate (*dbr*) every second, which is indicated by points in the graph. After t=1 *bw* begins to decrease, and at t=2.5 the critical level, where $br = bw$, is reached. At the next capture point of *dbr*, the delivery module and consequently the adaptation process notice that $bw < dbr$. At this time, the adaptation engine adjusts $br \leftarrow dbr$. Note that, because of the discrete measurement points, this algorithm causes an excess of the media stream bit rate ($br > dbr$) between the measurement points in case of a falling slope of *dbr* (red line). This exceeding bit rate consumption can usually be compensated by the input buffer of the media player. A continuous falling slope of *dbr* would empty the client buffer at some point in time, depending on the buffer's size. At t=5 where *bw* reaches a stable level, *br* is adjusted to *dbr* as well. During this stable period the player tries to refill its buffer by trying to read faster from the socket (by increasing *dbr*). This is not possible because it gets blocked as a consequence of *bw* not being greater than *dbr*. At t=6, *bw* starts increasing monotonically. Now the player is able to increase *dbr* for buffer refilling.

[4]http://ffmpeg.mplayerhq.hu/

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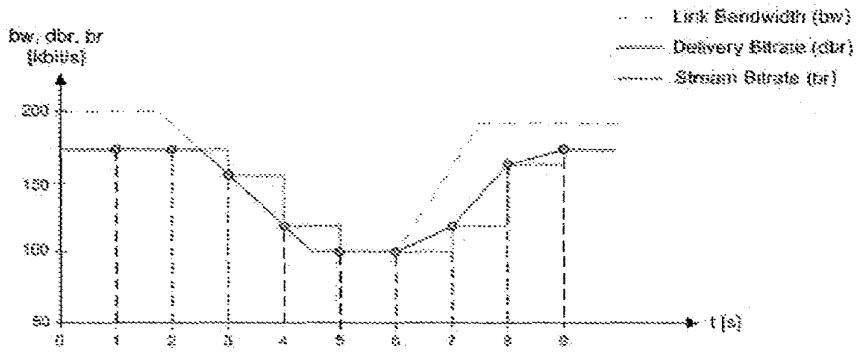


Fig. 2. Handling Bandwidth Fluctuations

As a consequence, at t=7 the delivery module subsequently increases br according to the measurement of dbr (green lines). This action forces the player to amplify the increase of dbr. At t=9, br reached its initial value, the buffer is refilled. As a consequence $dbr = br$ at $t > 9$.

Remark 1: The mechanism works as long as the client buffer does not underrun.

Remark 2: The adaptation engine was implemented by adjusting br at an abstract (encoder independent) level. All encoders under consideration maintain the bit rate adjustment in the SNR domain. As a consequence, this mechanism works only in a certain dynamic range of bandwidth fluctuations. If bw gets too low, the media playback will become jerky again.

B. Determining Available Bit Rate

In general, a higher bit rate leads to a higher perceived quality for the client. Therefore, a QoS aware multimedia framework should efficiently use all available resources. Apart from handling bandwidth fluctuations as shown before, it is possible that the available bandwidth is rising or the user does not know his/her correct bandwidth limit. In this case another mechanism is implemented as shown in Figure 3.

The available bandwidth is initially higher than the stream bit rate (t=0). As a consequence, the delivery bit rate is equal to the stream bit rate. The measurement of the delivery bit rate is done in intervals, marked by points as mentioned in the previous section. The automatic bandwidth detection algorithm works as follows. If the delivery bit rate is equal to the stream bit rate at two sequential measurements (e.g., $dbr_{t=1} = dbr_{t=2}$), the stream bit rate is increased by a constant $\Delta\ br = 5\%$ of $br_{t=0}$. ($br_{t=2} = br_{t=1} + \Delta\ br$). In other words, the delivery module tries to push more data to the client. As a consequence, the player at the client side has to consume this amount of data in the same time as before (real time consumption). Consequently, the client pulls the data faster which results in an increased delivery bit rate as well ($dbr_{t=3} = br_{t=3}$). This successive increase of br is repeated until the delivery bit rate is smaller than the stream bit rate (determined at t=11). At this point br is reduced: $br_{t=11} - br_{t=10} - \Delta\ br$. If br is smaller than dbr at the next measurement, br gets increased again (t=12). The temporarily higher delivery bit rate is compensated by the buffer at the client side. Note, that the average delivery bit rate is not changing at $t \geq 10$. If dbr is reduced as a consequence of a decrease of the available link bandwidth (bw), the dynamic bandwidth adjustment algorithm as discussed before is applied. Please note that the delivery module tries to push more data ($br > dbr$) to the client only if a constant average delivery bit rate (dbr) is detected. This can be compared to the additive increase behavior of the TCP congestion control mechanism. For this reason, both presented algorithms can used in parallel without influencing each other.

V. Evaluation

In order to demonstrate the perceived QoS improvements of our approach, we performed some real-world experiments. For that purpose we used an MPEG-2 video stream that was captured by a DVB-S card with a bit rate of approximately 3.8 Mbps and a duration of 80 seconds. The video stream was made available on our adaptive server implementation. As a client application, we used two instances of the popular multimedia player VLC which were running on the same client machine. The player was configured to use a buffer of approximately 5 seconds which seems to be a suitable value for the playback of content streamed via HTTP. On the link between the server and the client machine a traffic shaper was deployed that limited the throughput to 6 Mbps. The traffic shaper should emulate the behavior of a DSL link that is commonly used to connect a home network to the Internet. In the case of two simultaneous streams with a bit rate of 3.8 Mbps each, the bandwidth required by the streams will exceed the maximum throughput and will cause a choppy playback at the client. To quantify the smoothness of the playback we used the statistics provided by the VLC player. We decided to use the number of events in which pictures arrived too late and were skipped during the playback as a measure of smoothness. In order to show the advantage of our algorithm, we first measured the smoothness of the video in the case where no adaption was performed. For that purpose we requested the video stream with player 1 (t=0). Since the bit

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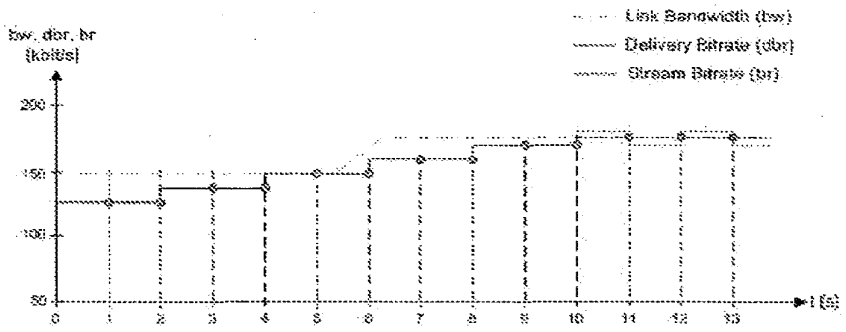


Fig. 3. Available Bandwidth Detection

TABLE I
NUMBER OF FRAME-SKIP EVENTS

Run	Normal		Adaptive	
	Player 1	Player 2	Player 1	Player 2
1	23	30	2	0
2	31	23	1	3
3	20	28	1	10
4	13	31	1	6
5	16	28	4	0
Average	21	28	2	4

rate of the stream was significantly lower than the capacity of the link, the playback was smooth. After 40 seconds (t=40) we requested the same stream with player 2 and tried to consume both video streams simultaneously for additional 40 seconds. As a result of the insufficient capacity, both players were not able to download the video stream as fast as they consumed them. This forced both player instances to skip frames that arrived too late which resulted in a choppy playback. The number of such frame-skip events of both players 1 and 2 in the case of a normal, non-adaptive delivery can be found in Table I. In order to get significant numbers, the experiments were performed five times and finally the mean value was calculated. During the 80 seconds of the experiments, on average each of the players had to skip frames 25 times. Then we performed the same experiment again, but with the dynamic bandwidth adjustment algorithm enabled. The results show that the adaptation of the video led to an improved smoothness at both players. On average only 3 late frames had to be skipped at both players within the 80 seconds of the experiment's duration.

VI. CONCLUSION

In this paper, we presented an approach to increase the perceived QoS for TCP-based video streaming over best effort networks like the global Internet. This improvement is accomplished by the continuous adaptation (transcoding) of the video stream and taking into account TCP throughput measurements at the server side. Based on our experimental setup, we demonstrated that our proposed algorithm leads to a smoother playback at the client in cases where the video stream has to share the bandwidth of a bottleneck link with other TCP flows. Another important advantage of our approach is that it works independently of the player used by the client. No explicit signalling information or feedback to the server is necessary. A drawback of the video encoders considered so far is that a continuous video adaptation can only performed in the SNR domain since other parameters like the frame rate cannot be modified on-the-fly. This limits the bit rate ranges in which the adaptation can be performed. Additionally, this kind of adaptation is very CPU intensive and therefore a tradeoff between perceived QoS for the consumer and operational costs has to be made. In order to tackle this problem, our future work will utilize the emerging scalable extension of the H.264/AVC codec that is designed to support computationally cheap adaptation by simple truncations or extractions of parts of the video bitstream.

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ABSTRACT OF THE DISCLOSURE

Systems and methods for chunking a media file for streaming over a network are disclosed. These systems and methods provide for receiving requests for chunks of a media file and responding to these requests by generating the requested chunks dynamically. The chunks can then be provided to the requesting entity. These systems and methods, which can be utilized with a dynamic file index generator, enable a high degree of flexibility in streaming chunked media files and preclude the need to chunk the media files and store the chunks prior to streaming.

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Regulation 3.2

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

STANDARD PATENT

APPLICANT: **UNICORN MEDIA, INC.**

Invention Title: **DYNAMIC CHUNKING FOR MEDIA STREAMING**

The following statement is a full description of this invention, including the best method of performing it known to me:

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DYNAMIC CHUNKING FOR MEDIA STREAMING

BACKGROUND OF THE INVENTION

[0001] This disclosure relates in general to cloud-based computer processing and, but not by way of limitation, to indexing and chunking media files for use in media streaming.

[0002] The delivery of media over networks such as the Internet can be accomplished in many ways, including progressive downloading or streaming. Streaming is often preferred to progressive downloading because it offers additional features such as content protection and the ability to seek to undownloaded parts of a media file. The process of preparing a media file for streaming typically involves "chunking" the file, or dividing files up into smaller segments for delivery. Information including where chunks may be accessed can be stored in an index file. This index file can be delivered to a client, such as a media player application, for use in streaming.

[0003] The processes of chunking and indexing files for streaming present challenges to a content delivery network or content provider desiring to host media files for streaming. For example, a significant amount of preprocessing is required to prepare media for streaming. Media content may be encoded into several different files to accommodate several different sub-streams. Each of these files typically are chunked, stored, and indexed before the media content is available for streaming. This preprocessing leaves little flexibility for inserting an advertisement during streaming and can require a large amount of storage space to store the preprocessed chunks of media.

[0004] The inventions embodied herein address these and other problems.

BRIEF SUMMARY OF THE INVENTION

[0005] Systems and methods for chunking a media file for streaming over a network are disclosed. These systems and methods may be part of a larger media servicing network that can be used to, among other things, process uploaded media content, provide it for streaming, and collect metric information regarding the streaming. The disclosed systems and methods provide for receiving requests for chunks of a media file from, for example, a content delivery network (CDN), and responding to these requests by generating the requested chunks dynamically and

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providing the chunks to the requesting entity. These systems and methods, which can be utilized with a dynamic file index generator, enable a high degree of flexibility in streaming chunked media files and preclude the need to chunk the media files and store the chunks prior to streaming.

[0006] In other words, systems and methods disclosed herein provide for communicating a media file having a plurality of segments by receiving a request for a first segment of the media file and determining a starting point and an ending point of the requested first segment based, at least in part, on the request. A first portion of the media file having a first format, the first portion including at least the requested first segment of the media file, is retrieved. The requested first segment is generated, having a second format and being generated, at least in part, from the first portion of the media file. The requested first segment of the media file is then provided. A similar process is followed upon receiving a request for a second segment of the media file.

[0007] Embodiments of the present invention can further allow for the first and second portions of the media file being stored in memory can comprising the same portion of the media file. Moreover, the requested first segment of the media file and the requested second segment of the media file can comprise contiguous segments of the media file. Embodiments further allow for the first format including one or more of an audio compression format, a video compression format, and/or an image compression format. The second format can include a media container format.

[0008] Embodiments of the present invention additionally contemplate the process described above being executed during playback of the media file by a device communicatively linked to the network. The segments for a first media file may be of a different length than the segments of a second media file, and the requests for segments may be received from a Content Delivery Network (CDN).

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present disclosure is described in conjunction with the appended figures:

[0010] FIG. 1 illustrates a block diagram of a media servicing system.

[0011] FIG. 2A illustrates a block diagram of an embodiment of a kernel application center connected with application centers.

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[0012] FIG. 2B illustrates a block diagram of an alternative embodiment of a kernel application center.

[0013] FIG. 3 illustrates a block diagram of an embodiment of an application center.

[0014] FIG. 4 illustrates a block diagram of processes and objects utilized by a cloud-hosted integrated multi-node pipelining system for media ingestion.

[0015] FIG. 5A illustrates a simplified block diagram of an embodiment of a system configured to provide dynamic indexing and chunking for media streaming.

[0016] FIG. 5B illustrates a simplified block diagram of another embodiment of a system configured to provide dynamic indexing and chunking for media streaming.

[0017] FIG. 5C illustrates a simplified block diagram of another embodiment of a system configured to provide dynamic indexing and chunking for media streaming, utilizing a redirector.

[0018] FIG. 6 illustrates a simplified flowchart of an embodiment of a method for implementing a dynamic index for media streaming.

[0019] FIG. 7 illustrates a simplified flowchart of an embodiment of a method for dynamically chunking a media file for streaming.

[0020] FIG. 8 illustrates a simplified swim lane flowchart describing the interaction of components in a system configured to provide dynamic indexing and chunking for media streaming, according to one embodiment.

[0021] In the appended figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The ensuing description provides preferred exemplary embodiment(s) only, and is not intended to limit the scope, applicability or configuration of the disclosure. Rather, the ensuing description of the preferred exemplary embodiment(s) will provide those skilled in the art with

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an enabling description for implementing a preferred exemplary embodiment. It is understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope as set forth in the appended claims.

[0023] The increased availability of media content over data communications networks such as the Internet has mirrored the increased bandwidth for these networks. Because media has recently taken a more prominent role in data communications, the distribution of media and the data associated with such distribution has become increasingly important, particularly to media content providers. Media streaming has become a widely-used method of media distribution, but the preprocessing associated with streaming can be burdensome. Certain protocols, including forms of Hypertext Transfer Protocol (HTTP) streaming, require chunking and storing media assets, and generating a corresponding index files. These requirements can deprive a content provider of the ability to dynamically insert additional media such as advertisements into a media stream, and can consume a large amount of storage space to store chunks of media for a media asset, including chunks for any alternative sub-streams (e.g., streams with alternative bitrates, captions, alternative languages, etc.). Certain systems and methods can be utilized, however, to introduce the desired functionality back into the system.

[0024] A traditional approach to preprocessing media for streaming involves chunking and storing media assets, then creating corresponding index files to indicate where chunks may be located to download for streaming. Streaming protocols often provide for frequently updating an index file for instances where the corresponding media is frequently updated, such as during live streaming. Thus, an index file does not need to contain all chunks for a requested media asset. In addition, because media files are frequently stored in a format that requires little additional processing to chunk, the chunks can be created in real time, during the streaming of a media file. The systems and methods disclosed herein take advantage of these features to enable dynamic index file creation and dynamic media file chunking.

[0025] For instance, rather than preprocess media assets for streaming by chunking and indexing all files with relevant sub-streams prior to streaming the media, a server can dynamically create and update an index file during streaming. The dynamically-created index file can contain information regarding a next chunk of media in the various available sub-streams. The next chunk of media may not be cached at a location specified in the index file, in which case a chunk may be dynamically created by pulling all or part of the media file of interest

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from a media file origin, chunking it, and making it available for download. The chunk also may be cached, thereby eliminating the need to create the chunk again if it is requested at some later time.

[0026] Because the chunks are created during streaming, a content provider and/or media distributer can have more information and control during the streaming process. Rather than generate single index file for a given media asset, an instance of the index file generator may be created at the beginning of the media streaming to provide individualized media content to a particular end user and unique information regarding the streaming session to a content provider. The file index generator can vary the length of each chunk by, for example, indicating starting and ending points in the index file. Thus, the file index generator may determine a uniform chunk length for a media asset, varying the length of the chunks for different media assets, or the file index generator may adjust the length of the chunks within a single media asset. The index file generator can further insert additional media, such as an advertisement, at any time during the streaming by specifying the location of the additional media in the index file. The determination to insert advertisements can be based on any information, including data collected during the streaming session.

[0027] As the index file generator receives requests for and generates index files, it can further gather data regarding the streaming session for reporting to a content provider. Content providers often rely on beaconing data collected from media player applications to determine when an end user stops, plays, pauses, skips, etc., the streaming media content. Such information can be vital in determining the value of the media.

[0028] Because not all media player applications provide this beaconing data, the data gathered by the index file generator can serve as a substitute for or complement to the beaconing data. For example, if a request is made for a chunk that does not immediately follow a previously-requested chunk, a skip was made. If the amount of time elapsed between a previous request and a subsequent request exceeds the time for playback of the previously-requested chunk, a pause was made. If a request is not received within a certain time since a prior request, it can be determined that a stop was made.

[0029] As illustrated above, the state of a client may be determined from a variety of factors. This can include when the request for the index file is received, when the index file is provided, a length of time to play back the segment of media for streaming, and/or the starting and/or ending

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point of the segment of media for streaming. The determined state of a client may also be based on whether the request for the index file has been received within a certain amount of time since receipt of a previous request for an index file, whether the segment of media for streaming includes media other than the media file, and more. The state of a client and/or the data from which it was determined, may be used to create reporting data to serve as a substitute or complement to beaconing data from a client media player application. Because the index file generator can determine the length of the chunks, it therefore can determine the frequency of subsequent index file requests and the resolution of the reporting data based on the requests. The index file generator may log the reporting data and/or transmit the reporting data over a network during streaming.

[0030] The determined state of a client may be used by the index file generator and/or other services for various purposes. For example, it may be used in behavioral advertisement targeting and enforcement of session advertisement behavior, adjusting advertisement content and playback based on the behavior of a user as determined by the stated of a client. The state of a client further may be used to support resume features on a per client basis, allowing a user to continue playback of a media asset from a point at which the user had previously stopped playback. The state of a client also may be used to support individual encryption keys in an encryption scheme and allow the index file generator to return secure URLs (e.g., time expiring or Internet Protocol (IP) allowed) for chunks to support functions such as payment services.

[0031] Additionally or alternatively, the tasks of generating the index file and providing a location a requested chunk can be split up, thereby enabling the system to determine which chunks are actually requested. For example, a system may be configured to dynamically create an index file having links to one or more redirectors on the system. These redirectors can be configured to issue the location of the chunk, which can be created dynamically. The redirectors can further determine which chunk is actually requested, thereby enabling, among other things, calculation of Quality of Service (QOS) metrics, an increase the accuracy of reporting data, a decrease the frequency of index file generation if efficient to do so, and the ability to more easily handle keys of an encryption scheme.

[0032] While the above embodiments may be implemented in a variety of different systems, some particular embodiments may be implemented as part of a media service system. **FIG. 1** is a block diagram illustrating a media servicing system 100, according to some embodiments of

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the present invention. The system may deliver media content to the end user device 140 through a network such as the Internet 120. The end user device 140 can be one of any number of devices configured to receive media over the Internet 120, such as a mobile phone, tablet computer, personal computer, portable media device, etc. A media asset provided by a content provider 130 can be processed and indexed by cloud-hosted integrated multi-node pipelining system (CHIMPS) 110, and further stored on content delivery network (CDN) 150. Additionally or alternatively, the CHIMPS 110 may also be adapted to store the media asset.

[0033] The media servicing system further enables a content provider 130 or other entity to gather information regarding user behavior during media playback. For example, a content provider 130 can be provided with data indicating that end users tend to stop watching a video at a certain point in playback, or that users tended to follow links associated with certain advertisements displayed during playback. With this data, a content provider 130 can adjust factors such as media content, advertisement placement and content, etc., to increase revenue associated with the media content and provide the end user device 140 with a more desirable playback experience.

[0034] End user device 140 can request a media asset to stream with a client program executed by the end user device 140. The client program can be, for example, a media player, browser, or other application adapted to request and/or play media assets. In response to a request for a media asset, the CHIMPS 110 can utilize any number of application centers 112 and/or kernel application center(s) 111 to provide the client program with a data object concerning the requested media asset. The data object can include information about the media asset, including where the media asset can be located, such as within the CDN 150 or within the CHIMPS 150 itself. Location information may be provided by Universal Resource Indicator (URI), a Universal Resource Locator (URL) or other indicator. During playback of the media asset, the CHIMPS 150 can collect data regarding the playback through beaconing provided by a client program executed by the end user device 140 and/or indexing service from within the CHIMPS and/or CDN. The CHIMPS 150 can subsequently provide the data and/or any analytics information derived from the data to the content provider 130.

[0035] **FIG. 2A** is a block diagram illustrating an embodiment of a kernel application 111-1 center connected with application centers from within the CHIMPS 110-1. The kernel application center 111-1 and application centers 112 can be geographically distant and can be

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connected via the Internet 120, wide area network (WAN), and/or other data communication network. Because application centers can be geographically separated, DNS services (not shown) can be used to allow an end user device 140 to connect to the nearest available application center 112. The kernel application center 111-1 can connect with application centers 112 within the CHIMPS 110-1 through an internal interface 270, thereby enabling the application centers 112 access to the various components within the kernel application center 111-1.

[0036] Components within the kernel application center 111-1 can communicate through network 260 such as a local area network (LAN) and can include one or more origin servers 240 and a storage array 230 with which data objects and/or media assets may be stored and distributed. The storage array 230 may also be utilized by services running on processing server(s) 220 and/or transcoding server(s) 250 that may require temporary or long-term storage. Kernel server 210 can utilize processing server(s) 220, transcoding server(s) 250 to provide various functional capabilities to the CHIMPS 110.

[0037] For example, as described in more detail below, the CHIMPS 110-1 can provide transcoding service for media assets provided by a content provider 130 for syndication. Such a service can allow a content provider 130 to upload a media asset to an application center 112, after which the application center 112 would notify the kernel server 210 that the media asset has been uploaded. The kernel server can then notify services running on the processing server(s) 220 of the upload. These services can utilize transcoding server(s) to transcode the media asset, which can then be moved to a CDN and/or stored locally by storage array 230 and origin server(s) 240. Services running on the processing server(s) 220 can also update the associated data object stored by the storage array 230 and origin server(s) 240.

[0038] **FIG. 2B** is a block diagram illustrating an alternative embodiment of a kernel application center 111-2. In addition to the components of the embodiment of FIG. 2A, this embodiment incorporates an application center 112 within the kernel application center 111-2. The application center 112 incorporated within kernel application center 111-2 may be located at or near the other components of the kernel application center 111-2, and can be communicatively connected to the other components via network 260. The incorporated application center 112 can therefore have faster access to kernel application center functionality because it does not need to communicate over long distances. In consideration of this advantage, it will be

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understood that the CHIMPS 110 can include multiple kernel centers with one or more application centers incorporated therein. Additionally or alternatively, components of the kernel application center may be incorporated into one or more application centers 112 in the CHIMPS 110 to provide quicker access to certain functionality.

[0039] **FIG. 3** is a block diagram illustrating an embodiment of an application center 112. The application center 112 can include caching server(s) 330 and a storage array 310 for storing and distributing data objects of media assets requested by end user devices through end user interface 360. Caching server(s) 330 and storage array 310 can also be used to collect, process, and/or store metrics information from beaconing data, media chunk requests, and/or other data sources, including data collected through end user interface 360. The application center can further include ingest server(s) 320 for ingesting uploaded media assets from a content provider 130 through a content provider interface 370. The media assets may be stored on the storage array 310. As with the kernel application center 111, the components of the application center 112 can be communicatively linked through a network 340, such as a LAN. The application center can further include an internal interface 350, providing a communication link from the application center to the rest of the CHIMPS. It is through internal interface 350, for example, that media assets stored on storage array 310 can be made available to a kernel application center 111 for services such as transcoding.

[0040] **FIG. 4** is a block diagram 400 of processes and objects utilized by the CHIMPS 110 for media ingestion, according to some embodiments. Although FIG. 4 further indicates the physical systems in which my execute or store these processes and objects, it will be understood that the processes and objects disclosed may be executed or stored on more than one system, including systems not disclosed in FIG. 4. In other words, the processes and objects shown in FIG. 4 allow for a variety of implementations through one or more of hardware, software, firmware, microcode, etc.

[0041] Media can be ingested into the CHIMPS 110 when a content provider 130 uploads a media asset to ingestion server(s) 410 in an application center 112 by utilizing a client 405. The client 405 can be a stand-alone application or browser based, for example, and can communicate with ingest server(s) 410 through an application programming interface (API) configured for the ingestion of media assets.

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[0042] Ingest server(s) 410 can communicate with devices in the kernel application center 111 executing programs such as kernel server 425 and file replication service 430. The kernel server 425 can be configured organize the workflow among services such as transcoding 440 file system manager 435, and other services 445 (e.g., analytics, dynamic API, etc.) Upon a particular event, for example, the kernel server can be configured to notify the relevant services of the event, causing the services to process tasks associated with the event.

[0043] The file replication service 430, under direction of the kernel server 425, can coordinate the movement of the media assets between services. For example, retrieving the uploaded media asset from the ingest server(s) 410 and storing it on the file archive 450, or retrieving transcoded media assets from transcoding server(s) 460 and storing them in the media asset origin.

[0044] The data object updater 420 keeps the data object origin 415 up to date in response to any changes in the system. When, for example, a file is uploaded, transcoded, and stored in media asset origin 455, the location and other metadata concerning the transcoded media assets need to be created or updated in the data object origin 415 to ensure an end user device that accesses the object in the data object origin 415 has the correct information regarding the related media asset. Because the data object updater 420 receives updates from the kernel server 425 (which is notified when a transcoded media asset is stored in the media asset origin 455, the system ensures the data objects in the data object origin are constantly up to date.

[0045] The upload of a media asset to the ingest server(s) 410, as described above, can provide an example of how the kernel server 425 may coordinate workflow. For instance, in response to the upload, the ingest server(s) 410 can notify the kernel server 425 that a media asset has been uploaded. The kernel server 425 informs the file replication service 430 of the uploaded media asset, and the file replication service 430 moves the uploaded media asset into the file archive 450 and notifies the kernel server 425 of the move. In response, the kernel server 425 notifies the file replication service 430, the file system manager 435, and the transcoding master 440 of the move. The file replication service 430 then will know it can delete the uploaded media asset from the ingest server(s) 410, the file system manager 435 will update the file system accordingly, and the transcoding master 440 will notify transcoding service(s) 460 of different transcoding tasks to be performed. The transcoding service(s) 460 can then retrieve the uploaded media asset from the file archive 450 to create transcoded media assets. The transcoding service(s) 460 notify the kernel server 425 once transcoding is complete, and the kernel server

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425 relays this information to the file replication service 430. The file replication service 425 then takes the transcoded media assets from the transcoding services 460 and moves them to the media asset origin 455. Once the file replication service 430 notifies the kernel server 425 of the move, the kernel server 425, in turn, notifies the file replication service 430 and the data object updater 420. The data object updater 420 which updates the data object origin 415 accordingly, and the file replication service 430 deletes the transcoded media assets from the transcoding services 460.

[0046] The modular nature of the system enables all tasks associated with an event to be completed quickly. As illustrated in the example above, workflow relating to a particular event, such as a media asset upload, can be spread among the various services simultaneously. Moreover, because the system's modularity enables it to be scaled to accommodate differing hardware capacities, and because the system can be configured to dynamically allocate hardware to different services according to the needs of the system, the speed of completing tasks relating to a particular event can further be increased. For example, a server of the CHIMPS 110 can be configured to dynamically switch its purpose based on external conditions such as load and overall system performance, providing functions such as transcode, upload, metrics collection, application web service, and more, on an as-needed basis.

[0047] Embodiments of such systems may include other systems that manage various requests from end users. For example, a system for dynamic index file generation an media file chunking. Referring to **FIG. 5A**, shows an embodiment of such a system 500-1. Media may be streamed to end user device 140 though a client 510. As mentioned above, the client 510 can be stand-alone media player, a plug-in, a browser, or other application, which can be executed on a personal computer or other electronic device.

[0048] An index file generator 530, as discussed previously, can be a program instantiated for media streaming to a particular client 510. The index file generator 530 can be executed on a server or other computing device within an application center 112 of the CHIMPS 110. Index files generated by the index file generator can include a wide variety of information such as starting, ending, and or run times for media chunks and locations for media chunks. This information can be embedded in a single string of data, such as a URI or a URL. If media includes various sub-streams (e.g., streams with alternative bitrates, captions, alternative languages, etc.) the index file can include data for chunks corresponding to each of the

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alternative sub-streams, as well as information regarding the bitrate and/or other unique information for each stream. Alternatively or in addition, index files indicating alternative sub-streams may be separate from index files indicating one or more media chunks for streaming.

[0049] It should be understood that the index file can further comprise a wide variety of formats, which can depend on the particular protocol. HTTP streaming may, for example, require index files to comprise one or more of M3U, M3U8, XML, and XML-based formats. Of course, other formats can be used in accordance with relevant streaming protocols.

[0050] **Table 1** illustrates a simplified example of an generated index file in M3U9 format, indicating chunk of media for streaming. The index file in this example provides a URI for a chunk of media. The URI indicates the chunk is to be generated by dynamic segmentor 550, the chunk being 10 seconds long, starting at 9 seconds into the media file and ending 19 seconds into the media file.

Table 1: Example Index File Contents

```
#EXTM3U
#EXT-X-MEDIA-SEQUENCE:1
#EXT-X-TARGETDURATION:10
#EXTINF:10,
http://video.example.com/seg/9/19/seg1.ts
```

[0051] Referring again to FIG. 5A, the index file generator 530 can also include an indicator within an index file to indicate whether a chunk of media is to be dynamically created. If, for example, it is determined that a requested media asset has not been chunked and that the asset will be chunked dynamically, the index file generator can include the indicator in data corresponding to a chunk of media to be created. The indicator, which can be as simple as including the term "/seg/" in a URL, will indicate that a requested chunk of media needs to be generated.

[0052] The chunks of media can be generated during media streaming by a dynamic segmentor 550, which can be incorporated into an HTTP service 540. The HTTP service 540, as well as the media asset origin 560 can be located within a kernel application center 111 of the CHIMPS 110 on, for example, a media asset origin server. The system 500-1 can be configured such that the kernel application center 111 provides dynamically-created chunks of media to a CDN 150 for

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delivery to client 510. The CDN 150 can store the chunks locally in, for example, a media asset cache 520, thereby forgoing the need to dynamically create a chunk again if the same chunk is requested in the future.

[0053] In sum, the system for dynamic index file generation and media asset chunking 500-1 can, after receiving a request for an index file from a client 510, dynamically generate an index file with an index file generator 530. The index file can, among other things, indicate where a next chunk of media may be located. A client can then request the chunk from the location indicated by the index file, which can comprise a media asset cache 520 in a CDN 150. If the chunk is not found in the media asset cache 520, the cache miss can redirect the request to a segmentor 550 of an HTTP service 540, which can dynamically generate the requested chunk of media by accessing the corresponding media asset in the media asset origin 560. The requested media chunk can then be provided to the CDN 150 for storage in the media asset cache 520 and delivery to the client 510. If the same chunk is requested at a later point in time, the CDN 150 can deliver the chunk from the media asset cache 520, thereby forgoing the need to redirect the request to the segmentor 550 to regenerate the chunk.

[0054] **FIG. 5B** illustrates an alternative embodiment 500-2 of a system for dynamic index file generation an media file chunking. Rather than utilize a CDN, this embodiment 500-2 includes a media caching server within an application center 112 of the CHIMPS 110. The media caching server can receive chunk requests from and provide the corresponding chunks to a client. It will be understood that such a media caching server(s) or similar device(s) can be located anywhere within the CHIMPS and/or in a system(s) communicatively linked to the CHIMPS.

[0055] **FIG. 5C** illustrates an embodiment 500-3 of a system for index file generation used in conjunction with a redirector 590. As discussed above, an index file generator 530 may create an index file having one or more URIs or other location information directing the client 510 to one or more redirectors 590. Redirector 590, can then provide the URI of the requested chunk with a redirect, such as a redirect under HTTP status code 302. The URI can be located on a CDN 520 or other location (such as a media caching server 570) and/or dynamically created by the dynamic segmentor 550. It will be understood that there can be any number of redirectors 590, which can be at any location, including locations of the CHIMPS 110 such as the application center 112 (as shown in FIG. 5C) or the kernel application center 111. It also will be understood that the URI or other location information provided by redirector 590 can be generated by or

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provided to the redirector 590 in any number of ways. The URI can be generated, for example, based on the request received by redirector 590 from client 510. Finally, it will be understood that the CHIMPS 110 can be configured to dynamically implement any combination of embodiments 500-1, 500-2, and 500-3, further choosing whether to utilize one or more redirectors based on factors such as, for example, a detected type of client 510.

[0056] Embodiments utilizing one or more redirectors can have several advantages. For example, and not by way of limitation, if a certain client were implemented in such a way that it "reads ahead" to request chunks, it could result in incorrect reporting data. Thus, it would be advantageous to determine which chunk is actually requested by the client. Additionally or alternatively, where chunks are available in various sub-streams with different bitrates, determining the actual requested chunk can be useful in calculating Quality of Service (QOS) metrics. Furthermore, it there may be scenarios in which it is more efficient to create larger index files having many chunks comprising large segments of media, reducing the number of index files required to stream a media asset, and thereby reducing the processing requirements to create the index files. If encryption is used having, for example, a rotating key or a per client key encryption scheme in which a valid key might change during playback of a media asset, it also may be advantageous to incorporate redirector(s) for handling legacy keys for some period of time.

[0057] **FIG. 6** illustrates a simplified flowchart of an embodiment of a method 600 for implementing a dynamic index for media streaming. The method 600, which can be executed by the index file generator 530, begins at block 610, where a request for an index file is received from a client 510. According to media streaming protocols contemplated by this embodiment, if data regarding a chunk of media is not provided in an initial index file, the client will continue to request or refresh an index file until it reaches an indicator in the index file that signals the end of a stream. Thus, the method can be assured to receive more than one request for an index file from a client provided that an initial index file does not include an indicator signaling the end of the stream.

[0058] At block 615, the method 600 additionally provides for receiving input from an advertising service. According to some embodiments, this input could be the availability of an advertisement, and can be provided by a service inside or outside the CHIMPS. In other embodiments, the input could come from a service that factors in any of a variety of factors to

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indicate that a specific advertisement or type of advertisement should be shown. Or that any advertisement should be shown.

[0059] At block 620, a determination is made whether to include an advertisement in the next chunk. According to some embodiments, this determination can be made with or without input from an advertisement service. It should be known that this determination can include the factors used by an advertisement service to provide the input of block 615. Whether the determination includes input from an advertisement service of block 615 or not, the determination can still include factors such as information about an end user collected before or during streaming of the media. This can include behavior of the end user during streaming of the media (as determined, for example, by machine-based logic through beaconing data and/or requested chunks of media provided by a client 510). Factors can also include information regarding the media asset used for streaming (such as type of content or preferred points within the media for an advertisement), preference(s) and/or selection(s) of an end user, when a previous advertisement was shown, time of day, and more. It can further include information regarding the source of a media asset, such as who created and/or provided the asset for viewing by an end user. It will be understood that other embodiments contemplate include secondary media, other than advertisements into the media stream in this manner. Moreover, the secondary media and/or advertisement can be of any length and also may be chunked. Thus, it may be determined that the next chunk includes all, or a select portion, of an advertisement of any specific length.

[0060] An index file is created based on the request as well as the determination of whether media, such as an advertisement, should be streamed, indicated by block 625. As discussed above, the index file can assume a variety of formats and include any amount of information regarding a next chunk of media for streaming. For example, HTTP streaming can utilize index files having the URLs of available chunks of media. Information can be embedded in these URLs to indicate a location to download the corresponding chunk of media, starting point and/or ending point of a chunk of media, an indicator to indicate whether the chunk is to be dynamically created by a segmentor 550, a location of an advertisement to be streamed, and more. This information is included in the index file and sent to the client at block 630.

[0061] At block 635, reporting data can be created based on information included in the index file. As previously discussed, information included in an index file and/or index file request can

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indicate the behavior of an end user device 140 during streaming, such as a pause, stop, skip, play, etc. of the media. According to some embodiments, this information can be extracted from requests for an index file and/or providing the requested index file. The information can be gathered in addition to or as a substitute for beaconing data provided by a client 510. Moreover, if beaconing data is provided, the creation of reporting data may be omitted altogether.

[0062] Reporting data can include any amount of information regarding end user behavior, as indicated through index file requests and/or provided index files. This can include a particular action and when it was performed. Additionally or alternatively, the data may be kept in a more rudimentary form, depending on the application or embodiment, indicating the data included in a index file request and/or an index file. This reporting data may be stored in a log file for reporting after streaming and/or transmitted during streaming to a relevant service that collects such metrics.

[0063] As indicated by block 640, the reporting data may be sent to a metrics collector for analytics. A metrics collector, according to certain embodiments, may be an application executed by a server from within the application center 112 in which the index file generator 530 is executed, or it may be executed elsewhere, such as in a kernel application center 111 or in a system outside the CHIMPS 110. Depending on the form of the reporting data, the metrics collector can further process and store the information.

[0064] **FIG. 7** illustrates a simplified flowchart of an embodiment of a method for dynamically chunking a media file for streaming 700. This method can be employed by a variety of systems and/or programs. For example, it may be executed by a dynamic segmentor 550 of an HTTP service 540 running on a server located in a kernel application center 111 of the CHIMPS 110.

[0065] The method 700 can begin at block 710, when a request for a chunk of media is received from a CDN 150. As discussed above, this request may be made in response to a cache miss at the CDN 150 and/or because an indicator was included in the request for the chunk of media that the chunk was to be created dynamically. As discussed herein, if the CDN 150 has the requested chunk cached from a prior request, the CDN 150 can provide the requested chunk and preclude the need to send the request to a dynamic segmentor 550 to generate the chunk. It should be understood that the request may come from sources other than a CDN 150 according to alternative embodiments. One such source includes the media caching server 570 of embodiment 500-2, as shown in FIG. 5B.

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[0066] The starting and ending points of a requested chunk of media are then determined at block 715. This information can be included directly in the request or derived from the request, a previous request, and/or other sources. At block 720, the information, as well as information identifying the requested chunk of media, can be used to retrieve all or part of the relevant media asset from a media asset origin 560. The retrieved portion will include at least the relevant media from the starting point to the ending point of the requested chunk of media.

[0067] At block 725, the requested media chunk is generated by converting the relevant portion of the media asset into a deliverable chunk. The media asset, as stored in the media asset origin, may not be chunked; it may be stored in its entirety as a media file (or group of alternative files corresponding to alternative sub-streams). Generating the chunk therefore can require determining the starting and ending points from the retrieved portion of the media asset and converting the resulting segment of media into a deliverable chunk.

[0068] Although the generation of the deliverable chunk may involve transcoding, it may not. The media asset can be stored in a format where transcoding may not be needed, thereby reducing the processing requirements for creating chunks of media during streaming. For example, media assets may be stored such as H.264 or MPEG-4 video format and/or AAC, HE-AAC, or MP3 audio format. According to some streaming protocols, such as some forms of HTTP streaming, chunks of media in these formats would not need transcoding before being wrapped in an MPEG-2 transport stream container format. Instead, such a conversion essentially would require the addition of metadata to create the streaming format from the format of the stored media asset. In other words, generating a deliverable chunk of media may only require identifying the stored media asset, extracting the relevant segment of the media from the media asset, and adding certain metadata in accordance with a container format. This process requires little processing power and can be easily performed on the fly during streaming. Once the deliverable chunk of media is generated, it is sent to the CDN 150 or other requesting entity, at block 730.

[0069] **FIG. 8** illustrates a simplified swim lane flowchart describing the interaction of components in a system configured to provide dynamic indexing and chunking for media streaming, according to one embodiment. In this embodiment, a client can send a request for an index file 805, the request received by an index file generator 810. A particular request may be made to initiate the streaming of a media asset, or it may be during streaming. Depending on the

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streaming protocol, the request may be made while a client plays a chunk of media previously downloaded during streaming.

[0070] The index file generator generates an index file to indicate the next chunk of media 815. As described above, this chunk may include an advertisement, and the index file can include any amount of information about a chunk of media, including information regarding alternative sub-streams for streaming. The dynamic index file generator can include information regarding existing chunks of media, and, when used in conjunction with a dynamic segmentor may also include information regarding chunks of media that may need to be created. As detailed above, if a chunk of media is to be generated dynamically, the index file generator may indicate this by including an indicator in the generated index file, such as in a URL for one or more chunks described within the index file. Once the index file is generated, the index file generator sends the index file 820, which is received by the client 825.

[0071] Alternative embodiments may provide for the generation of index files containing more than a next chunk of media. For example, an index file generator may generate an index file containing information regarding several chunks of media, in which case the chunks of media can be dynamically generated by a dynamic segmentor when requested by the client. The determination of whether to include information regarding more than a next chunk of media can include factors such as whether the index generator is generating reporting data, the desired frequency of such reporting data, and more.

[0072] Using information contained in the index file, the client can then request the next chunk of media 830, and this request can be received by a CDN 835. The CDN then checks to see if the chunk is already stored in the cache 840. If so, the CDN can provide the requested chunk to the client, blocks 845 and 850. The requested chunk may be found in a CDN's cache if the chunk was created and stored in the CDN during preprocessing or if a the chunk was dynamically created and stored in the CDN from an earlier request.

[0073] If the chunk is not found on the CDN, the chunk can be requested of the dynamic segmentor, which receives the request 855 and retrieves the corresponding media asset from an asset origin server 860. As discussed above, the entirety of the relevant media asset does not need to be retrieved as long as at least the portion containing the relevant segment for the requested chunk is retrieved. It will be understood that alternative embodiments can provide for

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the media asset being stored in a variety of locations accessible, directly or indirectly, to the dynamic segmentor.

[0074] The dynamic segmentor can then generate the requested chunk by converting the retrieved media into a deliverable chunk. That is, the dynamic segmentor converts the retrieved media into an acceptable format for streaming, which can vary depending on the streaming protocol utilized. The dynamic segmentor can then return the requested chunk 870 to the CDN, which can cache the chunk and return it to the client 875. Once the chunk is received by the client 880, the client can play the chunk to an end user.

[0075] It should be noted that the methods, systems, and devices discussed above are intended merely to be examples. It must be stressed that various embodiments may omit, substitute, or add various procedures or components as appropriate. For instance, it should be appreciated that, in alternative embodiments, the methods may be performed in an order different from that described, and that various steps may be added, omitted, or combined. Also, features described with respect to certain embodiments may be combined in various other embodiments. Different aspects and elements of the embodiments may be combined in a similar manner. Also, it should be emphasized that technology evolves and, thus, many of the elements are examples and should not be interpreted to limit the scope of the invention.

[0076] Specific details are given in the description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, well-known circuits, processes, algorithms, structures, and techniques have been shown without unnecessary detail in order to avoid obscuring the embodiments. This description provides example embodiments only, and is not intended to limit the scope, applicability, or configuration of the invention. Rather, the preceding description of the embodiments will provide those skilled in the art with an enabling description for implementing embodiments of the invention. Various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the invention.

[0077] Also, it is noted that the embodiments may be described as a process which is depicted as a flow diagram or block diagram. Although each may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be rearranged. A process may have additional steps not included in

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the figure. Furthermore, embodiments of the methods may be implemented by hardware, software, firmware, middleware, microcode, hardware description languages, or any combination thereof. When implemented in software, firmware, middleware, or microcode, the program code or code segments to perform the necessary tasks may be stored in a computer-readable medium such as a storage medium. Processors may perform the necessary tasks.

[0078] Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without departing from the spirit of the invention. For example, the above elements may merely be a component of a larger system, wherein other rules may take precedence over or otherwise modify the application of the invention. Also, a number of steps may be undertaken before, during, or after the above elements are considered. Accordingly, the above description should not be taken as limiting the scope of the invention.

[0079] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

[0080] The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any form of suggestion that the prior art forms part of the common general knowledge in Australia.

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WHAT IS CLAIMED IS:

1. A server for communicating, with a network, a media file having a plurality of segments of a certain length, the server comprising:

an interface for communicating with the network;

a memory configured to store:

one or more of the plurality of media file segments; and

a plurality of instructions for communicating the media file over the network;

a processor communicatively coupled with the memory and the interface, the processor further configured to execute the plurality of instructions, the plurality of instructions configured to cause the server to:

receive, with the interface, a request for a first segment of the media file;

determine a starting point and an ending point of the requested first segment of the media file, wherein the determination is based, at least in part, on the request for the first segment of the media file;

retrieve a first portion of the media file from the memory, wherein:

the first portion of the media file includes at least the requested first segment of the media file, and

the first portion of the media file includes a first format;

generate the requested first segment of the media file, wherein:

the requested first segment of the media file has a second format, and

the requested first segment of the media file is generated, at least in part, from the first portion of the media file;

provide, with the interface, the requested first segment of the media file;

receive, with the interface, a request for a second segment of the media file;

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determine a starting point and an ending point of the requested second segment of the media file, wherein the determination is based, at least in part, on the request for the second segment of the media file;

retrieve a second portion of the media file from the memory, wherein:

the second portion of the media file includes at least the requested second segment of the media file, and

the second portion of the media file includes the first format;

generate the requested second segment of the media file, wherein:

the requested second segment of the media file has the second format, and

the requested second segment of the media file is generated, at least in part, from the second portion of the media file; and

provide, with the interface, the requested second segment of the media file.

2. The server of claim 1 further having instructions configured to cause the server to retrieve the first and second portions of the media file with the interface and store the first and second portions of the media file in the memory.

3. The server of claim 1 wherein the second portion of the media file is the same as the first portion of the media file.

4. The server of claim 1 wherein the requested first segment of the media file and the requested second segment of the media file comprise contiguous segments of the media file

5. The server of claim 1 wherein at least a portion of the instructions are executed during playback of the media file by a device communicatively linked to the network.

6. The server of claim 1 wherein the first format includes one or more of an audio compression format, a video compression format, and an image compression format.

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7. The server of claim 1 wherein the second format includes a media container format.

8. The server of claim 1 further configured to receive the requests for the first and second segments of the media file from a Content Delivery Network (CDN).

9. The server of claim 1 wherein the plurality of segments of a first media file have a different length than a plurality of segments of a second media file.

10. A method for providing, with a data network, a plurality of segments of a media file, the segments having a certain size, the method comprising:

receiving a request for a first segment of the media file;

determining a starting point and an ending point of the requested first segment of the media file, wherein the determination is based, at least in part, on the request for the first segment of the media file;

retrieving a first portion of the media file, wherein:

the first portion of the media file includes at least the requested first segment of the media file, and

the first portion of the media file includes a first format;

generating the requested first segment of the media file, wherein:

the requested first segment of the media file has a second format, and

the requested first segment of the media file is generated, at least in part, from the first portion of the media file;

providing the requested first segment of the media file;

receiving a request for a second segment of the media file;

determining a starting point and an ending point of the requested second segment of the media file, wherein the determination is based, at least in part, on the request for the second segment of the media file;

retrieving a second portion of the media file, wherein:

the second portion of the media file includes at least the requested second segment of the media file, and

the second portion of the media file includes the first format;

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generating the requested second segment of the media file, wherein:

the requested second segment of the media file has the second format, and

the requested second segment of the media file is generated, at least in part, from the second portion of the media file; and

providing the requested second segment of the media file.

11. The method of claim 10 wherein the first portion of the media file is the same as the second portion of the media file.

12. The method of claim 10 wherein the first format includes one or more of an audio compression format, a video compression format, and an image compression format.

13. The method of claim 10 wherein the second format includes a media container format.

14. The method of claim 10 wherein the requests for the first and second segments of the media file are received from a CDN.

15. The method of claim 14 wherein the requested first and second segments of the media file are provided to the CDN.

16. The method of claim 10 wherein the receiving the requests for the first and second segments of the media file and the providing the requested first and second segments of the media file occur during playback of the media file by a device communicatively linked to the data network.

17. The method of claim 10 wherein the data network comprises a first network and the retrieving at least a portion of the media file from a data origin occurs over a second network.

18. A system for communicating, with a network, a media file having a plurality of segments of a certain size, the system comprising:

a data storage configured to store the media file having a first format;

a processing server communicatively coupled with the data storage, the processing server configured to:

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receive, with a network, a request for a first segment of the media file;

determine a starting point and an ending point of the requested first segment of the media file, wherein the determination is based, at least in part, on the request for the first segment of the media file;

retrieve a first portion of the media file from the data storage, wherein:

the first portion of the media file includes at least the requested first segment of the media file, and

the first portion of the media file includes the first format;

generate the requested first segment of the media file, wherein:

the requested first segment of the media file has a second format, and

the requested first segment of the media file is generated, at least in part, from the first portion of the media file;

provide, with a network, the requested first segment of the media file;

receive, with a network, a request for a second segment of the media file;

determine a starting point and an ending point of the requested second segment of the media file, wherein the determination is based, at least in part, on the request for the second segment of the media file;

retrieve a second portion of the media file from the data storage, wherein:

the second portion of the media file includes at least the requested second segment of the media file, and

the second portion of the media file includes the first format;

generate the requested second segment of the media file, wherein:

the requested second segment of the media file has the second format, and

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the requested second segment of the media file is generated, at least in part, from the second portion of the media file; and

provide, with the interface, the requested second segment of the media file.

19. The system of claim 18 further comprising a media caching server configured to:

send the requests for the first and second segments of the media file with the network to the processing server;

receive the requested first and second segments of the media file with the network from the processing server; and

store the requested first and second segments of the media file in a memory.

20. The system of claim 19 wherein the media caching server is further configured to provide the requested first and second segments of the media file to a device communicatively coupled with the media caching server.

21. The system of claim 19 configured such that the media caching server will not send the requests for the a segment of the media file with the network to the processing server if the media caching server has the segment of the media file stored in the memory.

22. A server for communicating, with a network, a media file having a plurality of segments of a certain length substantially as herein described.

23. A method for providing, with a data network, a plurality of segments of a media file, the segments having a certain size substantially as herein described.

24. A system for communicating, with a network, a media file having a plurality of segments of a certain size substantially as herein described.

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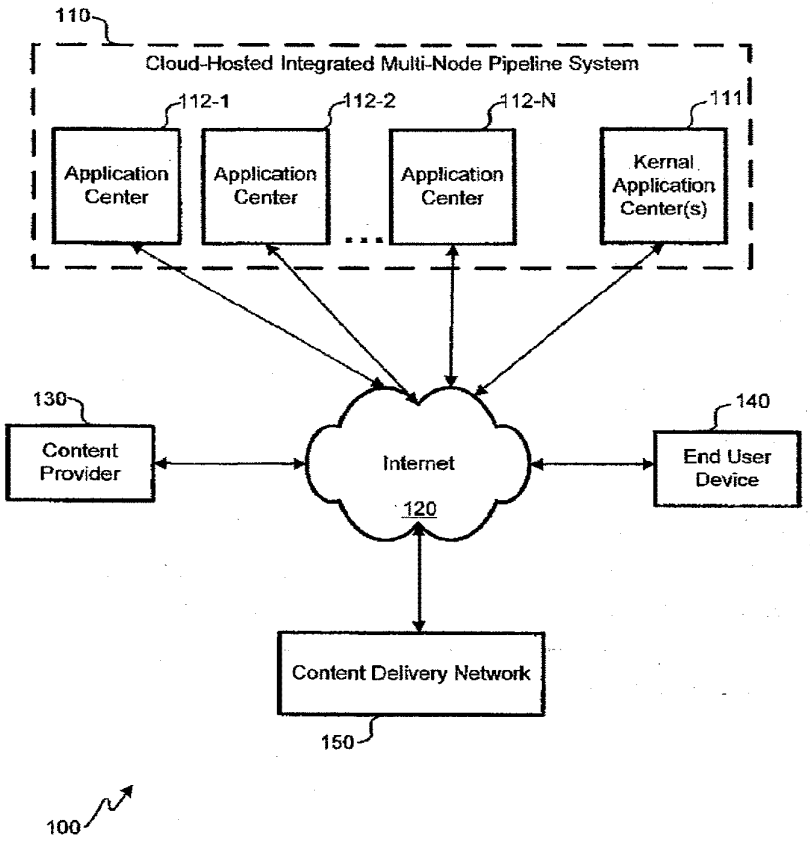


FIG. 1

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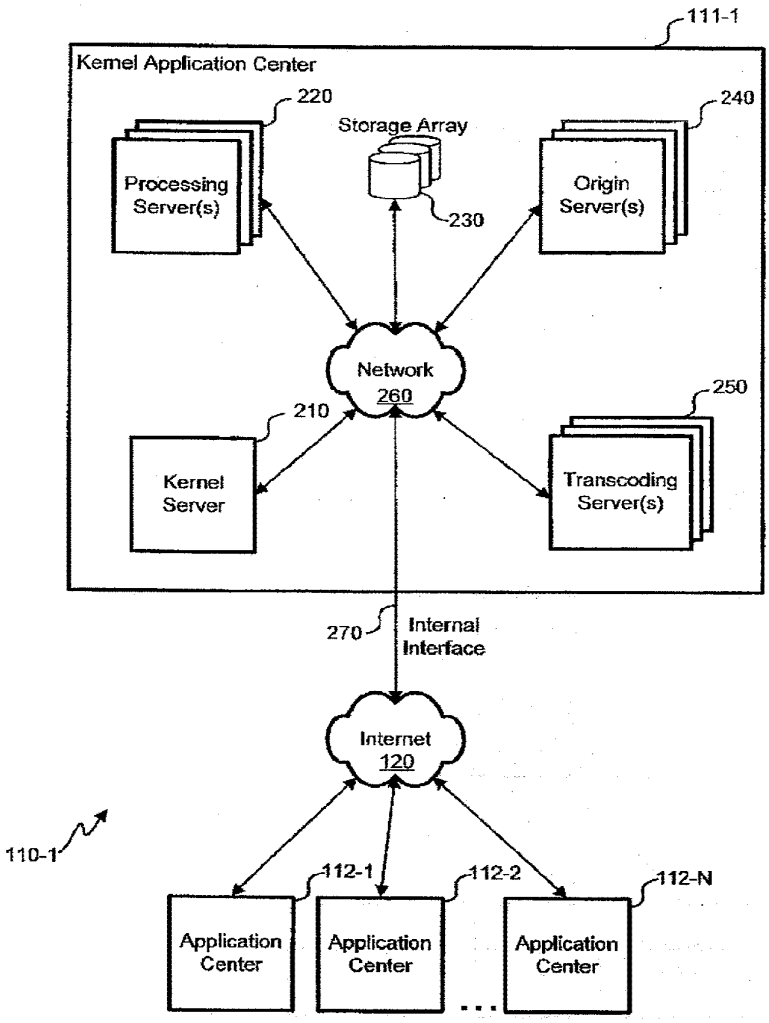


FIG. 2A

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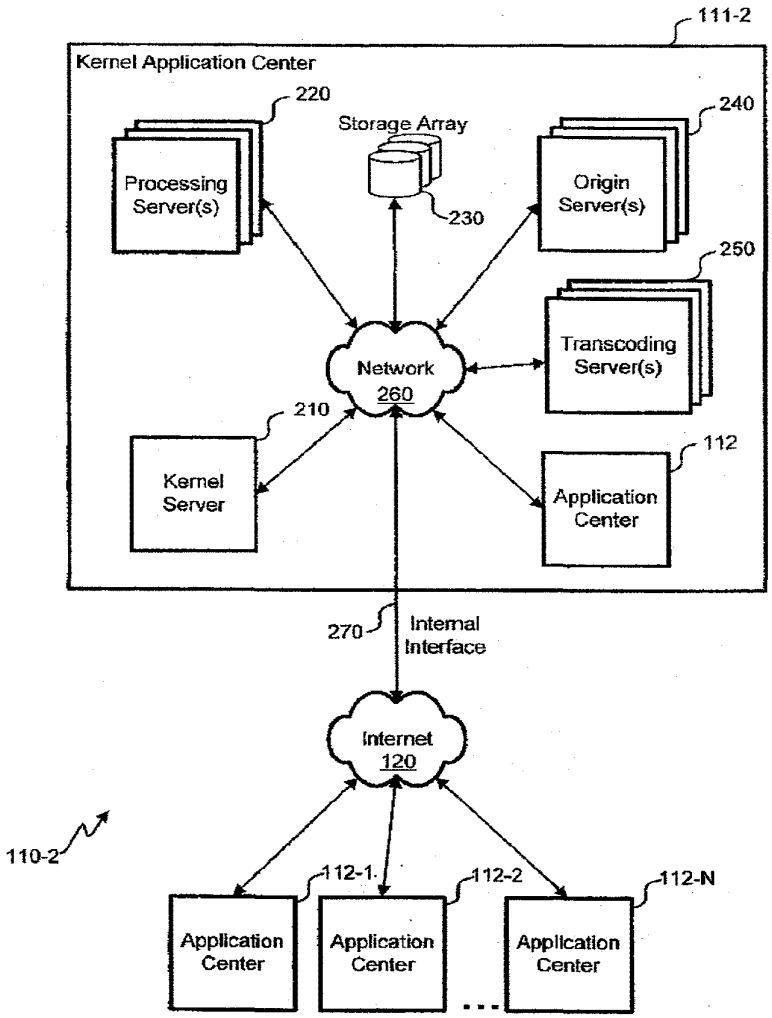


FIG. 2B

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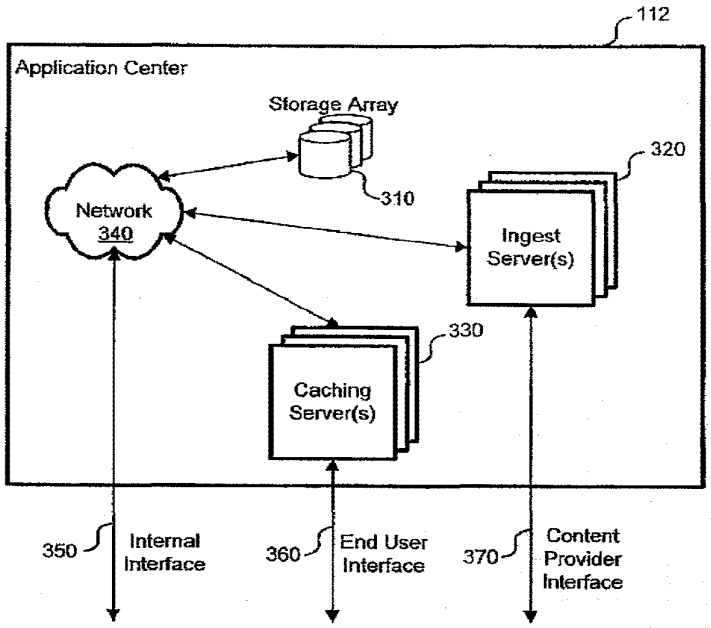


FIG. 3

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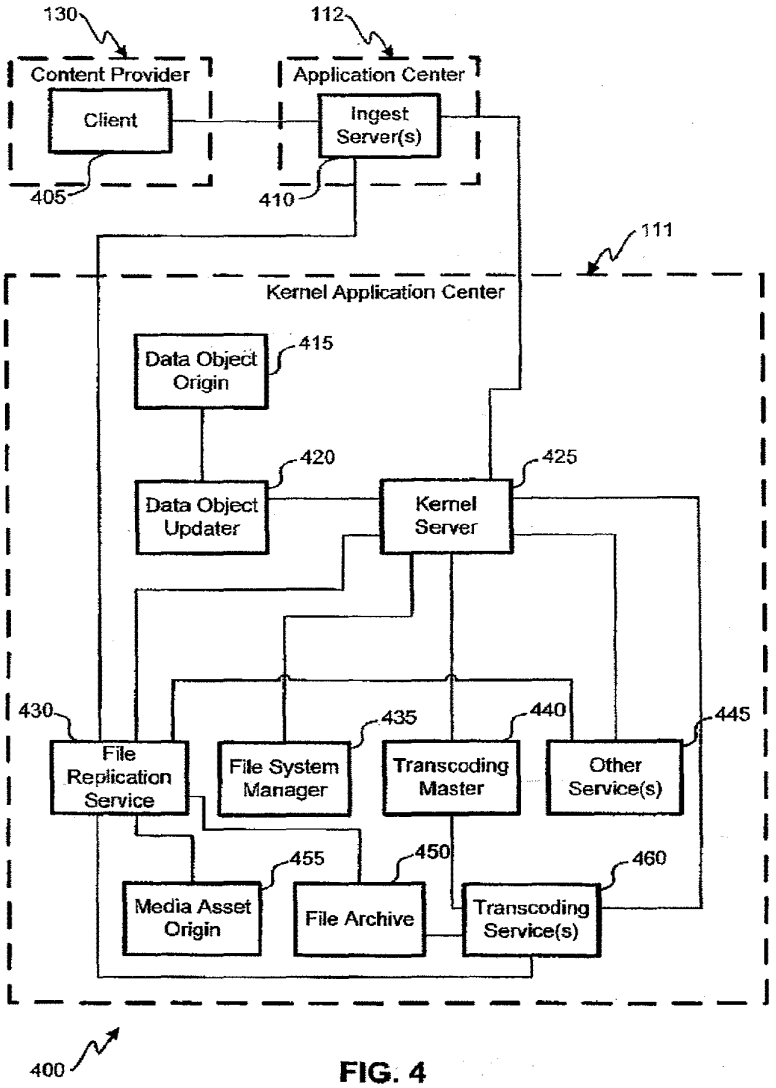


FIG. 4

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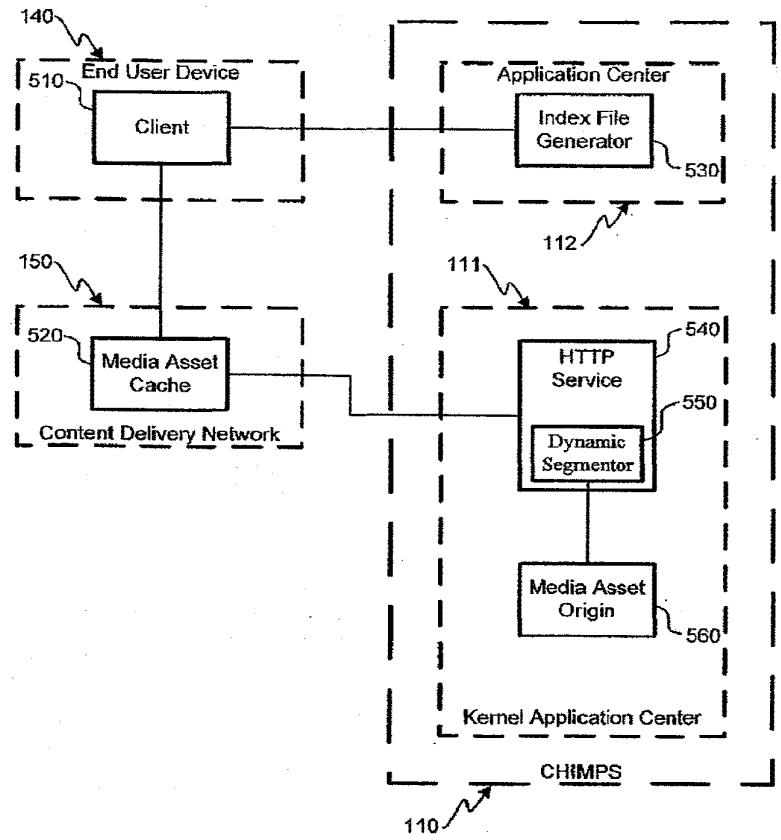


FIG. 5A

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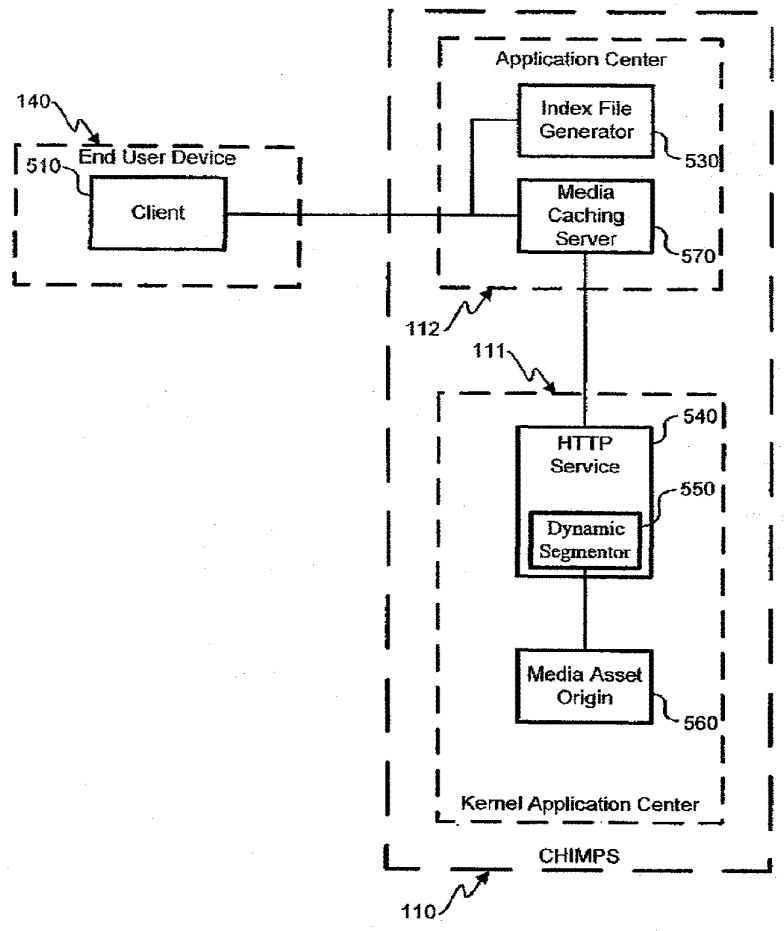


FIG. 5B

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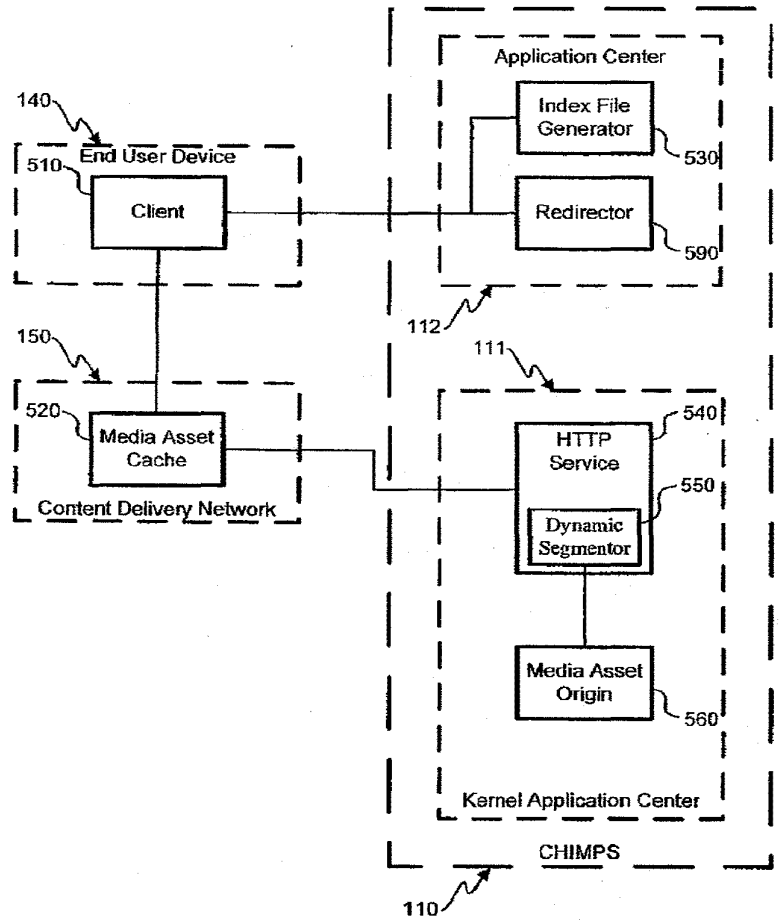
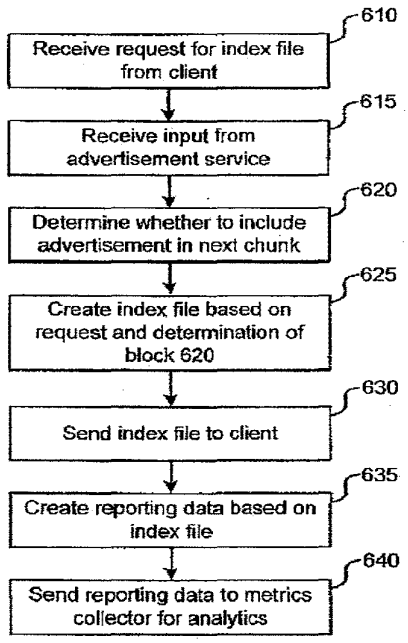


FIG. 5C

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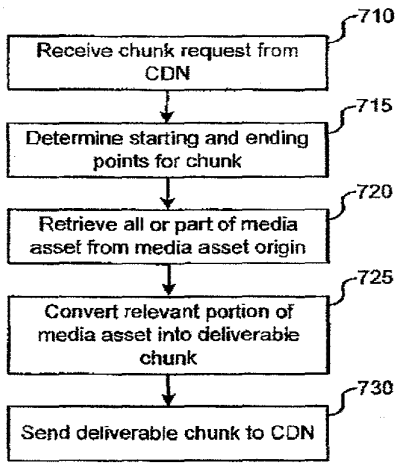


600

FIG. 6

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700

FIG. 7

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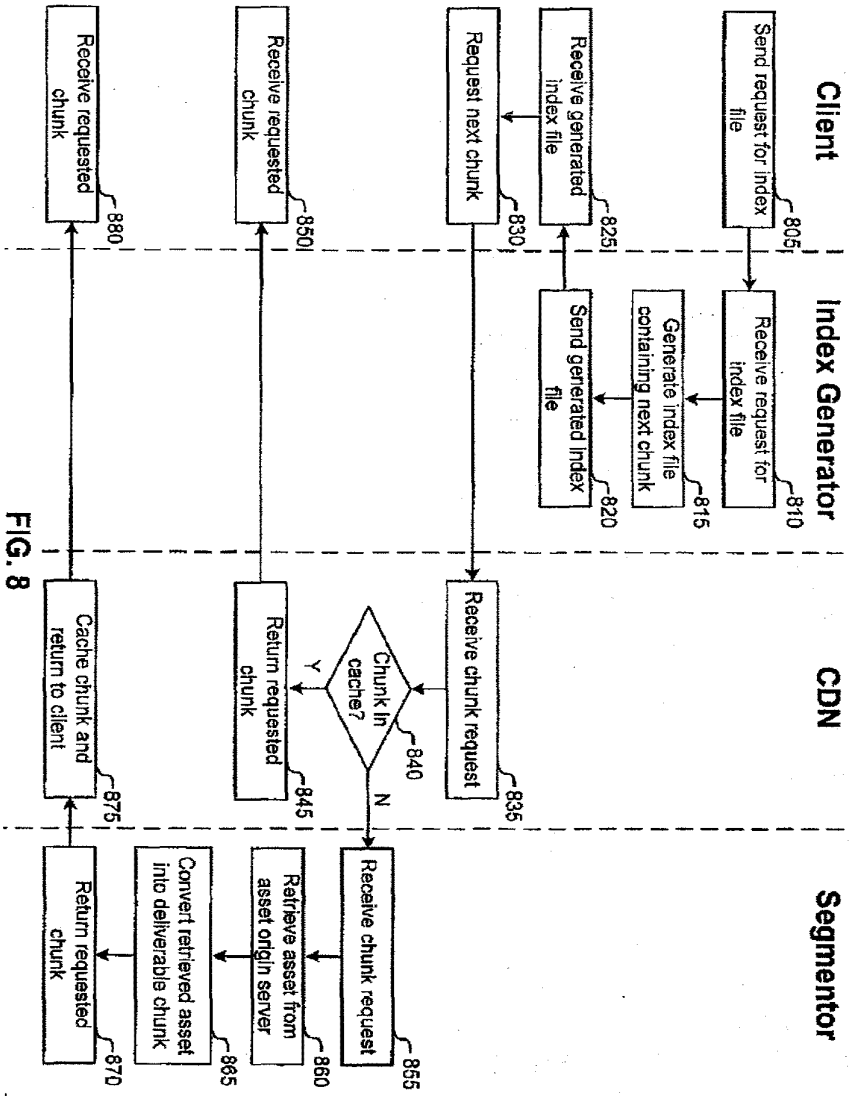


FIG. 8

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(54) **METHOD OF UTILIZING A SINGLE UNIFORM RESOURCE LOCATOR FOR RESOURCES WITH MULTIPLE FORMATS**

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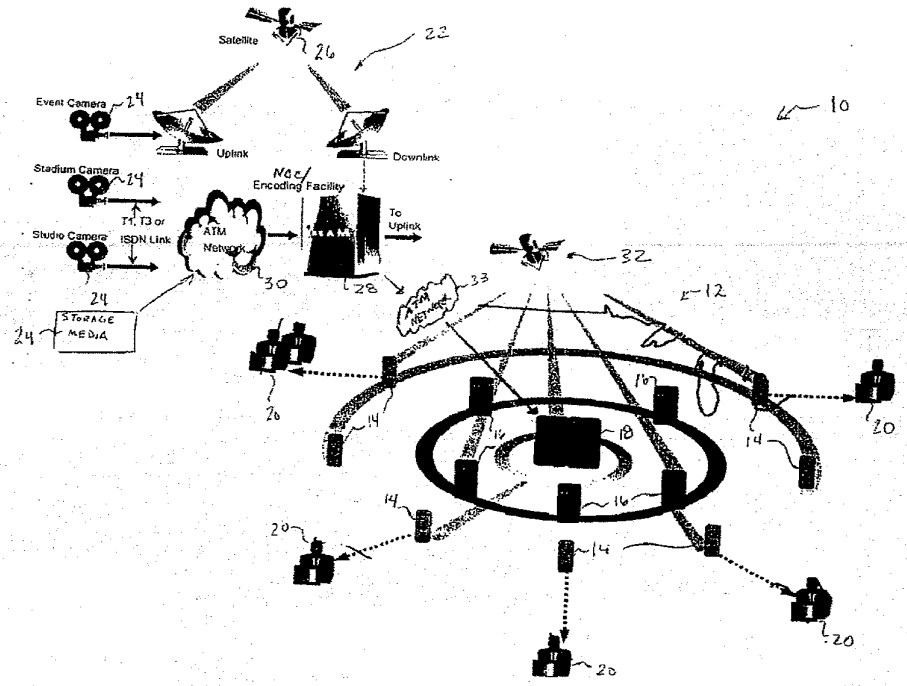
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(57) **ABSTRACT**

A broadcast system for streaming media is provided. A tiered hierarchy of network components each receive broadcast media streams, store popular content, and serve media to clients. The system allows for content hosting for resources having multiple formats and employs a single URL for a resource having multiple formats. A testing component uses information regarding the client and service provider provided in the metafile corresponding to a resource request to determine the type of client and to redirect the client to a server that can service the request.



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FIG. 1

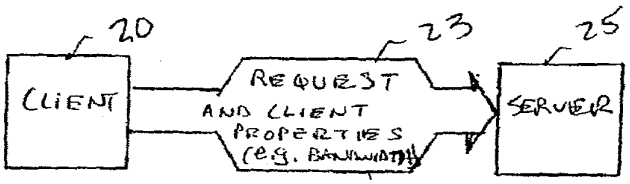
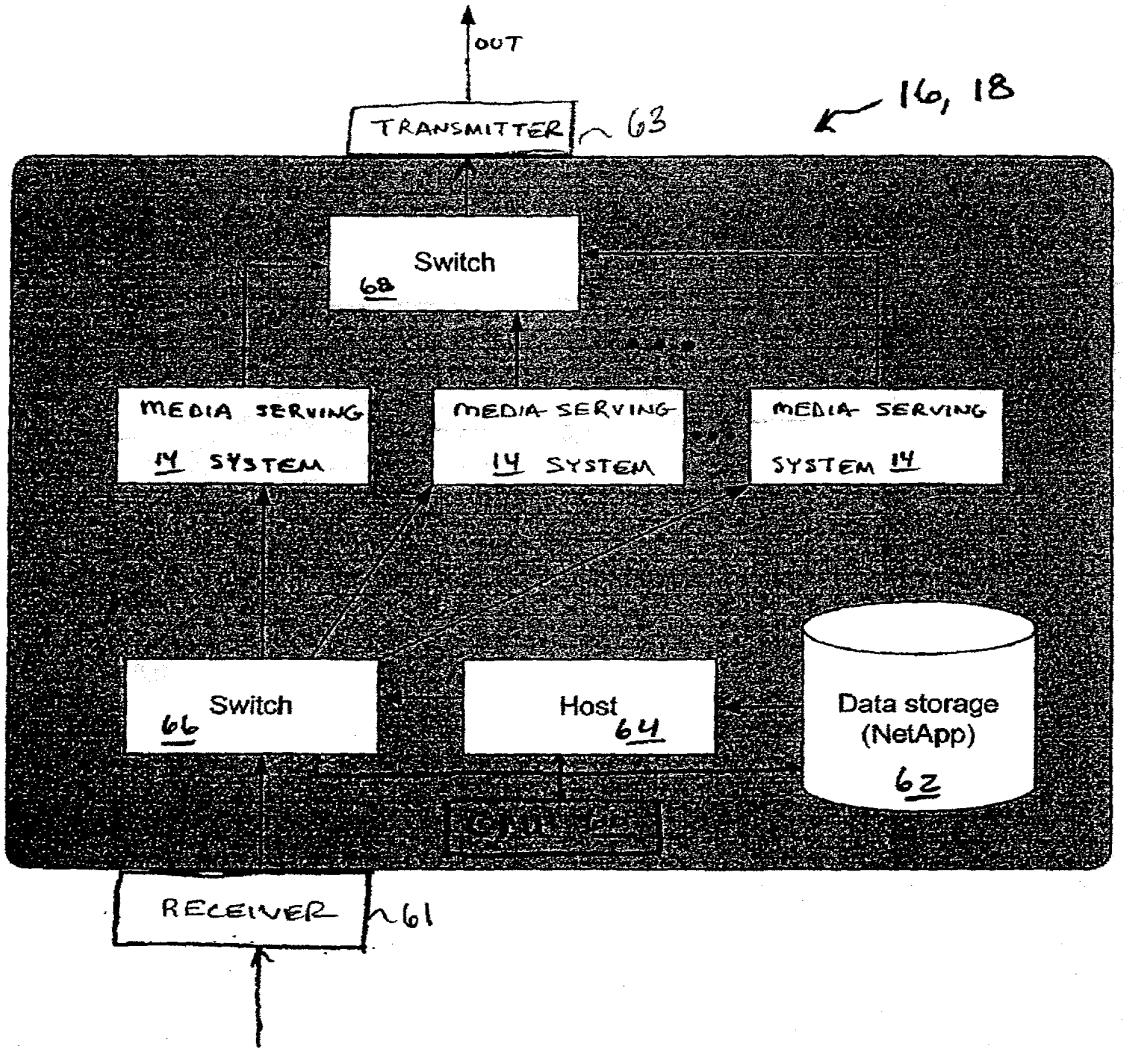

20
23
25
CLIENT
REQUEST
AND CLIENT
PROPERTIES
(e.g. BANDWIDTH)
SERVER

FIG. 4


OUT
TRANSMITTER
63
16, 18
Switch
68
MEDIA SERVING
14 SYSTEM
MEDIA SERVING
14 SYSTEM
MEDIA SERVING
SYSTEM 14
Switch
66
Host
64
Data storage
(NetApp)
62
RECEIVER
61

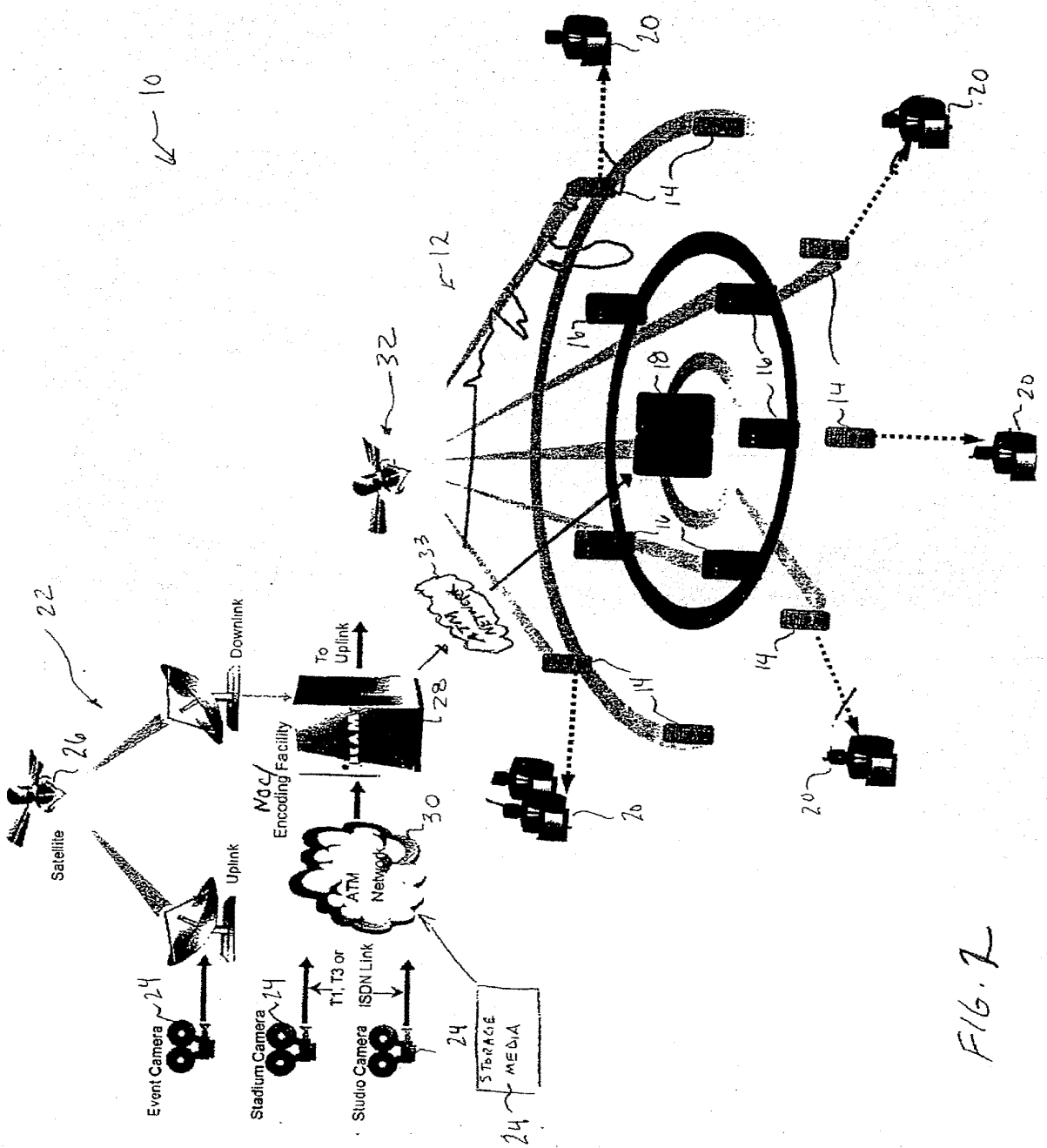
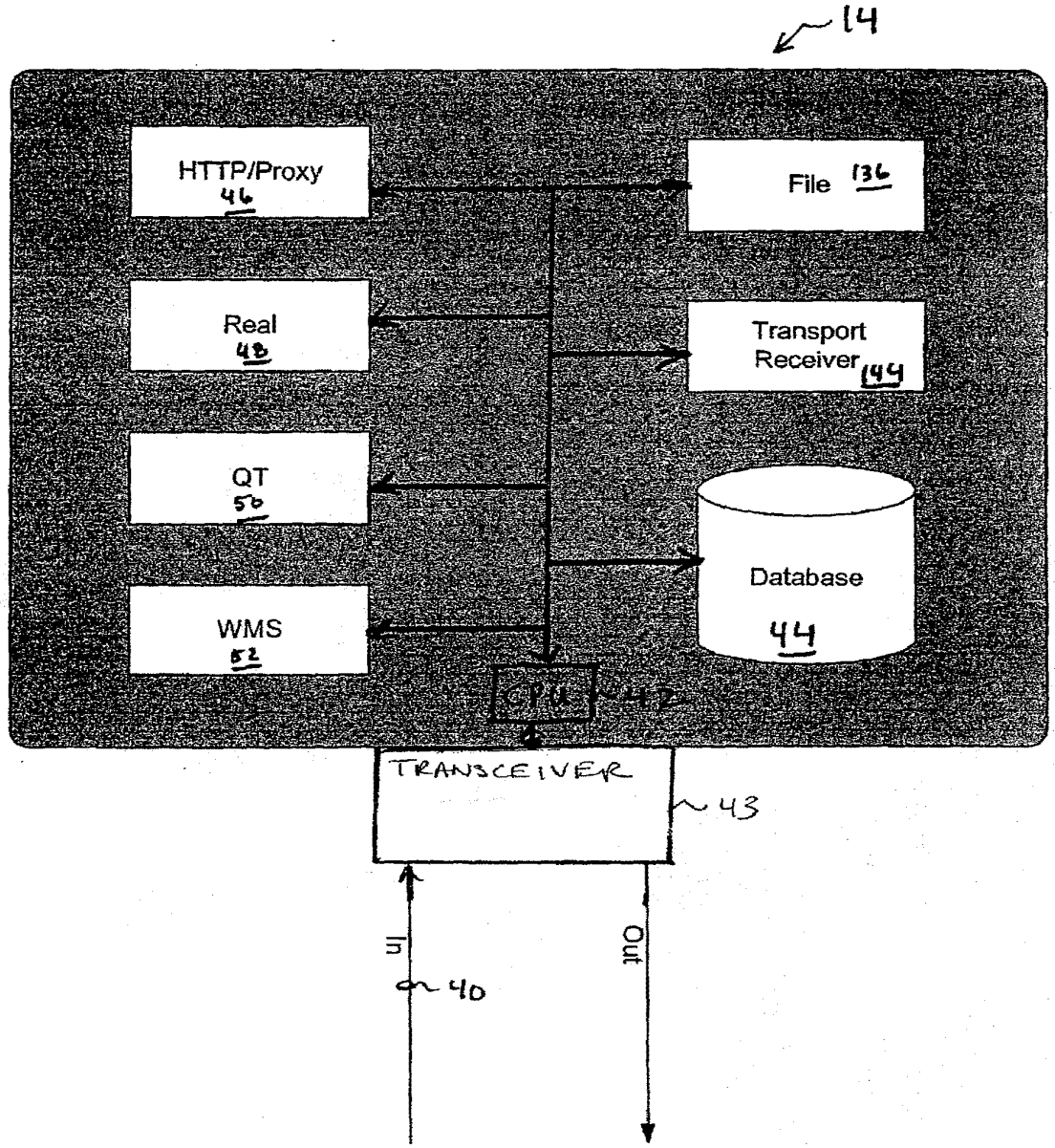

10
12
14
16
18
20
22
24
26
28
30
32
33
Satellite
Downlink
Uplink
To Uplink
MPEG Encoding Facility
ATM Network
T1, T3 or ISDN Link
Event Camera
Stadium Camera
Studio Camera
STORAGE MEDIA

FIG. 2

Fig. 3


14
HTTP/Proxy
46
File
136
Real
48
Transport
Receiver
144
QT
50
Database
44
WMS
52
CPU
42
TRANSCEIVER
43
In
40
Out

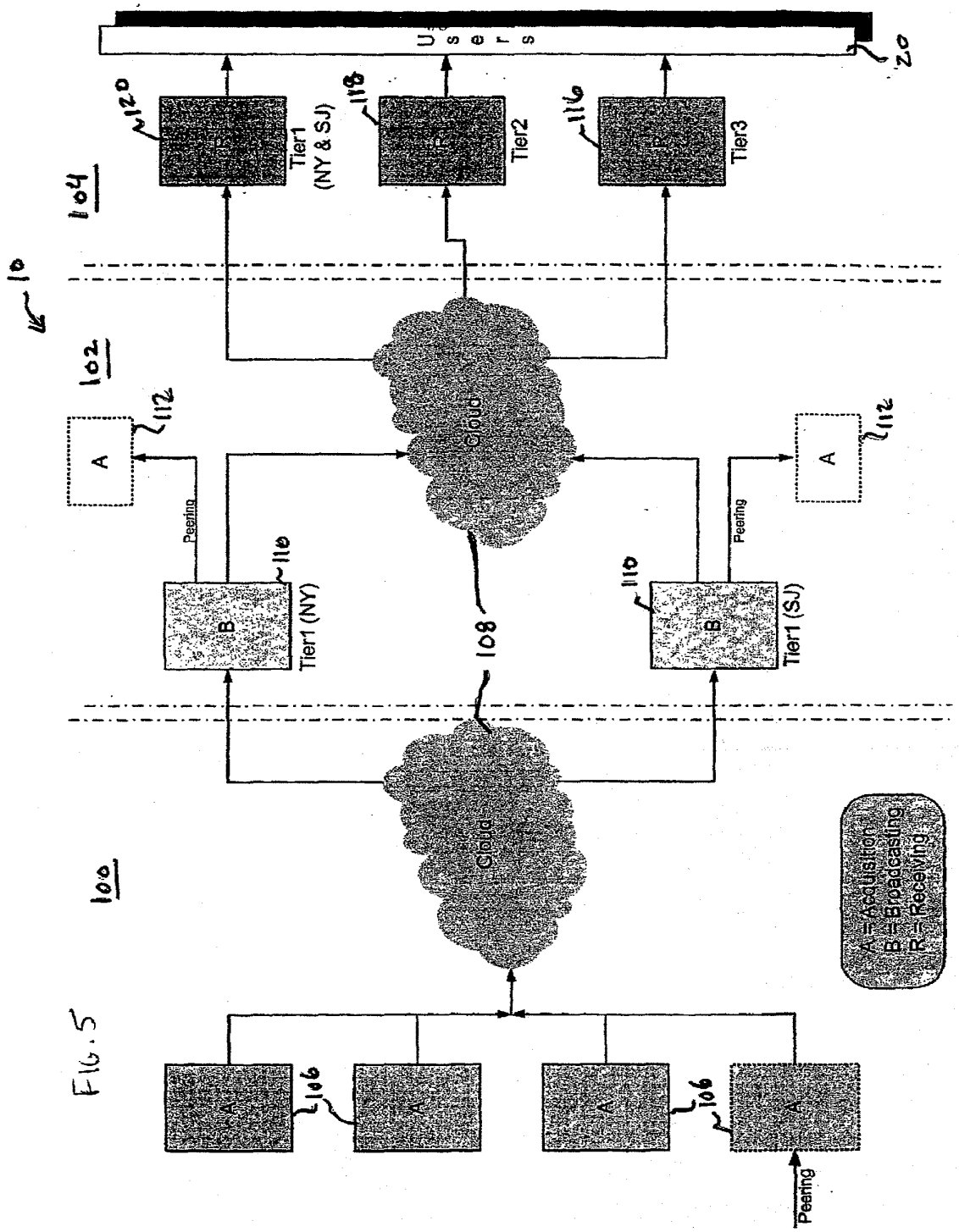

Users
20
120
Tier1 (NY & SJ)
118
Tier2
116
Tier3
104
10
102
112
A
Peering
Cloud
108
110
B
Tier1 (NY)
Tier1 (SJ)
100
A = Acquisition
B = Broadcasting
R = Receiving
106
Peering

FIG. 5

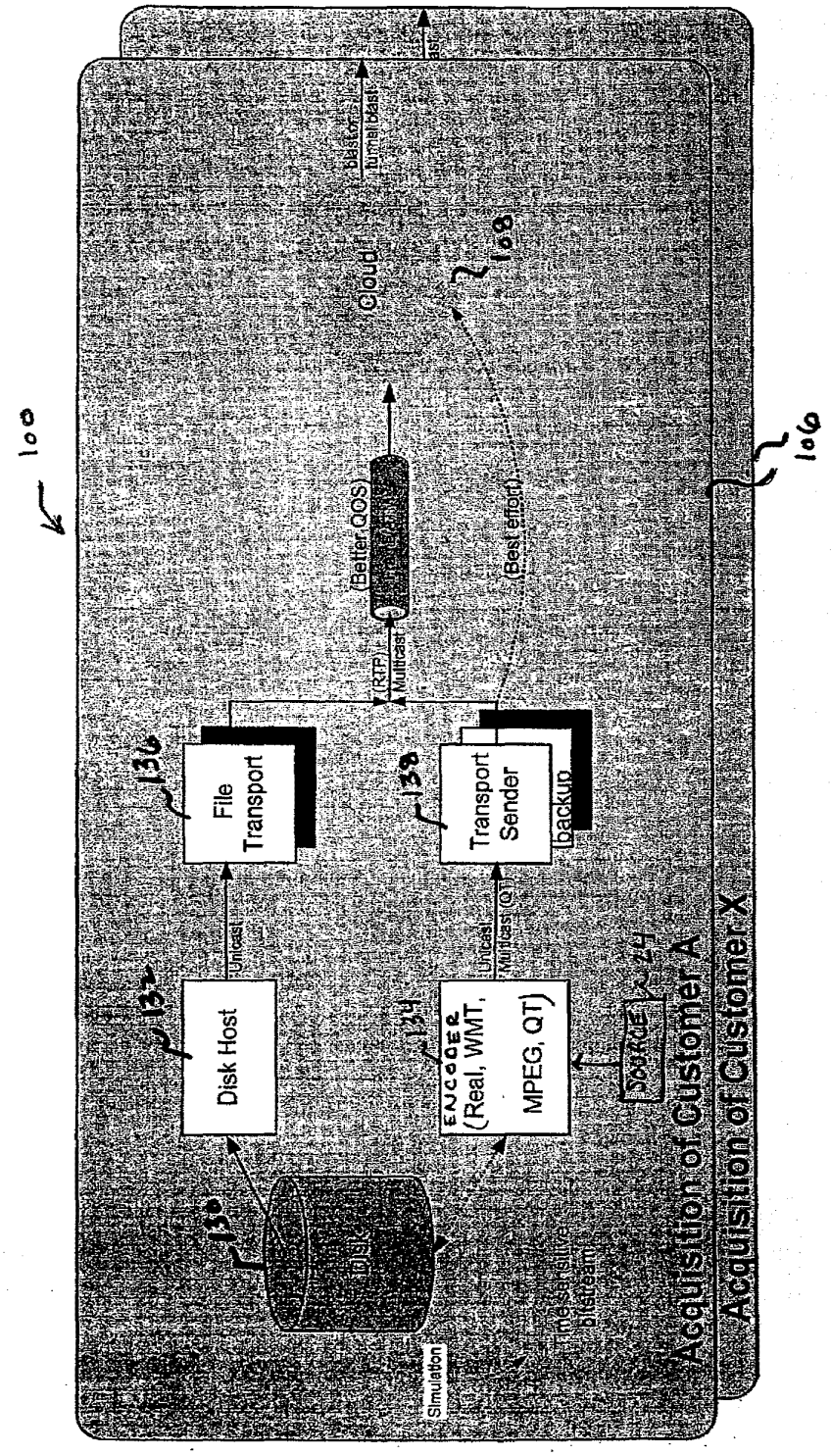

100
106
Acquisition of Customer A
Acquisition of Customer X
Disk Host
132
File Transport
136
Transport Sender
138
backup
ENCODER
(Real, WMT, MPEG, QT)
134
Unicast
Multicast QT
Multicast
(RTP)
(Better QoS)
(Best effort)
Cloud
109
Tunnel blast
Blast
Disk
130
Simulation
DogRide
124

Fig. 6

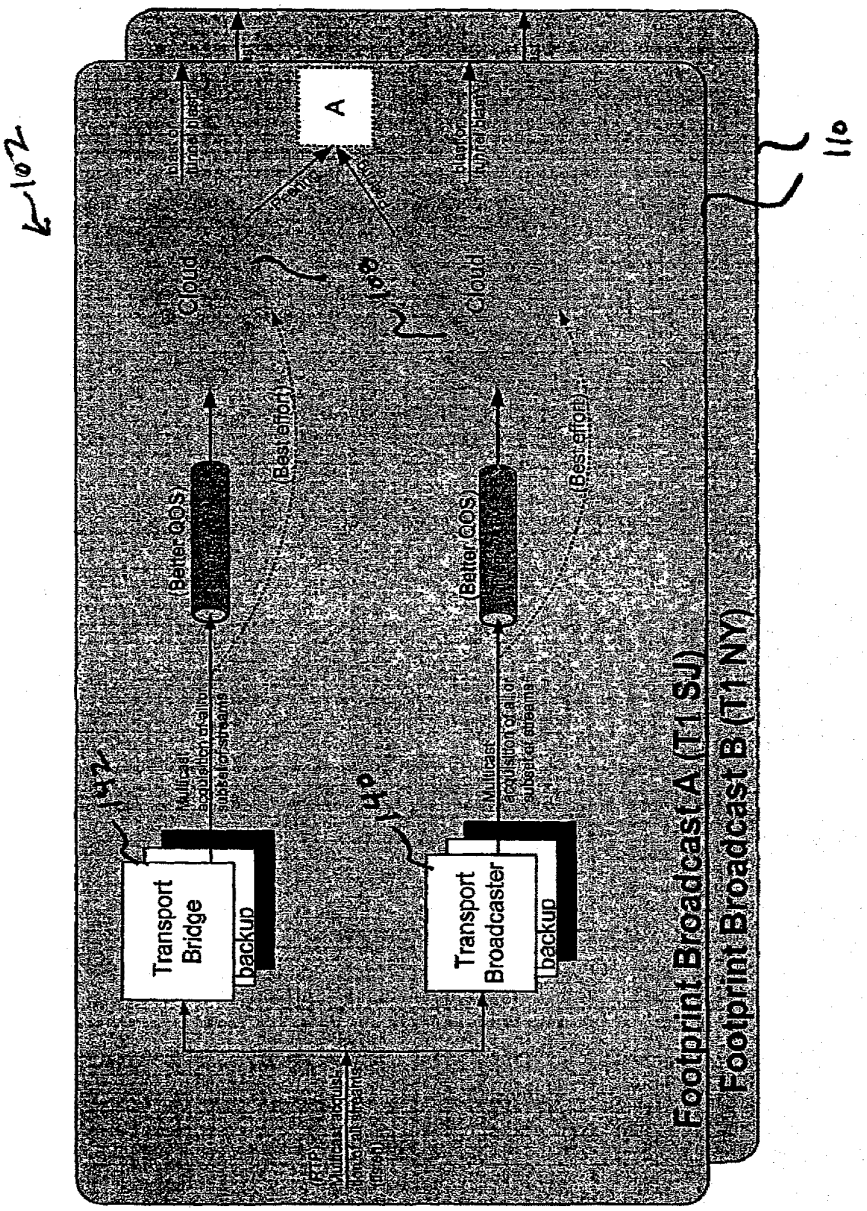

102
110
108
A
Cloud
Cloud
(Better QoS)
(Best effort)
(Better QoS)
(Best effort)
Transport Bridge
backup
Transport Broadcaster
backup
Footprint Broadcast A (T1 SJ)
Footprint Broadcast B (T1 NY)

Fig. 7

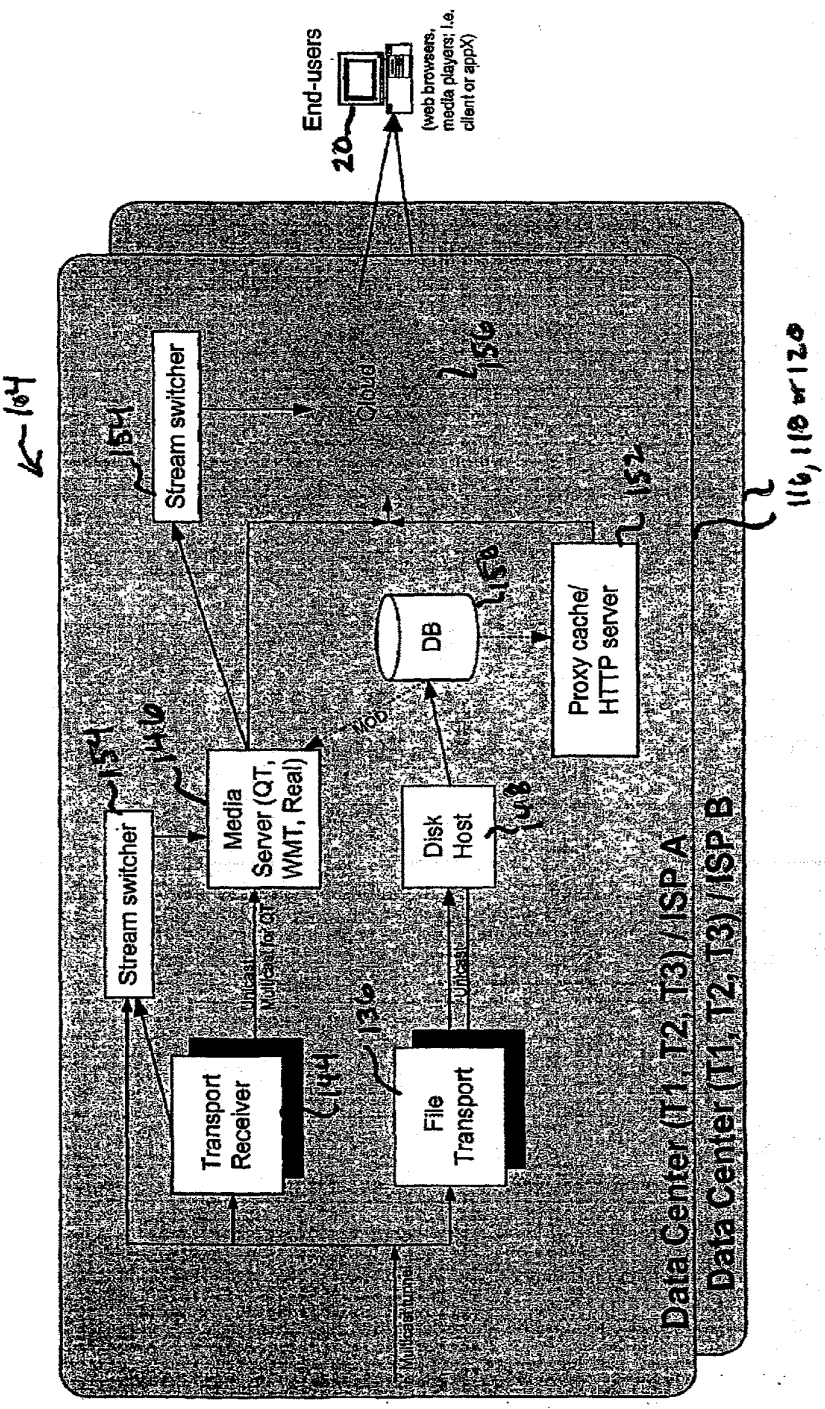

End-users
20
(web browsers, media players; i.e. client or appX)
Cloud
Stream switcher
154
Stream switcher
154
Media Server (QT, WMT, Real)
140
Unicast
Multicast or
Transport Receiver
144
136
File Transport
Unicast
Multicast or Unicast
DB
158
Disk Host
148
Proxy cache/ HTTP server
152
Data Center (T1, T2, T3) / ISP A
Data Center (T1, T2, T3) / ISP B

FIG. 8

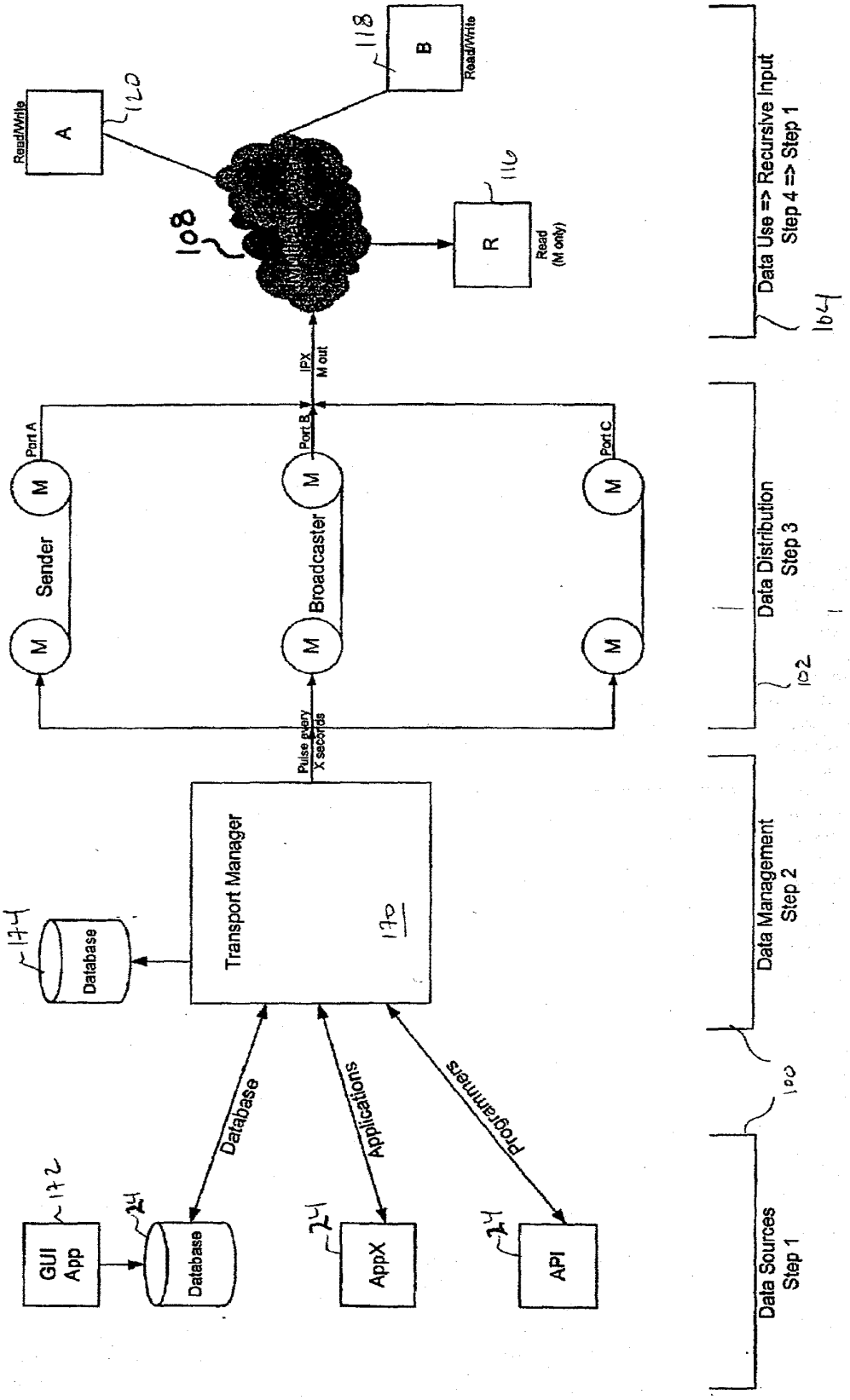

Data Use => Recursive Input
Step 4 => Step 1
Data Distribution
Step 3
Data Management
Step 2
Data Sources
Step 1
Read/Write
A
120
B
118
Read/Write
108
R
116
Read
(M only)
IPX
M out
Port A
Port B
Port C
M
Sender
Broadcaster
Pulse query
X seconds
Transport Manager
170
Database
174
GUI
App
172
Database
AppX
API
Database
Applications
Programmers
164
102
100

FIG. 9

METHOD OF UTILIZING A SINGLE UNIFORM RESOURCE LOCATOR FOR RESOURCES WITH MULTIPLE FORMATS

[0001] This application claims the benefit of U.S. provisional application Ser. No. 60/178,751, filed Janu. 28, 2000.

CROSS REFERENCE TO RELATED APPLICATIONS

[0002] Related subject matter is disclosed in co-pending U.S. patent application of Nils B. Lahr et al., filed Sep. 28, 1998, entitled "Streaming Media Transparency" (attorney's file IBC-P001); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "Method and Apparatus for Encoder-Based Distribution of Live Video and Other Streaming Content" (attorney's file 39512A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "A System and Method for Rewriting Media Resource Request and/or Response Between Origin Server and Client" (attorney's file 39511A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "Method and Apparatus for Client-Side Authentication and Stream Selection in a Content Distribution System" (attorney's file 39505A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "Method and System for Distributed Data Mining and Analysis for Networks" (attorney's file 39510A); in co-pending U.S. patent application of Nils B. Lahr et al., filed even date herewith, entitled "A System and Method for Mirroring and Caching Compressed Data in a Content Distribution System" (attorney's file 39565A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "A System and Method for Determining Optimal Server in a Distributed Network for Serving Content Streams" (attorney's file 39551A); and in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "A System and Method for Performing Broadcast-Enabled Disk Drive Replication in a Distributed Data Delivery Network" (attorney's file 39564A); the entire contents of each of these applications being expressly incorporated herein by reference.

FIELD OF THE INVENTION

[0003] The present invention relates to method of providing and utilizing a single Uniform Resource Locator for a resource which may be provided in a plurality of different formats and via different servers via the Internet.

BACKGROUND OF THE INVENTION

[0004] A Uniform Resource Locator (URL) is an address of a resource or file accessible on the Internet. The URL contains the name of the protocol required to access the resource, a domain name that identifies a specific computer or server on the Internet, and a hierarchical description of a file location on that computer or server. Presently, a single URL is associated with a single resource available on the Internet. There are many different types of Internet resources or client-server applications that are provided in different formats. If a resource is hosted in multiple formats, then a separate link to each format must be provided. This is problematic in that it can greatly complicate content management and create extra work. Moreover, as more formats are introduced, the problem increases.

SUMMARY OF THE INVENTION

[0005] In accordance with the present invention, a method and system are provided to supply content hosting for resources having multiple formats by providing a single URL for a resource having multiple formats.

[0006] In accordance with an aspect of the present invention, a testing component uses information regarding the client and service provider provided in the metafile corresponding to the request to determine the type of client from which the request originated and to redirect the client to a server that can service the request.

[0007] In accordance with another aspect of the present invention, the testing component is implemented in a server.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and other objects, advantages and novel features of the invention will be more readily appreciated from the following detail description when read in conjunction with the accompanying drawing, in which:

[0009] **FIG. 1** illustrates a client-side testing and stream selection device constructed in accordance with an embodiment of the present invention;

[0010] **FIG. 2** illustrates an Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention;

[0011] **FIG. 3** is a block diagram of a media serving system constructed in accordance with an embodiment of the present invention;

[0012] **FIG. 4** is a block diagram of a data center constructed in accordance with an embodiment of the present invention;

[0013] **FIG. 5** illustrates data flow in a Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention;

[0014] **FIGS. 6, 7** and **8** illustrate acquisition, broadcasting and reception phases, respectively, employed in a Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention; and

[0015] **FIG. 9** illustrates transport data management in a Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention.

[0016] Throughout the drawing figures, like reference numerals will be understood to refer to like parts and components.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS:

[0017] In accordance with the present invention, a testing component **27** is provided between a client **20** and a server **25**, as shown in **FIG. 1**. The testing component **27** is operable to receive a request from the client **20** for access and to selectively establish a network connection **29** with the server **25**. As described below, the request is analyzed to determine information regarding the client with which to logically redirect the client to a server for serving a particular media type.

[0018] The testing component **27** can be implemented as an add-on software and/or hardware component provided that it can be configured to selectively establish or intercept a network connection **29** between the client **20** and the server **25**. The client-server relationship is described herein for illustrative purposes in connection with a content distribution system. An overview of an exemplary content distribution system **10** follows. The system **10** employs data transport protocols to implement the testing component **27** in accordance with the present invention. It is to be understood that implementation of the invention is not limited to the architecture of the illustrative system **10** described herein.

[0019] 1. System Component Overview

[0020] With reference to **FIG. 2**, a system **10** is provided which captures media (e.g., using a private network), and broadcasts the media (e.g., by satellite) to servers located at the edge of the Internet, that is, where users **20** connect to the Internet such as at a local Internet service provider or ISP. The system **10** bypasses the congestion and expense associated with the Internet backbone to deliver high-fidelity streams at low cost to servers located as close to end users **20** as possible.

[0021] To maximize performance, scalability and availability, the system **10** deploys the servers in a tiered hierarchy distribution network indicated generally at **12** that can be built from different numbers and combinations of network building components comprising media serving systems **14**, regional data centers **16** and master data centers **18**. The system also comprises an acquisition network **22** that is preferably a dedicated network for obtaining media or content for distribution from different sources. The acquisition network **22** can operate as a network operations center (NOC) which manages the content to be distributed, as well as the resources for distributing it. For example, content is preferably dynamically distributed across the system network **12** in response to changing traffic patterns in accordance with the present invention. While only one master data center **18** is illustrated, it is to be understood that the system can employ multiple master data centers, or none at all and simply use regional data centers **16** and media serving systems **14**, or only media serving systems **14**.

[0022] An illustrative acquisition network **22** comprises content sources **24** such as content received from audio and/or video equipment employed at a stadium for a live broadcast via satellite **26**. The broadcast signal is provided to an encoding facility **28**. Live or simulated live broadcasts can also be rendered via stadium or studio cameras, for example, and transmitted via a terrestrial network such as a T1, T3 or ISDN or other type of a dedicated network **30** that employs asynchronous transfer mode (ATM) or other technology. In addition to live analog or digital signals, the content can include analog tape recordings, and digitally stored information (e.g., media-on-demand or MOD), among other types of content. Further, in addition to a dedicated link **30** or a satellite link **26**, the content harvested by the acquisition network **22** can be received via the Internet, other wireless communication links besides a satellite link, or even via shipment of storage media containing the content, among other methods. The encoding facility **28** converts raw content such as digital video into Internet-ready data in different formats such as the Microsoft Windows Media (MWM), RealNetworks G2, or Apple QuickTime (QT) formats. The system **10** also employs unique encoding methods to maximize fidelity of the audio and video signals that are delivered via multicast by the distribution network **12**.

[0023] With continued reference to **FIG. 2**, the encoding facility **28** provides encoded data to the hierarchical distribution network **12** via a broadcast backbone which is preferably a point-to-multipoint distribution network. While a satellite link indicated generally at **32** is used, the broadcast backbone employed by the system **10** of the present invention is preferably a hybrid fiber-satellite transmission system that also comprises a terrestrial network **33**. The satellite link **32** is preferably dedicated and independent of a satellite link **26** employed for acquisition purposes. The tiered network building components **14**, **16** and **18** are each equipped with satellite transceivers to allow the system **10** to simultaneously deliver live streams to all server tiers **14**, **16** and **18** and rapidly update on-demand content stored at any tier. When a satellite link **32** is unavailable or impractical, however, the system **10** broadcasts live and on-demand content though fiber links provided in the hierarchical distribution network **12**. Where the feed is pulled from in case of a failure is based on a set of routing rules that include priorities, weighting, and so on. In other words, the feed is pulled in a manner similar to the way routers currently operate, but at the actual stream level.

[0024] The system **10** employs a director agent to monitor the status of all of the tiers of the distribution network **12** and redirect users **20** to the optimal server, depending on the requested content. The director agent can originate, for example, from the NOC/encoding facility **28**. The system employs an Internet Protocol or IP address map to determine where a user **20** is located and then identifies which of the tiered servers **14**, **16** and **18** can deliver the highest quality stream, depending on network performance, content location, central processing unit load for each network component, application status, among other factors. Cookies and data from other databases can also be employed to facilitate this system intelligence.

[0025] Media serving systems **14** comprise hardware and software installed in ISP facilities at the edge of the Internet. The media serving systems preferably only serve users **20** in its subnetwork. Thus, the media serving systems **14** are configured to provide the best media transmission quality possible because the end users **20** are local. A media serving system **14** is similar to an ISP caching server, except that the content served from the media serving system is controlled by the content provider that input the content into the system **10**. The media serving systems **14** each serve live streams delivered by the satellite link **32**, and store popular content such as current and/or geographically-specific news clips. Each media serving system **14** manages its storage space and deletes content that is less frequently accessed by users **20** in its subnetwork.

[0026] Content that is not stored at the media serving system **14** can be served from regional data centers.

[0027] With reference to **FIG. 3**, a media serving system **14** comprises an input **40** from a satellite and/or terrestrial signal transceiver **43**. The media serving system **14** can output content to users **20** in its subnetwork or control/feedback signals for transmission to the NOC or another hierarchical component in the system **10** via a wireline or

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wireless communication network. The media serving system **14** has a central processing unit **42** and a local storage device **44**. A file transport module **136** and a transport receiver **144**, which are described below with reference to **FIG. 8**, are provided to facilitate reception of content from the broadcast backbone. The media serving system **14** also preferably comprises one or more of an HTTP/Proxy server **46**, a Real server **48**, a QT server **50** and a WMS server **52** to provide content to users **20** in a selected format. The media serving system can also support Windows and Real caching servers, allowing direct connections to a local box regardless of whether the content is available. The content in the network **12** is then located and cached locally for playback. This allows for split live feeds by a local media serving system **14** regardless of whether is being sent via a broadcast or feed mechanism. Thus, pull splits from a media serving system **14** are supported, as well as broadcast streams that are essentially push splits with forward caching. Also, the database **44** and file system **136** can be local or remote, depending on where the media serving system **14** is installed.

[0028] The regional data centers **16** are located at strategic points around the Internet backbone. With reference to **FIG. 4**, a regional data center **16** comprises a satellite and/or terrestrial signal transceiver, indicated at **61** and **63**, to receive inputs and to output content to users **20** or control/feedback signals for transmission to the NOC or another hierarchical component in the system **10** via wireline or wireless communication network. A regional data center **16** preferably has more hardware than a media serving system **14** such as gigabit routers and load-balancing switches **66** and **68**, along with high-capacity servers (e.g., plural media serving systems **14**) and a storage device **62**. The CPU **60** and host **64** are operable to facilitate storage and delivery of less frequently accessed on-demand content using the servers **14** and switches **66** and **68**. The regional data centers **16** also deliver content if a standalone media serving system **14** is not available to a particular user **20**. The director agent software preferably continuously monitors the status of the standalone media serving systems **14** and reroutes users **20** to the nearest regional data center **16** if the nearest media serving system **14** fails, reaches its fulfillment capacity or drops packets. Users **20** are typically assigned to the regional data center **14** that corresponds with the Internet backbone provider that serves their ISP, thereby maximizing performance of the second tier of the distribution network **12**. The regional data centers **14** also serve any users **20** whose ISP does not have an edge server.

[0029] The master data centers **18** are similar to regional data centers **16**, except that they are preferably much larger hardware deployments and are preferably located in a few peered data centers and co-location facilities, which provide the master data centers with connections to thousands of ISPs. With reference to **FIG. 4**, master data centers **18** comprises multiterabyte storage systems (e.g., a larger number of media serving systems **14**) to manage large libraries of content created, for example, by major media companies. The director agent automatically routes traffic to the closest master data center **18** if a media serving system **14** or regional data center **16** is unavailable. The master data centers **18** can therefore absorb massive surges in demand without impacting the basic operation and reliability of the network.

[0030] Transmissions can occur out of the data centers **16** and **18**. In the case of the satellite **32**, however, transmissions can also be implemented by taking what is being received and routing a copy thereof directly to the uplink system without first passing through the media serving systems **14**.

[0031] 2. System Operation Overview

[0032] With reference to **FIG. 5**, the Internet broadcast system **10** for streaming media generally comprises three phases, that is, acquisition **100**, broadcasting **102** and receiving **104**. In the acquisition phase **100**, content is provided to the system **10** from different sources such as Internet content providers (ICPs) or event or studio content sources. As stated previously, content can be received from audio and/or video equipment employed at a stadium for a live broadcast. The content can be, for example, live analog signals, live digital signals, analog tape recordings, digitally stored information (e.g., media-on-demand or MOD), among other types of content. The content can be locally encoded or transcoded at the source using, for example, file transport protocol (FTP), MSBD, or real-time transport protocol/real-time streaming protocol (RTP/RTSP). The content is collected using one or more acquisition modules **106**, which are described in more detail below in connection with **FIG. 6**. The acquisition modules **106** represent different feeds to the system **10** in the acquisition network **12** and can be co-located or distributed. Generally, acquisition modules **106** can perform remote transcoding or encoding of content using FTP, MSBD, or RTP/RTSP or other protocols prior to transmission to a broadcaster **110** for multicast to edge devices and subsequent rendering to users **20** located relatively near to one of the edge devices. The content is then converted into a broadcast packet in accordance with an aspect of the present invention. This process of packaging packets in a manner to facilitate multicasting, and to provide insight at reception sites as to what the packets are and what media they represent, constitutes a significant advantage of the system **10** over other content delivery systems.

[0033] Content obtained via the acquisition phase **100** is preferably provided to one or more broadcasters **110** via a multicast cloud or network(s) **108**. The content is unicast or preferably multicast from the different acquisition modules **106** to the broadcasters via the cloud **108**. As stated above, the cloud **108** is preferably a point-to-multipoint broadcast backbone. The cloud **108** can be implemented as one or more of a wireless network such as a satellite network or a terrestrial or wireline network such as optical fiber link. The cloud **108** can employ a dedicated ATM link or the Internet backbone, as well as a satellite link, to multicast streaming media. The broadcasters **110** are preferably in tier **120**, that is, they are master data centers **18** that receive content from the acquisition modules **106** and, in turn, broadcast the content to other receivers in tiers **116**, **118** and **120**.

[0034] During the broadcasting phase **102**, broadcasters **110** operate as gatekeepers, as described below in connection with **FIG. 7**, to transmit content to a number of receivers in the tiers **116**, **118** and **120** via paths in the multicast cloud **108**. The broadcasters **110** support peering with other acquisition modules indicated generally at **112**. The peering relationship between a broadcaster **110** and an acquisition module **112** is via a direct link and each device agrees to forward the packets of the other device and to otherwise share content directly across this link, as opposed to a standard Internet backbone.

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[0035] During the reception phase **104**, high-fidelity streams that have been transmitted via the broadcasters **110** across the multicast cloud **108** are received by servers **14**, **16** and **18** located as close to end users as possible. The system **10** is therefore advantageous in that streams bypass congestion and expense associated with the Internet backbone. As stated previously, the servers are preferably deployed in a tiered hierarchy comprising media serving systems **14**, regional data centers **16** and master data centers **18** that correspond to tiers **116**, **118** and **120**, respectively. The tiers **116**, **118** and **120** provide serving functions (e.g., transcoding from RTP to MMS, RealNet, HTTP, WAP or other protocol), as well as delivery via a local area network (LAN), the Internet, a wireless network or other network to user devices **122** for rendering (e.g., PCs, workstations, set-top boxes such as for cable, WebTV, DTV, and so on, telephony devices, and the like). The tiers in the reception phase are described in further detail below in connection with **FIG. 8**.

[0036] 3. Data Transport Management

[0037] With reference to **FIGS. 6, 7** and **8**, hardware and/or software components associated with the acquisition **100**, broadcasting **102** and reception phases **104** will now be described. These hardware and/or software components comprise various transport components for supporting MOD or live stream content distribution in one or more multicast-enabled networks in the system **10**. The transport components can be, but are not limited to, a file transport module, a transport sender, a transport broadcaster, and a transport receiver. The content is preferably characterized as either live content and simulated/scheduled live content, or MOD (i.e., essentially any file). Streaming media such as live content or simulated/scheduled live content are managed and transported similarly, while MOD is handled differently.

[0038] Acquisition for plural customers A through X is illustrated in **FIG. 6**. By way of an example, acquisition for customer A involves an encoder, as indicated at **134**, which can employ Real, WMT, MPEG, QT, among other encoding schemes with content from a source **24**. The encoder also encodes packets into a format to facilitate broadcasting in accordance with the present invention. A disk **130** stores content from different sources and provides MOD streams, for example, to a disk host **132**. The disk host **132** can be proxying the content or hosting it. Live content, teleconferencing, stock and weather data generating systems, and the like, on the other hand, is also encoded. The disk host **132** unicasts the MOD streams to a file transport module **136**, whereas the encoder **134** provides the live streams to a transport sender **138** via unicast or multicast. The encoder can employ either unicast or multicast if QT is used. Conversion from unicast to multicast is not always needed, but multicast-to-multicast conversion can be useful. The file transport module **136** transfers MOD content to a multicast-enabled network. The transport sender **138** pulls stream data from a media encoder **134** or an optional aggregator and sends stream announcements (e.g., using session announcement protocol and session description protocol (SAP/SDP)) and stream data to multicast Internet protocol (IP) addresses and ports received from a transport manager. The transport manager is described below with reference to **FIG. 9**. When a Real G2 server is used to push a stream, as opposed to a pulling scheme, an aggregator can be used to convert from a push scheme to a pull scheme. The components described in connection with **FIG. 6** can be deployed at the encoding center **28** or in a distributed manner at, for example, content provider facilities.

[0039] **FIG. 7** illustrates an exemplary footprint for one of a plurality of broadcasts. As shown in **FIG. 7**, the broadcasting phase **102** is implemented using a transport broadcaster **140** and a transport bridge **142**. These two modules are preferably implemented as one software program, but different functions, at a master data center **18** or network operations center. The transport broadcaster **140** performs transport path management, whereas the transport bridge **142** provides for peering. The broadcaster **140** and bridge **142** get data from the multicast cloud (e.g., network **108**) being guided by the transport manager and forward it to an appropriate transport path.

[0040] One transport broadcaster **140**, for example, can be used to represent one transport path such as satellite uplink or fiber between data centers or even a cross-continental link to a data center in Asia from a data center in North America. The broadcaster **140** and bridge **142** listen to stream announcements from transport senders **138** and enable and disable multicast traffic to another transport path, accordingly. They can also tunnel multicast traffic by using TCP to send stream information and data to another multicast-enabled network. Thus, broadcasters **110** transmit corresponding subsets of the acquisition phase streams that are sent via the multicast cloud **108**. In other words, the broadcasters **110** operate as gatekeepers for their respective transport paths, that is, they pass any streams that need to be sent via their corresponding path and prevent passage of other streams. Transmission can also be accomplished using TCP to another receiver regardless whether the system that the receiver is in is multicast-enabled. Thus, multicast operation can be disabled and the broadcast is still routed and distributed, although not quite as effectively or inexpensively as multicast.

[0041] **FIG. 8** illustrates the reception phase **104** at one of a plurality of servers or data centers. As stated above, the data centers are preferably deployed in a tiered hierarchy **116**, **118** and **120** comprising media serving systems **14**, regional data centers **16** and master data centers **18**, respectively. The tiers **116**, **118** and **120** each comprise a transport receiver **144**. Transport receivers can be grouped using, for example, the transport manager. Each transport receiver **144** receives those streams from the broadcasters **110** that are being sent to a group to which the receiver belongs. The transport receiver listens to stream announcements, receives stream data from plural transport senders **138** and feeds the stream data to media servers **146**. The transport receiver **144** can also switch streams, as indicated at **154** (e.g., to replace a live stream with a local MOD feed for advertisement insertion purposes). The stream switch **154** can be a plug-in in the Media Server **14** or exist in the server itself to enable switching per end-user **20**. The plug-in can interact with an advertisement platform to inject advertisements into streams. The MOD streams are received via the file transport **136** and stored, as indicated via the disk host **148**, database **150** and proxy cache/HTTP server **152**. The servers **146** and **152** provide content streams to users **20**.

[0042] The transport components described in connection with **FIGS. 6, 7** and **8** are advantageous in that they generalize data input schemes from encoders and optional

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aggregators to data senders, data packets within the system **10**, and data feeding from data receivers to media servers, to support essentially any media format. The transport components preferably employ RTP as a packet format and XML-based remote procedure calls (XBM) to communicate between transport components.

[**0043**] The transport manager will now be described with reference to **FIG. 9** which illustrates an overview of transport data management. The transport manager is preferably a software module deployed at the encoding facility **28** or other facility designated as a NOC. As shown in **FIG. 10**, multiple data sources **14** (e.g., database content, programs and applications) provide content as input into the transport manager **170**. Information regarding the content from these data sources is also provided to the transport manager such as identification of input source **14** and output destination (e.g., groups of receivers). Decisions as to where content streams are to be sent and which groups of servers are to receive the streams can be predefined and indicated to the transport manager **170** as a configuration file or XBM function call in real-time. This information can also be entered via a graphical user interface (GUI) **172** or command line utility. In any event, the information is stored in a local database **174**. The database **174** also stores information for respective streams relating to defined maximum and minimum IP address and port ranges, bandwidth usage, groups or communities intended to receive the streams, network and stream names, as well as information for user authentication to protect against unauthorized use of streams or other distributed data.

[**0044**] With continued reference to **FIG. 9, a** customer requests to stream content via the system **10** using, for example, the GUI **172**. The request can include the customer's name and account information, the stream name to be published (i.e., distributed) and the IP address and port of the encoder or media server from which the stream can be pulled. Requests and responses are sent via the multicast network (e.g., cloud **108**) using separate multicast addresses for each kind of transport component (e.g., a transport sender channel, a broadcaster channel, a transport manager channel and a transport receiver channel), or one multicast address and different ports. IP and port combinations can be used for TCP transmissions. An operator at the NOC **28** can approve the request if sufficient system resources are available such as bandwidth or media server capacity. Automatic approval can be provided by a scheduling system configured to provide immediate responses to attempted broadcasts. The transport manager **170** preferably pulls stream requests periodically. In response to an approved request, the transport manager **170** generates a transport command in response to the request (e.g., an XML-based remote procedure call (XBM)) to the transport sender **138** corresponding to that customer which provides the assigned multicast IP address and port that the transport sender is allowed to use in the system **10**.

[**0045**] The transport sender **138** receives the XBM call and responds by announcing the stream that is going to be sent. All of the transport components listen to the announcement. Once the transport sender **138** commences sending the stream into the assigned multicast IP address and port, the corresponding transport broadcaster **140** filters the stream. The transport receiver **144** joins the multicast IP address and receives the data or stream if the stream is intended for a group to which the receiver **144** belongs. As stated above in connection with **FIG. 5**, the receiver converts the steam received via the cloud **108** and sends it to the media server available to the users **20**. The data is then provided to the media server associated with the receiver. Receivers **144** and broadcasters **140** track announcements that they have honored using link lists.

[**0046**] As stated above, the transport components described with reference to FIGS. **5-9** preferably use RPT as a data transport protocol. Accordingly, Windows Media, RealG2 and QT packets are wrapped into RTP packets. The acquisition network **22** preferably employs an RTP stack to facilitate processing any data packets, wrapping the data packets with RTP header and sending the data packets. RTSP connection information is generally all that is needed to commence streaming.

[**0047**] RTP is used for transmitting real-time data such as audio and video, and particularly for time-sensitive data such as streaming media, whether transmission is unicast or multicast. RTP employs User Datagram Protocol (UDP), as opposed to Transmission Control Protocol (TCP) that is typically used for non-real-time data such as file transfer and e-mail. Unlike with TCP, software and hardware devices that create and carry UDP packets do not fragment and reassemble them before they have reached their intended destination, which is important in streaming applications. RTP adds header information that is separate from the payload (e.g., content to be distributed) that can be used by the receiver. The header information is merely interpreted as payload by routers that are not configured to use it.

[**0048**] RTSP is an application-level protocol for control over the delivery of data with real-time properties and provides an extensible framework to enable controlled, on-demand delivery of real-time data including live feeds and stored clips. RTSP can control multiple data delivery sessions, provide means for choosing delivery channels such as UDP, multicast UDP and TCP, and provide means for choosing delivery mechanisms based on RTP. HTTP is not suitable for streaming media because it is more of a store-and-forward protocol that is more suitable for web pages and other content that is read repeatedly. Unlike HTTP, RTSP is highly dynamic and provides persistent interactivity between the user device (hereinafter referred to as a client) and server that is beneficial for time-based media. Further, HTTP does not allow for multiple sessions between a client and server, and travels over only a single port. RTP can encapsulate HTTP data, and can be used to dynamically open multiple RTP sessions to deliver many different streams at the same time.

[**0049**] The system **10** employs transmission control software deployed at the encoding facilities **28**, which can operate as a network operations center (NOC), and at broadcasters **110** (e.g., master data centers **120**) to determine which streams will be available to which nodes in the distribution system **12** and to enable the distribution system **12** to support one-to-one streaming or one-to-many streaming. The extensible language capabilities of RTSP augment the transmission control software at the edge of the distribution network **12**. Since RTSP is a bi-directional protocol, its use enables encoders **134** and receivers **144** to talk to each other, allowing for routing, conditional access (e.g., authentication) and bandwidth control in the distribution network

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12. Standard RTSP proxies can be provided between any network components to allow them to communicate with each other. The proxy can therefore manage the RTSP traffic without necessarily understanding the actual content.

[0050] For every RTSP stream, there is an RTP stream. Further, RTP sessions support data packing with timestamps and sequence numbers. They can also be used for carrying stereo information, wide screen versions of requested media, different audio tracks, and so on. RTP packets are wrapped in a broadcast protocol. Applications in the receiving phase **104** can use this information to determine when to expect the next packet. Further, system operators can use this information to monitor network **12** and satellite **32** connections to determine the extent of latency, if any.

[0051] Encoders and data encapsulators written with RTP as the payload standard are advantageous because off-the-shelf encoders (e.g., MPEG2 encoders) can be introduced without changing the system **10**. Further, encoders that output RTP/RTSP can connect to RTP/RTSP transmission servers. In addition, the use of specific encoder and receiver combinations can be eliminated when all of the media players support RTP/RTSP.

[0052] 4. Testing Component

[0053] As stated above, transport management facilitates requests for streaming content by system customers (e.g., content providers). The use of RTP/RTSP between transport components also facilitates communication between servers and users requesting to receive content from the servers.

[0054] Media resource requests from a client **22** can occur inside of an RTSP connection or via a simple HTTP request. Responses to media resource requests can be metafiles, but can also occur inside of a binary file or via the protocol being used between the client **22** and server (e.g., server **14**, **16** or **18**). In each of these instances, responses are similar to a response served by an Internet client-server application to allow sending links to a resource rather than having to send the resource itself. These files and/or response information indicate to the client **22** the location of requested media, i.e., where it should connect to and in what order. In video serving applications, metafiles allow content providers to create playlists of video clips, but metafiles can also be used to help define events and other information such as the author or resource owner. Further, the contents of metafiles can be written as more of a scriptable language to handle conditions and other more dynamic needs. In other words, RTSP can enable encoders **134**, receivers **144**, and servers or data centers **14**, **16** and **18** to communicate with each other to allow for routing, conditional access (e.g., authentication) and bandwidth control in the distribution network **12**, in accordance with the present invention. For example, standard RTSP proxies can be provided between any network components to allow them to communicate with each other.

[0055] With reference to the illustrative Internet broadcast system **10** for streaming media, the testing component **27** is implemented as a combination of software modules and hardware components in the system **10** and is operable to review properties of the client **20** in real-time using RTP/RTSP communications to determine, for example, the type of client (e.g., which media player is to be used), as well as the bandwidth and capability of the client. Information relating to these properties can be provided in a metafile corresponding to the request. The metafile can also provide information relating to the ISP such as client subscription type and priority to be provided the requested stream based on contracts between companies using the ISP and content providers. For example, a content provider can pay an ISP for higher quality of service. The testing component **27** is configurable to analyze requests and place higher priority to the content provider's connections than other requested traffic. The information for authenticating client requests can come from other sources via the internet than the metafile associated with the request, such as from an ISP or other database.

[0056] In accordance with the preferred embodiment of the present invention, a single URL is assigned to an Internet resource that is provided in a plurality of formats. In particular, rather than assign a separate URL for each available format of a resource, all formats of a resource are assigned the same URL.

[0057] In operation, when a client makes a request for a particular resource using a URL assigned to the resource, the type of resource format which the client can accept is determined by the testing component **27** based on the type of client making the request. The type of format that a particular client or customer can utilize can be known in advance or determined at the time of the request. The type of resource format that the client can accept is then compared to the available resource formats and based on the comparison, the resource is provided/served to the client in a proper format. Accordingly, by determining the type of client making a request for a resource, the system **10** is able to host a resource in multiple formats while still only providing one URL to customers for that resource. The testing component **27** can be implemented in the server **25** in accordance with one embodiment of the present invention.

[0058] While a server can host multiple media formats, each format is typically hosted by a different server. In accordance with another aspect of the invention, a client can be re-directed to a selected one of multiple servers, which respectively carry the different formats needed to fulfill a user request using the client information, in order to serve the specific media type needed for the client.

[0059] By way of an example, a content provider that wishes to stream media via the system **10** provides the NOC **28** with the URL The URL is translated at the NOC into publishing points or mount points into selected servers **14**, **16** and/or **18** in the distribution system **12**. When a client types that URL (e.g., http://www.ibeam.com/test), the initial connection is accepted, and the request is analyzed. If it is determined by the testing component **27** that the request came from a QuickTime player, the testing component **27** engages RTP/RTSP protocol signaling to generate a response that either informs the client to reconnect directly to the QuickTime server for '/test/', or redirects the initial connection to the QuickTime server in a manner similar to a proxy server.

[0060] Although the present invention has been described with reference to a preferred embodiment thereof, it will be understood that the invention is not limited to the details thereof. Various modifications and substitutions will occur to those of ordinary skill in the art. All such substitutions are intended to be embraced within the scope of the invention as defined in the appended claims.

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What is claimed is:

1. A method for processing client media requests in a content distribution network comprising the steps of:

preparing media for delivery via said content distribution system by storing multiple formats of said media and applying a uniform resource locator common to said multiple formats;

accepting a connection initiated by a client device;

analyzing a resource request from the client device;

determining the type of media player used by said client device from auxiliary information transmitted with said resource request; and

generating a response to said resource request substantially in real-time providing information for obtaining the requested resource in one of said multiple formats corresponding to said type of media player.

2. A method as claimed in claim 1, wherein said generating step comprises instructions for said client device to reconnect directly to a server supporting said type of media player indicated in said resource request using said uniform resource locator.

3. A method as claimed in claim 1, wherein said generating step comprises the step of redirecting said connection to a server supporting said type of media player indicated in said resource request using said uniform resource locator.

4. A method as claimed in claim 3, wherein said redirecting step is performed using a proxy server.

5. A method as claimed in claim 1, wherein said accepting step, said analyzing step, said determining step and said generating step are performed by a server.

* * * * *

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING TRANSMITTAL OF COPY OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (CHAPTER I OF THE PATENT COOPERATION TREATY)
(PCT Rule 44bis.1(c))

To:

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ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 10 July 2014 (10.07.2014)	
Applicant's or agent's file reference 92853858104P	**IMPORTANT NOTICE**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/071629	26 December 2012 (26.12.2012)	29 December 2011 (29.12.2011)

Applicant
UNICORN MEDIA, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

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Form PCT/IB/326 (January 2004)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 92853858104P	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2012/071629	International filing date *(day/month/year)* 26 December 2012 (26.12.2012)	Priority date *(day/month/year)* 29 December 2011 (29.12.2011)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant UNICORN MEDIA, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 01 July 2014 (01.07.2014)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt05.pct@wipo.int

Form PCT/IB/373 (January 2004)

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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/071629	26.12.2012	29.12.2011

International Patent Classification (IPC) or both national classification and IPC
INV. G06F17/30

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Boyadzhiev, Yavor Telephone No. +31 70 340-4548

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

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Re Item V.

1. Reference is made to the following documents (D1-D3):

D1 US 2006/129907 A1 (VOLK ANDREW R [US] ET AL) 15 June 2006

D2 AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010

D3 US 2001/029525 A1 (LAHR NILS B [US]) 11 October 2001 (2001-10-11)

Article 33(3) PCT

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-15, as interpreted by the examiner (see §3), does not involve an inventive step in the sense of Article 33(3) PCT.

INDEPENDENT CLAIM 1 (see §3)

2.1 The document D1 discloses: A method for enabling customized media file delivery via a data network (The abstract, lines 1-4, "System ... document."), the method comprising:
extracting first contextual data from a first URL request for a media file, wherein the first URL request is received via the data network and corresponds to a first device type (paragraph 75, lines 1-9, "In the ... providers."; paragraph 76, lines 5 and 6, "On the ... RSS feed.");
processing the first contextual data using syndication information to generate a first instruction set in a first format (paragraph 20, lines 1-3, In ... browser."; paragraph 45, lines 3-10, "Additionally ... characteristics ...");
sending the first instruction set via the data network (paragraph 78, lines 1-7, "Network ... feeds.");
extracting second contextual data from a second URL request for the media file, wherein the second URL request is received via the data network and corresponds to a second device type (paragraph 71, lines 10-13, "In ... any other device ..."; paragraph 75, lines 1-9, "In the ... providers."; paragraph 76, lines 5 and 6, "On the ... RSS feed.");
processing the second contextual data using the syndication information to generate a second instruction set in a second format (paragraph 23, lines 1-12, "In ... information."; paragraph 27, lines 1-6, "In ... form; paragraph 44, lines 1-11, "In ... exist."), and
sending the second instruction set via the data network (paragraph 78, lines 1-7, "Network ... feeds.").

The document D1 does not explicitly disclose that a second contextual data from a second URL request for the media file is extracted. However, D1 explicitly discloses

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(paragraphs , 44, 45, 71) that different types of devices, e.g., desktop computer, PDA, wireless phone, are able to request a specific URL, associated with RSS document/ file, according to the capabilities and/or format of the media content supported by the browser and/or media player of the requesting device which is considered technically equivalent to the above step/feature of claim 1. Thus, the subject-matter of claim 1 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 in combination with the common knowledge of the person skilled in the art.

The above argumentation (§2.1) also applies to the corresponding independent claims 9, 14 the subject-matter of which also lacks an inventive step Article 33(3) PCT.

2.2 The subject-matter of dependent claim 2 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 26, lines 1-3; paragraph 64, lines 1-4; paragraph 96, lines 2-4; paragraph 105, lines 1-2).

2.3 The subject-matter of dependent claim 3 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 4, lines 1-2).

2.4 The subject-matter of dependent claim 4 relates to the use of a software development kit corresponding to the device type. The document D1 does not explicitly disclose a Software Development Kit (SDK) used on per device basis. However, D1 (paragraph 44, 71) explicitly teaches that the RSS document/file can be requested by different types of devices, e.g., desktop computer, PDA, wireless phone, obviously using different types of operating systems, browsers, and/or media players, which implies that the attributes/elements, e.g., instruction set, of said RSS file must be adapted/generated by a computer program/module, e.g., SDK, corresponding to the type of the requesting device. Thus, this step/feature cannot involve an inventive step in the sense of Article 33(3) PCT.

2.5 The subject-matter of dependent claims 5-7 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 82, lines 1-6).

2.6 The subject-matter of dependent claim 8 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 68, lines 5-14; paragraph 71, lines 10-15; paragraph 73,lines 9-15; paragraph 138, lines 1-5).

The above objections (§2.2 - §2.6) against dependent claims 2-8 also applies to the corresponding dependent claims 10-13, 15 the subject-matter of which also lacks an inventive step Article 33(3) PCT.

Re Item VIII. (Clarity)

3. The expression "first instruction set" is not supported by the description and the drawings. In the computer field the term *instruction* has a well defined technical

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meaning, namely, an instruction is a single operation of a processor defined by its instruction set. However, in the light of the description (and claim 2) it appears that the above set rather defines attributes/parameters (e.g., a method for receiving chunks, bit rate, or advertisements) describing/controlling the streaming/playback of the media content. The foregoing interpretation is used for the rest of this written opinion.

The above objection (§3) also applies to the expression "a second instruction set" used in independent claim 1.

The above objections (§3) also applies to the use of the same expressions/terms in the corresponding independent claims 9 and 14.

Petitioner Disney Ex-1004, 0757

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
McMillan, Scott
Kilpatrick Townsend & Stockton LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
ETATS-UNIS D'AMERIQUE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 5 April 2013 (05-04-2013)
Applicant's or agent's file reference 92853858104P	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2012/071629	International filing date *(day/month/year)* 26 December 2012 (26-12-2012)

Applicant

UNICORN MEDIA, INC.

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	HUYSING-SOLLES, Henriëtte Tel: +31 (0)70 340-2585

Form PCT/ISA/220 (July 2010)

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
92853858104P		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2012/071629	26/12/2012	29/12/2011
Applicant		
UNICORN MEDIA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] the international application in the language in which it was filed
      [ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 14
      [X] as suggested by the applicant
      [ ] as selected by this Authority, because the applicant failed to suggest a figure
      [ ] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

Petitioner Disney Ex-1004, 0759

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/071629

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F17/30
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/129907 A1 (VOLK ANDREW R [US] ET AL) 15 June 2006 (2006-06-15) abstract paragraph [0003] - paragraph [0006] paragraph [0009] - paragraph [0014] paragraph [0019] - paragraph [0027] paragraph [0040] - paragraph [0045] paragraph [0051] - paragraph [0060] paragraph [0064] - paragraph [0071] paragraph [0073] - paragraph [0076] paragraph [0080] - paragraph [0092] paragraph [0096] - paragraph [0125] paragraph [0130] - paragraph [0147] paragraph [0151] - paragraph [0153] ----- -/--	1-15

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

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 March 2013	05/04/2013

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

2

Form PCT/ISA/210 (second sheet) (April 2005)

Petitioner Disney Ex-1004, 0760

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/071629

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010 (2010-12-23) abstract paragraph [0001] - paragraph [0008] paragraph [0023] - paragraph [0037] paragraph [0047] - paragraph [0058] paragraph [0060] - paragraph [0070] paragraph [0074] - paragraph [0075] -----	1-15
A	US 2001/029525 A1 (LAHR NILS B [US]) 11 October 2001 (2001-10-11) abstract paragraph [0004] - paragraph [0006] paragraph [0017] - paragraph [0022] paragraph [0032] paragraph [0038] paragraph [0044] paragraph [0054] - paragraph [0059] -----	1-15

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

Petitioner Disney Ex-1004, 0761

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/071629

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006129907 A1	15-06-2006	NONE	
AU 2010202741 B1	23-12-2010	AU 2010202741 B1	23-12-2010
		US 2012005312 A1	05-01-2012
		US 2012185608 A1	19-07-2012
US 2001029525 A1	11-10-2001	AU 3657101 A	07-08-2001
		US 2001029525 A1	11-10-2001
		WO 0155913 A1	02-08-2001

Petitioner Disney Ex-1004, 0762

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/071629	26.12.2012	29.12.2011

International Patent Classification (IPC) or both national classification and IPC
INV. G06F17/30

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Boyadzhiev, Yavor Telephone No. +31 70 340-4548

Form PCT/ISA/237 (Cover Sheet) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2012/071629

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Petitioner Disney Ex-1004, 0765

Re Item V.

1. Reference is made to the following documents (D1-D3):

D1 US 2006/129907 A1 (VOLK ANDREW R [US] ET AL) 15 June 2006

D2 AU 2010 202 741 B1 (UNICORN MEDIA INC) 23 December 2010

D3 US 2001/029525 A1 (LAHR NILS B [US]) 11 October 2001 (2001-10-11)

Article 33(3) PCT

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-15, as interpreted by the examiner (see §3), does not involve an inventive step in the sense of Article 33(3) PCT.

INDEPENDENT CLAIM 1 (see §3)

2.1 The document D1 discloses: A method for enabling customized media file delivery via a data network (The abstract, lines 1-4, "System ... document."), the method comprising:
extracting first contextual data from a first URL request for a media file, wherein the first URL request is received via the data network and corresponds to a first device type (paragraph 75, lines 1-9, "In the ... providers."; paragraph 76, lines 5 and 6, "On the ... RSS feed.");
processing the first contextual data using syndication information to generate a first instruction set in a first format (paragraph 20, lines 1-3, In ... browser."; paragraph 45, lines 3-10, "Additionally ... characteristics ...");
sending the first instruction set via the data network (paragraph 78, lines 1-7, "Network ... feeds.");
extracting second contextual data from a second URL request for the media file, wherein the second URL request is received via the data network and corresponds to a second device type (paragraph 71, lines 10-13, "In ... any other device ..."; paragraph 75, lines 1-9, "In the ... providers."; paragraph 76, lines 5 and 6, "On the ... RSS feed.");
processing the second contextual data using the syndication information to generate a second instruction set in a second format (paragraph 23, lines 1-12, "In ... information."; paragraph 27, lines 1-6, "In ... form; paragraph 44, lines 1-11, "In ... exist."), and
sending the second instruction set via the data network (paragraph 78, lines 1-7, "Network ... feeds.").

The document D1 does not explicitly disclose that a second contextual data from a second URL request for the media file is extracted. However, D1 explicitly discloses

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(paragraphs , 44, 45, 71) that different types of devices, e.g., desktop computer, PDA, wireless phone, are able to request a specific URL, associated with RSS document/ file, according to the capabilities and/or format of the media content supported by the browser and/or media player of the requesting device which is considered technically equivalent to the above step/feature of claim 1. Thus, the subject-matter of claim 1 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 in combination with the common knowledge of the person skilled in the art.

The above argumentation (§2.1) also applies to the corresponding independent claims 9, 14 the subject-matter of which also lacks an inventive step Article 33(3) PCT.

2.2 The subject-matter of dependent claim 2 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 26, lines 1-3; paragraph 64, lines 1-4; paragraph 96, lines 2-4; paragraph 105, lines 1-2).

2.3 The subject-matter of dependent claim 3 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 4, lines 1-2).

2.4 The subject-matter of dependent claim 4 relates to the use of a software development kit corresponding to the device type. The document D1 does not explicitly disclose a Software Development Kit (SDK) used on per device basis. However, D1 (paragraph 44, 71) explicitly teaches that the RSS document/file can be requested by different types of devices, e.g., desktop computer, PDA, wireless phone, obviously using different types of operating systems, browsers, and/or media players, which implies that the attributes/elements, e.g., instruction set, of said RSS file must be adapted/generated by a computer program/module, e.g., SDK, corresponding to the type of the requesting device. Thus, this step/feature cannot involve an inventive step in the sense of Article 33(3) PCT.

2.5 The subject-matter of dependent claims 5-7 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 82, lines 1-6).

2.6 The subject-matter of dependent claim 8 lacks an inventive step in the sense of Article 33(3) PCT over the teaching of D1 (paragraph 68, lines 5-14; paragraph 71, lines 10-15; paragraph 73,lines 9-15; paragraph 138, lines 1-5).

The above objections (§2.2 - §2.6) against dependent claims 2-8 also applies to the corresponding dependent claims 10-13, 15 the subject-matter of which also lacks an inventive step Article 33(3) PCT.

Re Item VIII. (Clarity)

3. The expression "first instruction set" is not supported by the description and the drawings. In the computer field the term *instruction* has a well defined technical

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meaning, namely, an instruction is a single operation of a processor defined by its instruction set. However, in the light of the description (and claim 2) it appears that the above set rather defines attributes/parameters (e.g., a method for receiving chunks, bit rate, or advertisements) describing/controlling the streaming/playback of the media content. The foregoing interpretation is used for the rest of this written opinion.

The above objection (§3) also applies to the expression "a second instruction set" used in independent claim 1.

The above objections (§3) also applies to the use of the same expressions/terms in the corresponding independent claims 9 and 14.

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Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.
Amending claims under Art. 19 PCT	Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.
Filing a demand for international preliminary examination	In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT). If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).
Filing informal comments	After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.
End of the international phase	At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).
Relevant PCT Rules and more information	Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

US 20060129907A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0129907 A1**

Volk et al. (43) **Pub. Date: Jun. 15, 2006**

(54) **SYNDICATING MULTIMEDIA INFORMATION WITH RSS**

(76) Inventors: **Andrew R. Volk**, San Francisco, CA (US); **David D. Hall**, New York, NY (US); **John J. Thrall**, San Francisco, CA (US)

Correspondence Address:
GREENBERG TRAURIG, LLP
MET LIFE BUILDING
200 PARK AVENUE
NEW YORK, NY 10166 (US)

(21) Appl. No.: **11/291,401**

(22) Filed: **Dec. 1, 2005**

Related U.S. Application Data

(60) Provisional application No. 60/633,295, filed on Dec. 3, 2004.

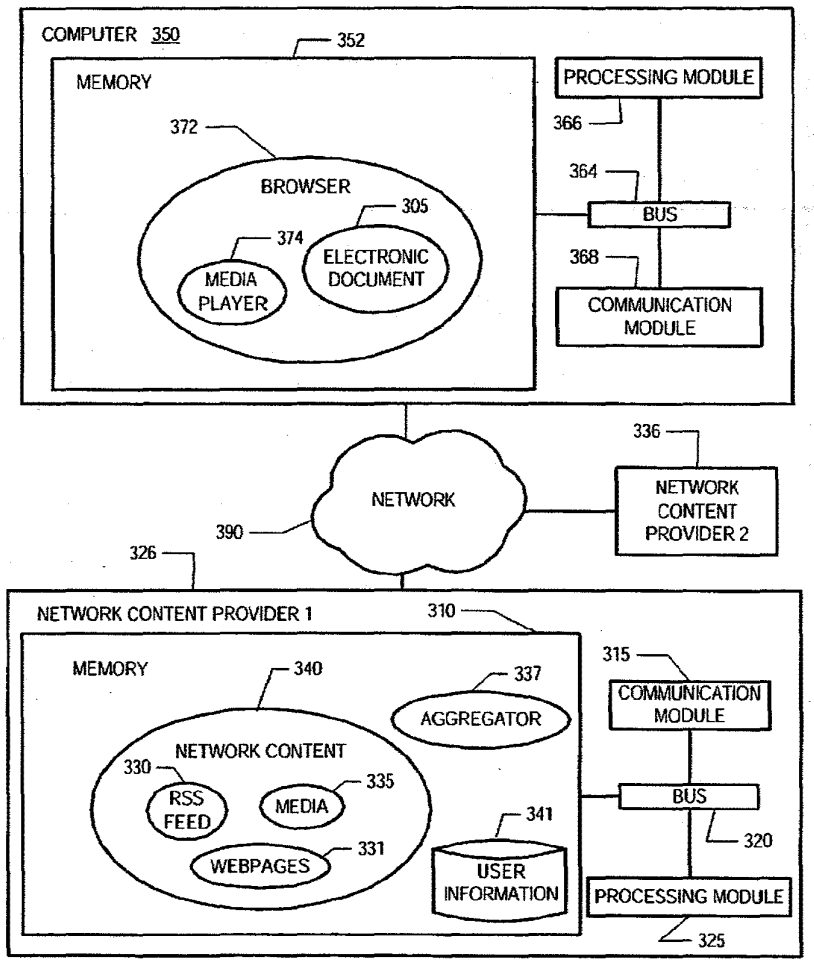
Publication Classification

(51) **Int. Cl.**
G06F 17/21 (2006.01)

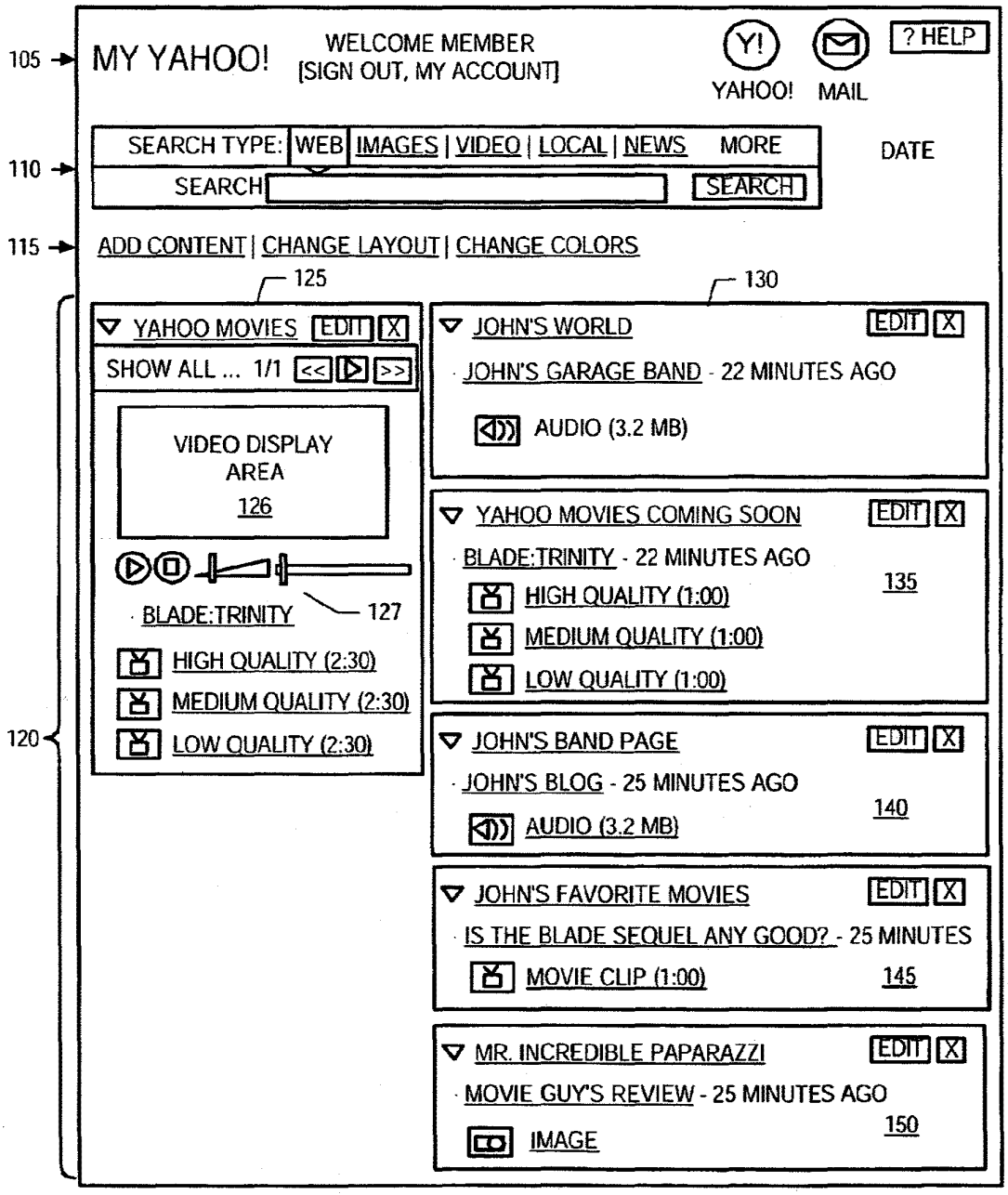
(52) **U.S. Cl.** **715/500**

(57) **ABSTRACT**

System and method for adding descriptive information to a Real Simple Syndication (RSS) document. The descriptive information describes the content of media objects syndicated through the document. The descriptive information can be used to provided additional information to a subscriber, and can be used in searching for syndicated media content.

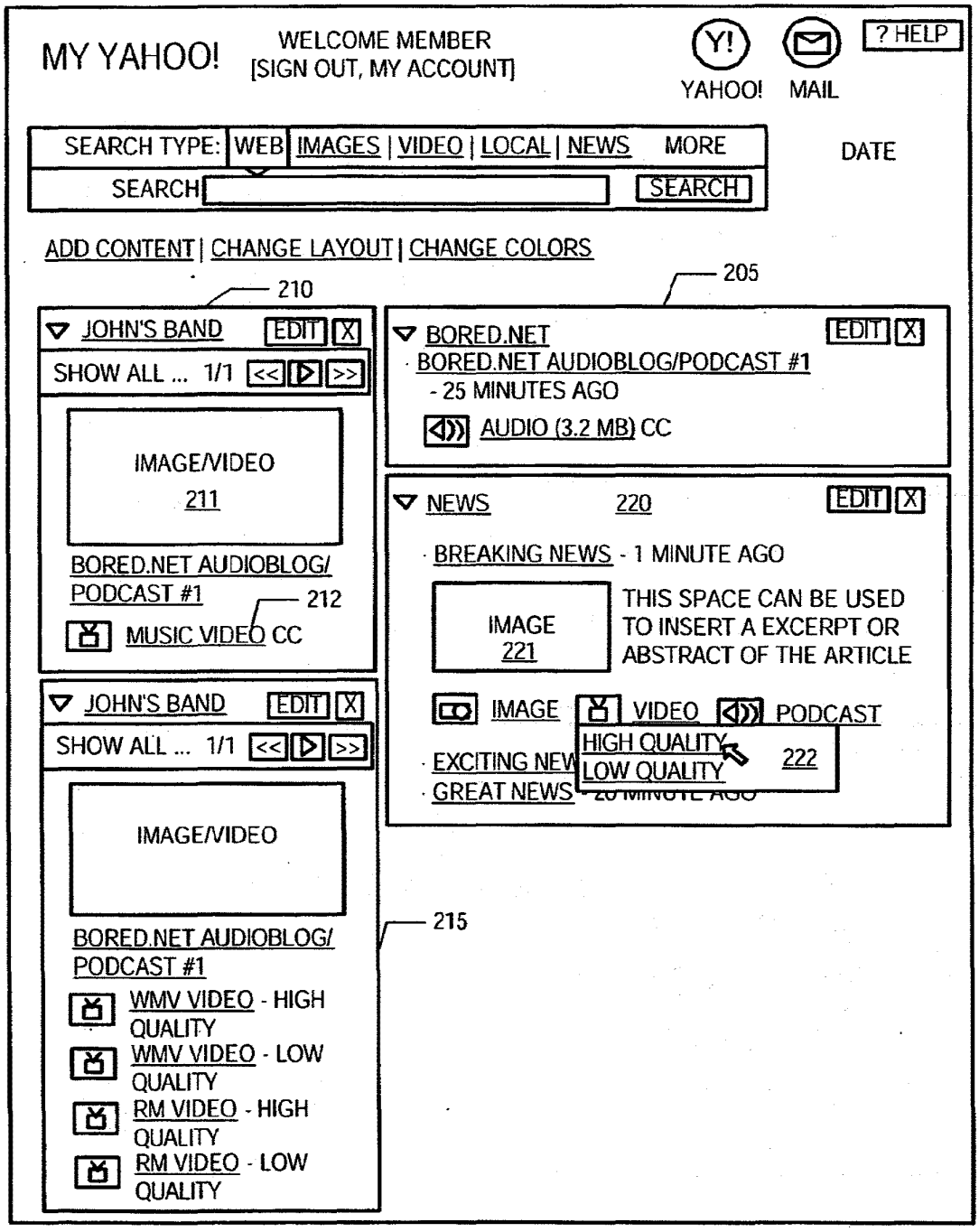


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105
MY YAHOO!
WELCOME MEMBER
[SIGN OUT, MY ACCOUNT]
Y!
YAHOO!
MAIL
? HELP
110
SEARCH TYPE: WEB | IMAGES | VIDEO | LOCAL | NEWS MORE
SEARCH
SEARCH
DATE
115
ADD CONTENT | CHANGE LAYOUT | CHANGE COLORS
125
130
YAHOO MOVIES EDIT X
SHOW ALL ... 1/1 << >>
VIDEO DISPLAY AREA
126
BLADE:TRINITY
127
HIGH QUALITY (2:30)
MEDIUM QUALITY (2:30)
LOW QUALITY (2:30)
120
JOHN'S WORLD EDIT X
JOHN'S GARAGE BAND - 22 MINUTES AGO
AUDIO (3.2 MB)
YAHOO MOVIES COMING SOON EDIT X
BLADE:TRINITY - 22 MINUTES AGO
HIGH QUALITY (1:00)
MEDIUM QUALITY (1:00)
LOW QUALITY (1:00)
135
JOHN'S BAND PAGE EDIT X
JOHN'S BLOG - 25 MINUTES AGO
AUDIO (3.2 MB)
140
JOHN'S FAVORITE MOVIES EDIT X
IS THE BLADE SEQUEL ANY GOOD? - 25 MINUTES
MOVIE CLIP (1:00)
145
MR. INCREDIBLE PAPARAZZI EDIT X
MOVIE GUY'S REVIEW - 25 MINUTES AGO
IMAGE
150

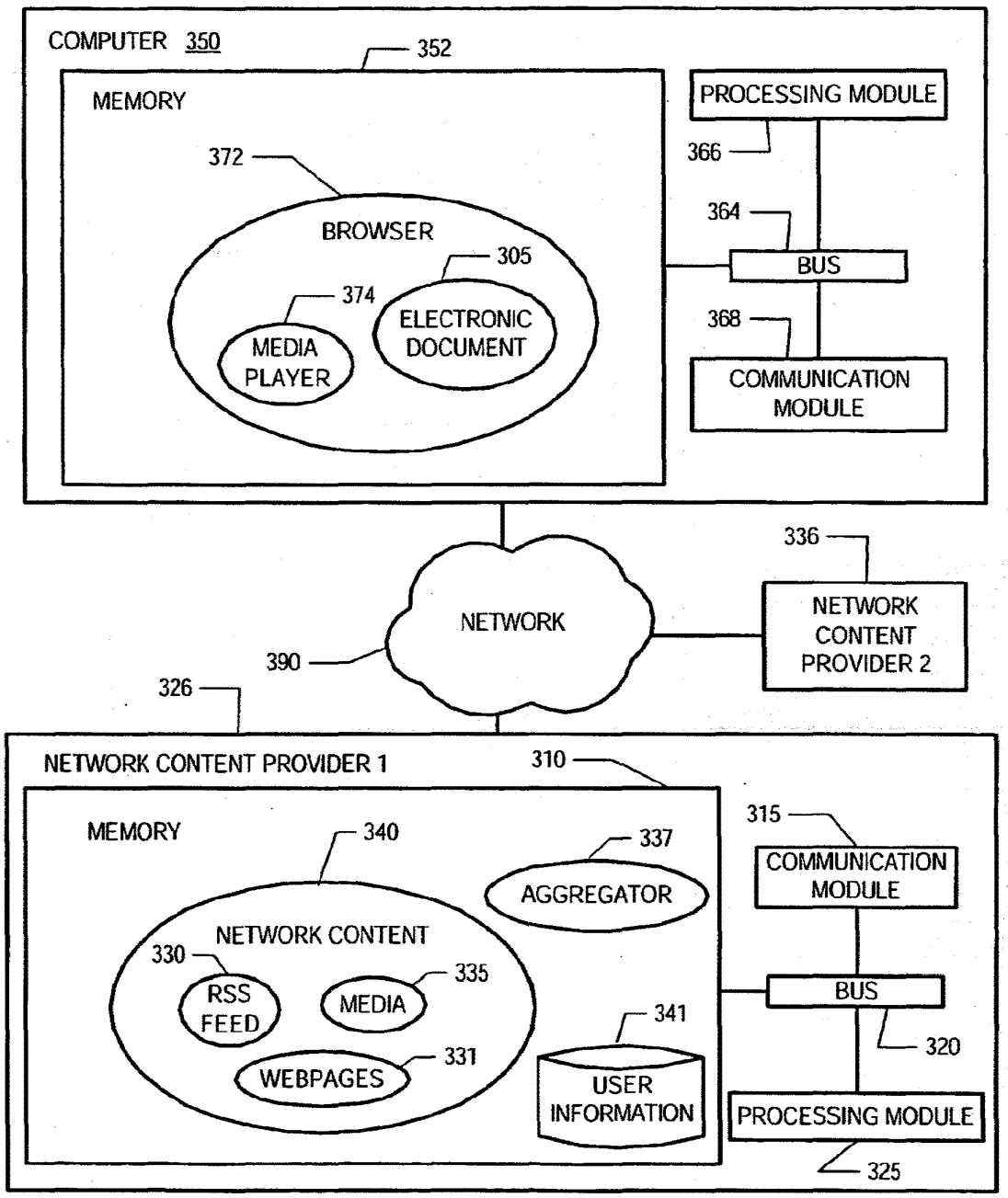
100

FIG. 1


MY YAHOO!
WELCOME MEMBER
[SIGN OUT, MY ACCOUNT]
Y!
YAHOO!
MAIL
? HELP
SEARCH TYPE: WEB | IMAGES | VIDEO | LOCAL | NEWS MORE
DATE
SEARCH
SEARCH
ADD CONTENT | CHANGE LAYOUT | CHANGE COLORS
210
205
JOHN'S BAND
EDIT
X
SHOW ALL ... 1/1
<<
>>
IMAGE/VIDEO
211
BORED.NET AUDIOBLOG/
PODCAST #1
212
MUSIC VIDEO CC
BORED.NET
BORED.NET AUDIOBLOG/PODCAST #1
- 25 MINUTES AGO
AUDIO (3.2 MB) CC
NEWS
220
BREAKING NEWS - 1 MINUTE AGO
IMAGE
221
THIS SPACE CAN BE USED TO INSERT A EXCERPT OR ABSTRACT OF THE ARTICLE
IMAGE
VIDEO
PODCAST
HIGH QUALITY
LOW QUALITY
222
EXCITING NEW
GREAT NEWS
JOHN'S BAND
EDIT
X
SHOW ALL ... 1/1
<<
>>
IMAGE/VIDEO
215
BORED.NET AUDIOBLOG/
PODCAST #1
WMV VIDEO - HIGH QUALITY
WMV VIDEO - LOW QUALITY
RM VIDEO - HIGH QUALITY
RM VIDEO - LOW QUALITY

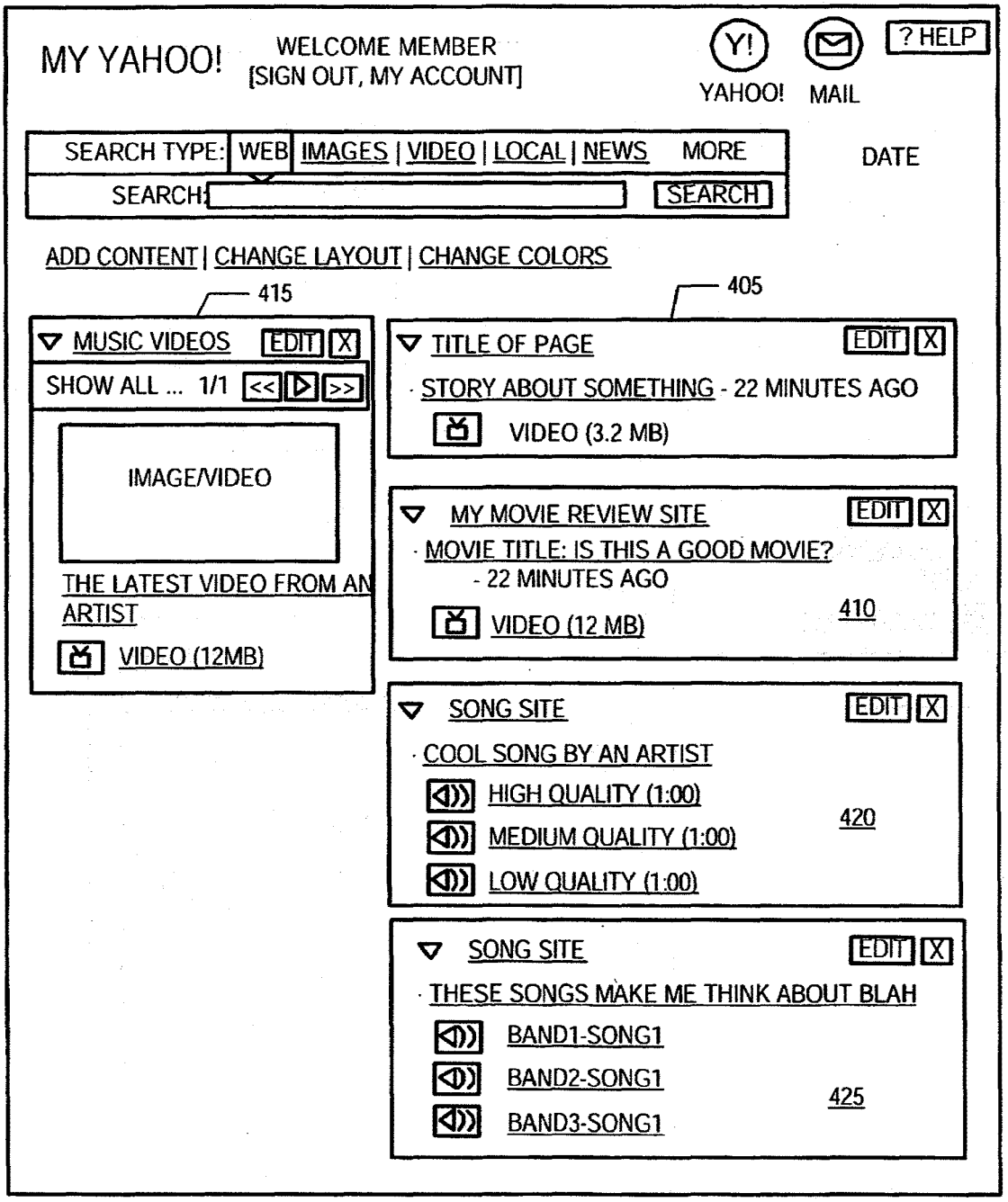
200

FIG. 2


COMPUTER 350
352
MEMORY
372
BROWSER
305
374
ELECTRONIC DOCUMENT
MEDIA PLAYER
PROCESSING MODULE
366
364
BUS
368
COMMUNICATION MODULE
336
NETWORK
NETWORK CONTENT PROVIDER 2
390
326
NETWORK CONTENT PROVIDER 1
310
MEMORY
340
337
AGGREGATOR
NETWORK CONTENT
330
RSS FEED
MEDIA
335
WEBPAGES
331
341
USER INFORMATION
315
COMMUNICATION MODULE
BUS
320
PROCESSING MODULE
325

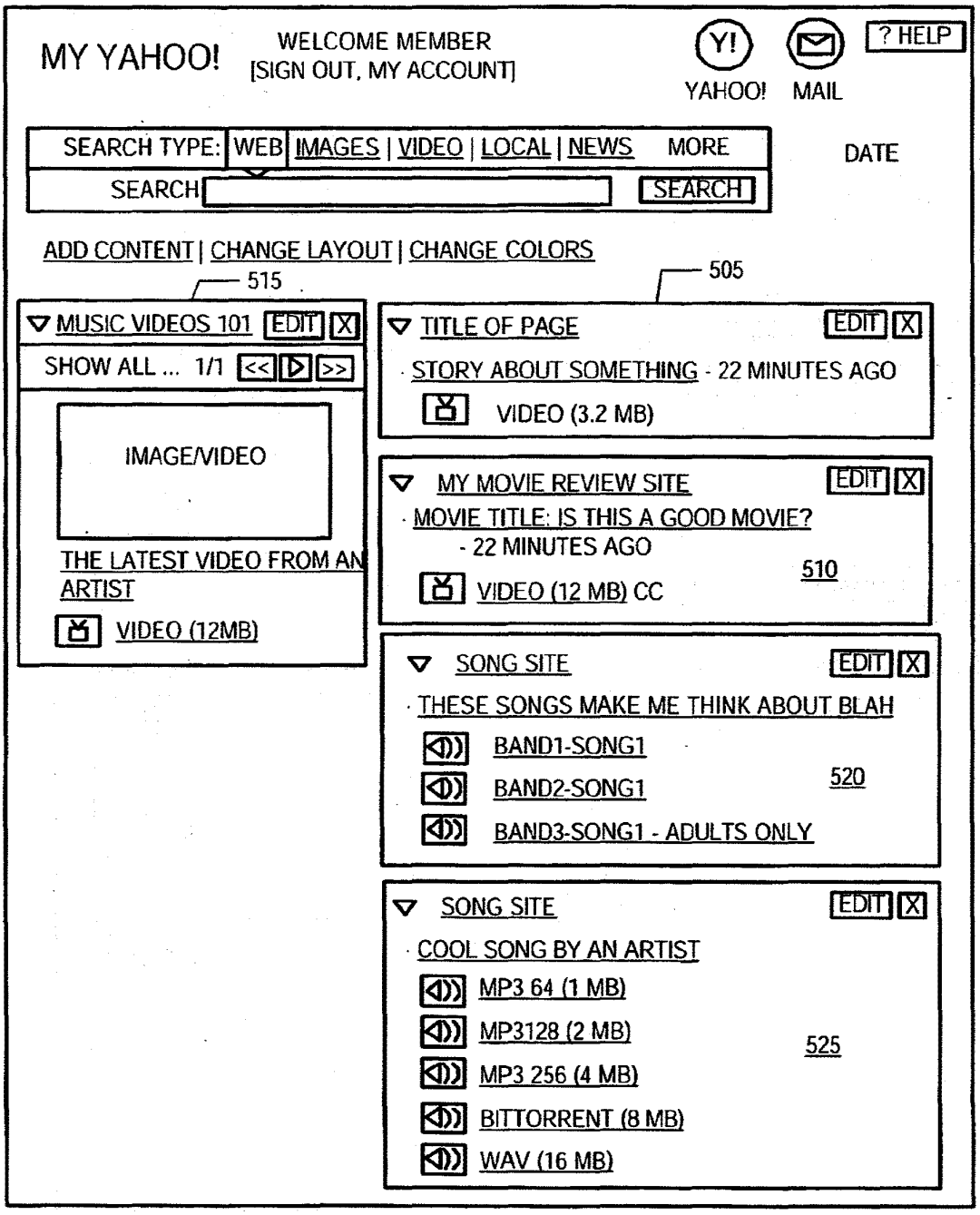
300

FIG. 3


MY YAHOO!
WELCOME MEMBER
[SIGN OUT, MY ACCOUNT]
Y!
YAHOO!
MAIL
? HELP
SEARCH TYPE: WEB | IMAGES | VIDEO | LOCAL | NEWS MORE
DATE
SEARCH:
SEARCH
ADD CONTENT | CHANGE LAYOUT | CHANGE COLORS
415
405
MUSIC VIDEOS EDIT X
SHOW ALL ... 1/1 << >>
IMAGE/VIDEO
THE LATEST VIDEO FROM AN ARTIST
VIDEO (12MB)
TITLE OF PAGE EDIT X
· STORY ABOUT SOMETHING - 22 MINUTES AGO
VIDEO (3.2 MB)
MY MOVIE REVIEW SITE EDIT X
· MOVIE TITLE: IS THIS A GOOD MOVIE?
- 22 MINUTES AGO
VIDEO (12 MB)
410
SONG SITE EDIT X
· COOL SONG BY AN ARTIST
HIGH QUALITY (1:00)
MEDIUM QUALITY (1:00)
LOW QUALITY (1:00)
420
SONG SITE EDIT X
· THESE SONGS MAKE ME THINK ABOUT BLAH
BAND1-SONG1
BAND2-SONG1
BAND3-SONG1
425

400

FIG. 4


MY YAHOO!
WELCOME MEMBER
[SIGN OUT, MY ACCOUNT]
YAHOO!
MAIL
? HELP
SEARCH TYPE: WEB | IMAGES | VIDEO | LOCAL | NEWS MORE
DATE
SEARCH
SEARCH
ADD CONTENT | CHANGE LAYOUT | CHANGE COLORS
515
505
MUSIC VIDEOS 101 EDIT X
SHOW ALL ... 1/1 << >>
IMAGE/VIDEO
THE LATEST VIDEO FROM AN ARTIST
VIDEO (12MB)
TITLE OF PAGE EDIT X
STORY ABOUT SOMETHING - 22 MINUTES AGO
VIDEO (3.2 MB)
MY MOVIE REVIEW SITE EDIT X
MOVIE TITLE: IS THIS A GOOD MOVIE?
- 22 MINUTES AGO
VIDEO (12 MB) CC
510
SONG SITE EDIT X
THESE SONGS MAKE ME THINK ABOUT BLAH
BAND1-SONG1
BAND2-SONG1
BAND3-SONG1 - ADULTS ONLY
520
SONG SITE EDIT X
COOL SONG BY AN ARTIST
MP3 64 (1 MB)
MP3128 (2 MB)
MP3 256 (4 MB)
BITTORRENT (8 MB)
WAV (16 MB)
525

500

FIG. 5

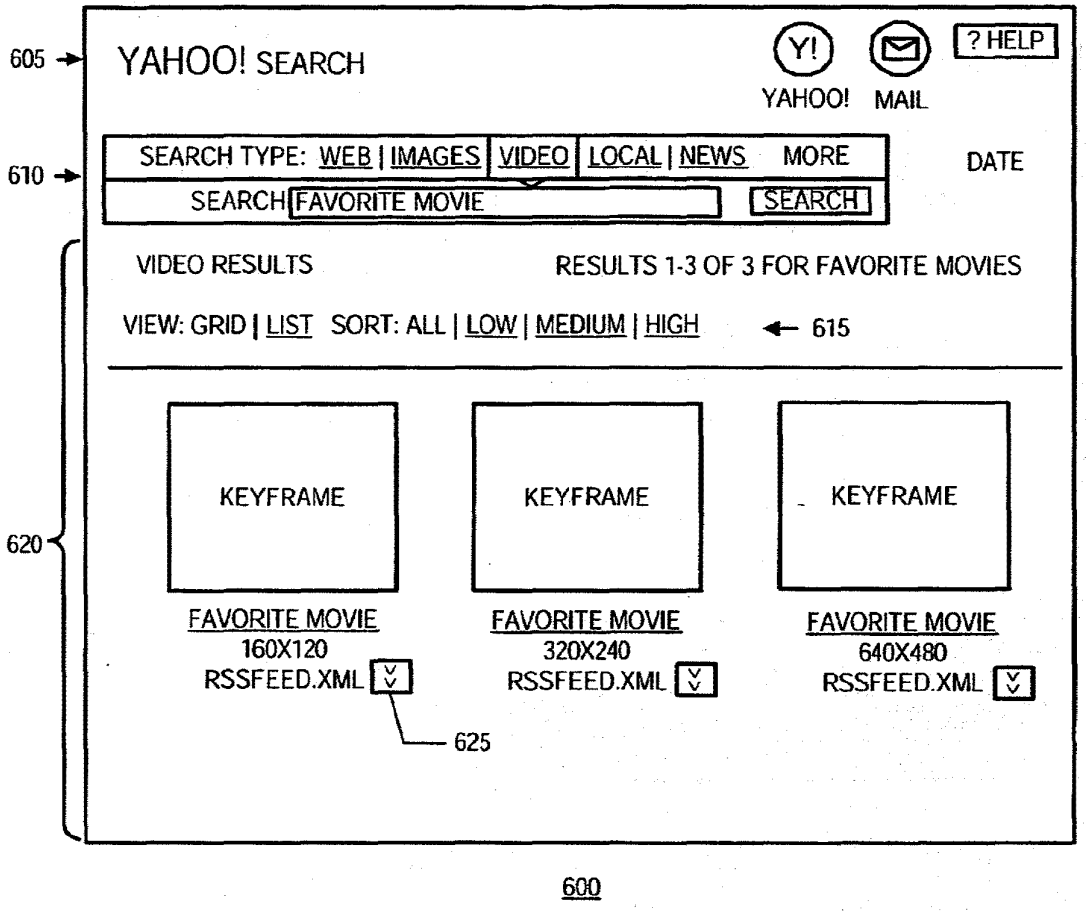

605
YAHOO! SEARCH
Y!
YAHOO!
MAIL
? HELP
610
SEARCH TYPE: WEB | IMAGES | VIDEO | LOCAL | NEWS MORE
DATE
SEARCH FAVORITE MOVIE
SEARCH
VIDEO RESULTS
RESULTS 1-3 OF 3 FOR FAVORITE MOVIES
VIEW: GRID | LIST SORT: ALL | LOW | MEDIUM | HIGH
615
620
KEYFRAME
KEYFRAME
KEYFRAME
FAVORITE MOVIE
160X120
RSSFEED.XML
FAVORITE MOVIE
320X240
RSSFEED.XML
FAVORITE MOVIE
640X480
RSSFEED.XML
625
600

FIG. 6

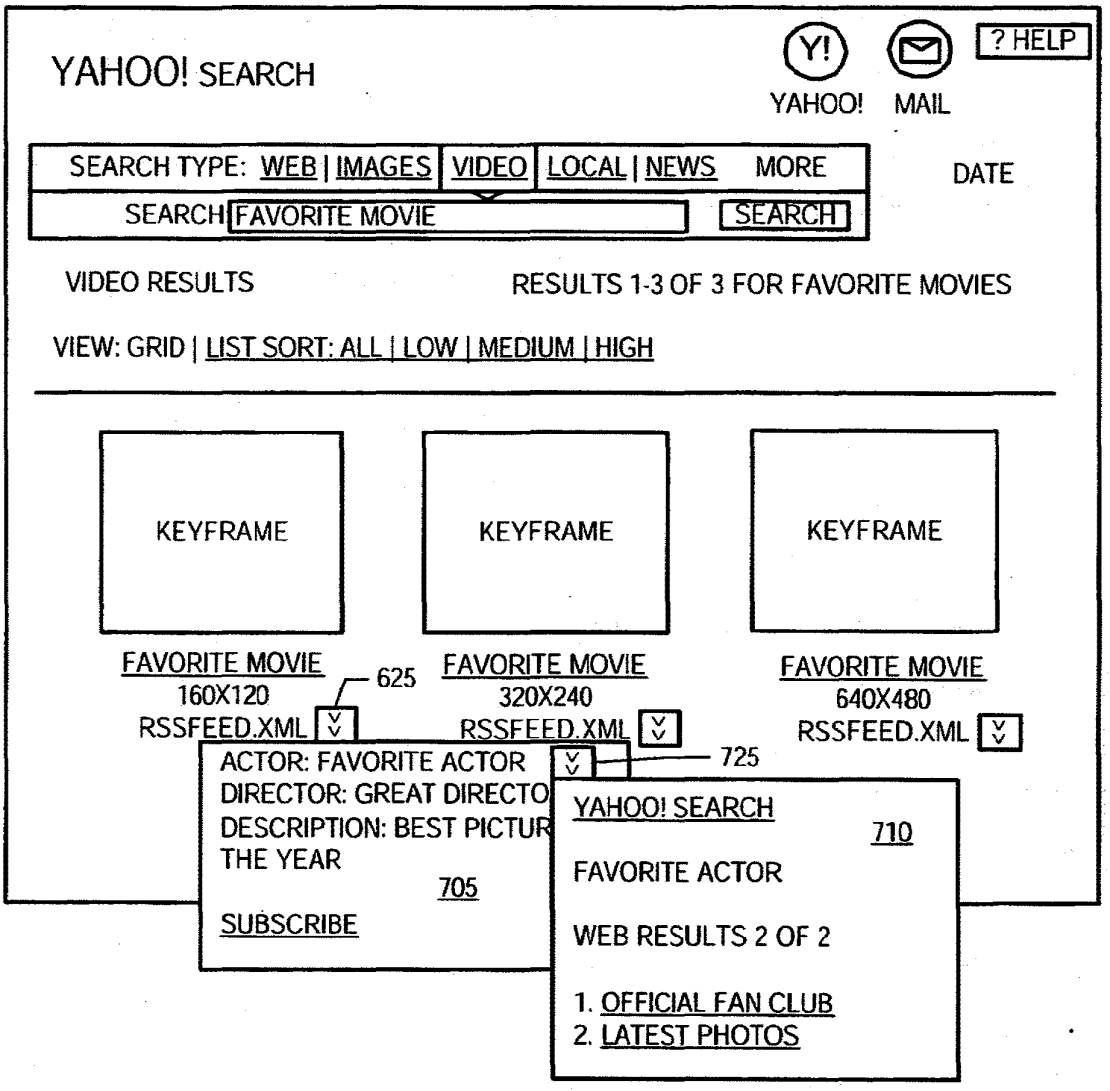

YAHOO! SEARCH
Y!
YAHOO!
MAIL
? HELP
SEARCH TYPE: WEB | IMAGES | VIDEO | LOCAL | NEWS MORE
DATE
SEARCH FAVORITE MOVIE
SEARCH
VIDEO RESULTS
RESULTS 1-3 OF 3 FOR FAVORITE MOVIES
VIEW: GRID | LIST SORT: ALL | LOW | MEDIUM | HIGH
KEYFRAME
KEYFRAME
KEYFRAME
FAVORITE MOVIE
160X120
RSSFEED.XML
625
FAVORITE MOVIE
320X240
RSSFEED.XML
FAVORITE MOVIE
640X480
RSSFEED.XML
ACTOR: FAVORITE ACTOR
DIRECTOR: GREAT DIRECTO
DESCRIPTION: BEST PICTUR
THE YEAR
705
SUBSCRIBE
725
YAHOO! SEARCH
710
FAVORITE ACTOR
WEB RESULTS 2 OF 2
1. OFFICIAL FAN CLUB
2. LATEST PHOTOS

FIG. 7

SYNDICATING MULTIMEDIA INFORMATION WITH RSS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 60/633,295, filed Dec. 3, 2004, entitled SYSTEM AND METHOD FOR PROVIDING MULTIMEDIA FUNCTIONALITY WITH REALLY SIMPLE SYNDICATION, which is hereby incorporated herein by reference.

FIELD OF THE INVENTION

[0002] This invention relates to the field of multimedia and the World Wide Web, and specifically to improve handling of the multimedia content utilizing Really Simple Syndication (RSS).

BACKGROUND OF THE INVENTION

[0003] Really Simple Syndication, or RSS as it is known, is a dialect of the extensible markup language (XML) specification, which is used for providing content over the Internet and especially the World Wide Web. RSS permits the creation of documents and files in accordance with known parameters so that developers and publishers can readily produce content for access and retrieval over the World Wide Web in a simple manner.

[0004] RSS documents are elements within the XML language, which designates constituent portions as "elements." RSS files or documents contain certain mandatory elements and certain optional elements. Thus, an RSS document is a <rss> element. Subordinate to the <rss> element is a single <channel> element, which contains information about the channel, namely metadata, and its contents. Subordinate elements are also known as subelements. Therefore, the <channel> element is a subelement of the <rss> element. The <channel> element has certain required elements and certain optional elements. Examples of required channel elements are the <title>, <link> and <description>. The <title> element is the name of the channel, which is how users having access to the channel would refer to the source of the particular RSS documents being published, typically a website. The <link> element is the actual URL to the website corresponding to the channel. The <description> element is a plain text phrase or sentence that describes the channel. Optional channel elements include the language that the channel is written in, an email address for a webmaster, a publication date, and others.

[0005] RSS also permits the inclusion of images as a subelement of <channel>. Another subelement of a channel is the <item > subelement. The <channel> may contain any number of <item> elements. An item may represent a story much like a story in a newspaper or magazine. An item may contain an <enclosure> subelement that can be used to associate one media object with an item. The <enclosure> subelement of <item> has three required attributes, namely URL, length and type. An example of an enclosure representation is indicated below:

```
<enclosure url="http://www.scripting.com/mp3s/weatherReportSuite.mp3"
    length="12216320" type="audio/mpeg" />
```

[0006] The enclosure element includes information that describes characteristics of the media object itself, such as, the length of the object and the type of the object. but the enclosure element does not include information that describes the user perceptible content of the media object, such as, the author of the weather report, or a text transcript of the weather report. Nor does the enclosure element include information related to the intellectual property rights associated with the media object.

[0007] A description of the media object's content can be included using a <description> subelement, but unfortunately, the description element is a non-specific element that can comprise unrelated data in no specific order. There is no standard for including information, such as, keywords, credits or text transcripts, in a description element, thus different RSS aggregators cannot render descriptive information about a media object consistently, and search engines and/or web crawlers cannot easily categorize and/or produce search results using the descriptive information. In addition, the <description> element can apply either to the <item> element or the <enclosure> element, and is therefore nondeterministic as to what the <description> element is describing. Accordingly, there is a desire, but no current solution, to syndicate media with additional descriptive information in a standard format, which describes the content of the media object with a greater level of specificity.

[0008] While a media object can be included with an item element using an <enclosure> element, unfortunately, each item element only supports one enclosure subelement. Therefore, if a media object is available in multiple video formats or multiple quality levels, a single item element cannot comprise all the available versions of the media object. A separate item element has to be created for each version. This makes it more difficult for aggregators to render multiple related media objects since each media object is under its own <item> and there is no standard for determining which <item> elements have related media objects. For example, all the films showed at a film festival cannot be grouped under a single item heading. Accordingly, there is a desire to syndicate multiple media objects under a single item element. Multiple media objects under a single item element allows syndicators to group related media objects for better organization, easier searchability and more efficient code.

[0009] In addition, while the <enclosure> element allows for the syndication of media objects, a URL providing a direct link to the media object must be provided. In some instances, a content provider may want to allow users to listen and/or view the content of the media object, but would like to limit the user's access to the media object itself. In other words, a content provider may want to allow a user to see and/or hear the content of a media object, but may not want the user to have access to a copy of the media object file that they can distribute. Therefore, there is a desire for methods and systems to limit a user's access to a media object itself in an RSS document.

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SUMMARY OF THE INVENTION

[0010] The invention as described and claimed herein satisfies this and other needs, which will be apparent from the teachings herein.

[0011] In one embodiment, an electronic document, such as, for example, a Real Simple Syndication (RSS) file comprises a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object. The electronic document also comprises a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising, descriptive information, the descriptive information being related to the media object's content, and a predefined tag that identifies a predefined type of the descriptive information.

[0012] In one embodiment, the electronic document further comprises legal information that sets forth an intellectual property right associated with the media object.

[0013] In one embodiment, the descriptive information comprises a keyword that describes the media object's content. In one embodiment, the descriptive information identifies an image that describes the media object. In one embodiment, the descriptive information is a universal resource identifier that identifies an image associated with the media object. In one embodiment, the descriptive information comprises a taxonomy of the media object, wherein the taxonomy of the media object is used to categorize the media object. In one embodiment, the electronic document of claim **1**, wherein the descriptive information comprises at least one entity that contributed to the creation of the media object. In one embodiment, the descriptive information comprises a text transcript of the words embodied in the media object. In one embodiment, the descriptive information comprises a bitrate. In one embodiment, the descriptive information comprises information identifying any one or more than one of an actor's role, a title, a cast, an artist, a director, a producer, a studio, a publisher, an album or a year associated with the media object.

[0014] In one embodiment, the first element identifies the media object via a universal resource identifier. In one embodiment, the second element identifies the media object via a universal resource identifier.

[0015] In one embodiment, the electronic document can further comprising a namespace declaration.

[0016] In one embodiment, a tag in the electronic document has a syntax comprising a less than symbol, a namespace, a colon, the predefined type and a greater than symbol. In one embodiment, the tag comprises the following syntax <media:content>. In one embodiment, the tag comprises the following syntax <media:category>. In one embodiment, the tag further comprises an attribute.

[0017] In one embodiment, the second element is a subelement of the first element. In one embodiment, the first element is an enclosure element. In one embodiment, at least one of the first element and the second element further comprises at least one attribute, the attribute comprising the descriptive information.

[0018] In one embodiment, a computer application, comprises computer code defining at least one routine, the at least one routine being operable to render an electronic document, the electronic document comprising, a first element written in a computer language. the language comprising a real simple syndication syntax, the element identifying a media object; and a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising, descriptive information, the descriptive information being related to the media object's content, and a predefined tag that identifies a predefined type of the descriptive information.

[0019] In one embodiment, the second element of an electronic document rendered by the computer application further comprises legal information that sets forth an intellectual property right associated with the media object.

[0020] In one embodiment, the computer application is a real simple syndication aggregator. In one embodiment, the computer application is a browser.

[0021] In one embodiment, if a pointer is positioned over a rendered element, the computer application renders an additional user perceptible object. In one embodiment, the additional user perceptible object is a window overlaid over the rendered element, the window comprising the descriptive information.

[0022] In one embodiment, the computer application is an extension to a second computer application. In one embodiment, the extension is a media player plugin.

[0023] In one embodiment, a system for syndicating media comprises a syndicating computer, the syndicating computer being operable to transmit to a user computer an electronic document comprising, a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising, descriptive information, the descriptive information being related to the media object's content, and a predefined tag that identifies a predefined type of the descriptive information.

[0024] In one embodiment, the second element of the electronic document transmitted by the syndicating computer further comprises legal information that sets forth an intellectual property right associated with the media object.

[0025] In one embodiment, a method of syndicating media comprises, transmitting an electronic document to a computer, the electronic document comprising, a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising, descriptive information, the descriptive information being related to the media object's content, and a predefined tag that identifies a predefined type of the descriptive information.

[0026] In one embodiment, the second element of a transmitted electronic document further comprises legal information that sets forth an intellectual property right associated with the media object.

[0027] In one embodiment, the first element of a transmitted electronic document identifies the media object via a universal resource identifier, and the universal resource identifier further identifies a media player, the media player

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being operable to render the media object into a user perceptible form. In one embodiment, the method of syndicating media further comprises receiving at least some part of the universal resource identifier; and transmitting the media object to the media player.

[0028] In one embodiment, the descriptive information can be used in a search. In one embodiment, a method of searching media comprises searching descriptive information within an electronic document comprising, a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising, descriptive information, the descriptive information being related to the media object's content, and a predefined tag that identifies a predefined type of the descriptive information.

[0029] In one embodiment, the second element of a searched electronic document further comprises legal information that sets forth an intellectual property right associated with the media object.

[0030] In one embodiment, the method of searching media further comprises receiving a search request from a user, the search request comprising a search term; searching a database of electronic documents; and returning at least one search result to the user. In one embodiment, the at least one search result identifies a media object associated with a real simple syndication document. In one embodiment, search results are sorted based on the descriptive information.

[0031] Other objects and features of the invention will become apparent from the following detailed description, considering in conjunction with the accompanying drawing figures. It is understood however, that the drawings are designed solely for the purpose of illustration and not as a definition of the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0032] The drawing figures are not to scale, are merely illustrative, and like reference numerals depict like elements throughout the several views.

[0033] **FIG. 1** illustrates a personalized homepage comprising renderings of RSS feeds according to one embodiment of the invention.

[0034] **FIG. 2** illustrates another personalized homepage comprising renderings of RSS feeds according to one embodiment of the invention.

[0035] **FIG. 3** illustrates a system implemented according to an embodiment of the invention.

[0036] **FIG. 4** illustrates a personalized homepage comprising renderings of RSS feeds according to one RSS module implemented in accordance with one embodiment of the invention.

[0037] and **5** illustrates a personalized homepage comprising renderings of RSS feeds according to one RSS module implemented in accordance with one embodiment of the invention.

[0038] **FIG. 6** illustrates a search results page comprising search results obtained according to one embodiment of the invention.

[0039] **FIG. 7** illustrates drop down menus that provide information related to topics on the search results page according to one embodiment of the invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0040] There will now be shown and described in connection with the attached drawing figures several embodiments of a standard for delivering and describing media through a real simple syndication (RSS) scheme.

[0041] The term Internet as used herein, unless otherwise specified expressly or by context, is intended to have a broad non-limiting definition, and refers, without limitation, to a global computer network and any other group of computers communicatively coupled together.

[0042] The term server as used herein, unless otherwise specified expressly or by context, is intended to have a broad non-limiting definition, and refers, without limitation, to any computer or group of computers coupled to a computer network that stores network information and provides the network information to one or more other computers on the network.

[0043] In accordance with one embodiment of the invention, a novel RSS module that supplements the <enclosure> element capabilities of RSS 2.0 to allow more robust media syndication is described. The RSS module, which is labeled Media RSS, in one embodiment, comprises one or more new elements and/or attributes that allow for the specification of multimedia content with greater particularity and expands the ability of RSS to handle more complex tasks. This provides an improved user experience in dealing with RSS documents and files that are published with included multimedia objects.

[0044] In one embodiment, a single item of multimedia content can exist in different versions of encoded files, such as versions for applications compatible with Windows Media™ as provided by Microsoft, or content in Real™ format, provided by Real Networks Inc. Such files are encoded in different formats to be compatible with those different standards. Also, in addition to the version of encoding, the content may be deliverable at different speeds, thus for a particular item of multimedia content multiple different encoded files representing different formats and speeds would exist.

[0045] In one embodiment of the invention, the association of multiple encoded files can be combined in a single item of multimedia. Additionally or separately, in one embodiment, the new media elements and/or attributes allow for the ability to call a specific URL to be associated with a specific webpage or RSS publication document, the URL invoking, for example, a particular player with desired characteristics within the presented page, thus allowing the publisher of a particular item of content to more precisely control the user experience. Additionally or separately, in one embodiment, deeper layers of metadata can be associated with the RSS files thereby allowing publishers to greatly enrich the user experience as well as track and control information provided within RSS files or documents.

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This metadata may be indexed and made searchable by computer programs, such as for example by search engines, RSS readers, pod casters, search programs or websites, to enhance the ability of multimedia content to be searched for and located on the World Wide Web. A description of expanded multimedia RSS elements and/or attributes are described below.

[0046] **FIG. 1** illustrates a personalized homepage **100** implemented in accordance with one embodiment of the invention. The personalized homepage **100** comprises a title section **105**, a search section **110**, content controls **115** and a content display area **120**. Information from a variety of web sources can be added to the content display area **120**, using content controls **115**. One type of information that can be added are RSS feeds. A personalized homepage **100** user can subscribe to one or more RSS feeds and the provider of the personalized homepage **100** can retrieve the user's feeds and render those feeds in the content display area **120**.

[0047] Content display area comprises modules **125** through **150**, which comprise rendered feeds. Some of the feeds are rendered from known RSS code and some of the feeds are rendered using one embodiment of Media RSS. The modules **125-150** are discussed below with the RSS code used to render the modules **125-150**. All rendered feeds depicted herein represent an single interpretation of the underlying code. Other personalized homepages and/or aggregators can display the code in a plurality of ways. In addition, the embodiments of the invention are not limited to RSS aggregators in personalized homepages. Stand alone aggregators, and any other computer program that can render RSS feeds can be modified to accept Media RSS.

[0048] **FIG. 2** illustrates another homepage **200** comprising additional modules discussed herein.

[0049] By way of example, a presently known RSS script is shown below:

```
<?xml version="1.0" ?>
- <rss version="2.0" xmlns:mrss="http://docs.yahoo.com/mrssModule">
  - <channel>
      <title>John's World</title>
      <link>http://www.fooblog.com</link>
      <language>en-us</language>
      <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Notepad</generator>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
    - <item>
        <title>John's garage band</title>
        <link>http://www.fooblog.com/karaoke.html</link>
        <description>My own interpretation of the national
          anthem</description>
        <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
        <guid>http://www.fooblog.com/karaoke.html</guid>
        <enclosure url="http://www.foo.com/anthem.mpg"
          length="3200000" type="video/mpeg" />
      </item>
  </channel>
</rss>
```

[0050] Module **130** of **FIG. 1** illustrates one rendering of the sample code above. As is known in the art, only one media object can be associated with the item entitled "John's Garage Band." In addition, as shown in the sample code above, the url attribute of the <enclosure> element provides a direct link to the media object, i.e., anthem.mpg. Furthermore, the known RSS code does not comprise deep layers of metadata that can further describe the content of the media object.

[0051] An example of a Media RSS script using the enhanced elements of one embodiment of the invention is shown below:

```
<?xml version="1.0" ?>
- <rss version="2.0" xmlns:mrss="http://docs.yahoo.com/mrssModule">
  - <channel>
      <title>Yahoo Movies Coming Soon</title>
      <link>http://movies.yahoo.com/movies/feature/
      comingsoon.html</link>
      <description>Upcoming movie releases.</description>
      <language>en-us</language>
      <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Notepad</generator>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
    - <item>
        <title>Blade: Trinity</title>
        <link>http://movies.yahoo.com/shop?d=hv&cf=info&id=1808
          473210&intl=us</link>
        <description>Movie trailer for Blade: Trinity on Yahoo!
          Movies.</description>
        <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
        <guid>http://movies.yahoo.com/shop?d=hv&cf=info&id=1808
          473210&intl=us</guid>
      - <mrss:media>
          <mrss:playerLink>http://movies.yahoo.com/player.pl?id=1
            2345&quality=hi</mrss:playerLink>
          <mrss:mediaInfo height="640" width="400" duration="150" />
          <mrss:mediaDefault />
        </mrss:media>
      - <mrss:media>
          <mrss:playerLink>http://movies.yahoo.com/player.pl?id=1
            2345&quality=mid</mrss:playerLink>
          <mrss:mediaInfo height="480" width="300" duration="150" />
        </mrss:media>
      - <mrss:media>
          <mrss:playerLink>http://movies.yahoo.com/player.pl?id=1
            2345&quality=low</mrss:playerLink>
          <mrss:mediaInfo height="320" width="200" duration="150" />
        </mrss:media>
        <mrss:thumbnail>http://img.yahoo.com/1231242.jpg</
        mrss:thumbnail
          >
        <mrss:movie title="Blade: Trinity" cast="Wesley Snipes, Kris
          Kristofferson, Ryan Reynolds, Jessica Biel, Parker Posey"
          year="2004" contentType="trailer" />
      </item>
  </channel>
</rss>
```

[0052] Module **125** of **FIG. 1** illustrates one rendering of the sample code above. The <mrss:thumbnail> element provides a link to an image that can be displayed in video display area **126**. In one embodiment, the image can be a frame from the video. Video controls **127** are positioned under the video display area **126** and the title of the item element is displayed under the video controls **127**. The item comprises three video options high quality, medium quality and low quality, each displayed to a user as subelements of the "Blade:Trinity" title.

[0053] The sample script incorporates multiple versions of the described trailer, as well as player calls, enabling the

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display of a media file of desired resolution in a player of predetermined size, utilizing a single item element. In one embodiment, the desired resolution can be selected by the user. In one embodiment, a resolution can be automatically selected based upon automatic bandwidth detection techniques, such as those disclosed in U.S. Pat. No. 6,813,580 and U.S. Pat. No. 6,601,009, the disclosures of which are incorporated herein by reference.

[0054] The sample script also incorporates metadata that describes the media object and the content of the media object with greater detail than previously known. For example, were the metadata to be searched, the search result could return three results for the same media item, one for each resolution, for the user to select. Alternatively, the search can return one result, automatically selected by software or hardware or both, by detecting the bandwidth available to the user on the device they are using, and selecting the appropriate file based upon the detected bandwidth. The sample script also comprises a element that comprises the title of the movie, cast of the movie, the year the movie was released and type of the media content.

[0055] Another example is shown below:

```
<?xml version="1.0" ?>
- <rss version="2.0" xmlns:mrss="http://docs.yahoo.com/mrssModule">
  - <channel>
      <title>Yahoo Movies Coming Soon</title>
      <link>http://movies.yahoo.com/movies/feature/
      comingsoon.html</link>
      <description>Upcoming movie releases.</description>
      <language>en-us</language>
      <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Notepad</generator>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
    - <item>
        <title>Blade: Trinity</title>
        <link>http://movies.yahoo.com/shop?d=hv&cf=info&id=1808
          473210&intl=us</link>
        <description>Movie trailer for Blade: Trinity on Yahoo!
          Movies.</description>
        <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
        <guid>http://movies.yahoo.com/shop?d=hv&cf=info&id=1
        808473210&intl=us</guid>
      - <mrss:media>
          <mrss:mediaLink>http://movies.apple.com/movies/new
          line/blade_trinity/blade_trinity-
          tlr_640.mov</mrss:mediaLink>
          <mrss:mediaDefault />
        </mrss:media>
      - <mrss:media>
          <mrss:mediaLink>http://movies.apple.com/movies/new
          line/blade_trinity/blade_trinity-
          tlr_480.mov</mrss:mediaLink>
        </mrss:media>
      - <mrss:media>
          <mrss:mediaLink>http://movies.apple.com/movies/new
          line/blade_trinity/blade_trinity-
          tlr_320.mov</mrss:mediaLink>
        </mrss:media>
        <mrss:movie title="Blade: Trinity" cast="Wesley Snipes, Kris
          Kristofferson, Ryan Reynolds, Jessica Biel, Parker Posey"
          year="2004" contentType="trailer" />
      </item>
    </channel>
</rss>
```

[0056] Module **135** of **FIG. 1** illustrates one rendering of the sample code above. The above example shows a single <item> element with multiple binary files embedded. In this example a user is given a direct link to the media object.

[0057] Internet content publishers have been using RSS to associate a media file (image, audio, video, flash, etc.) with other Internet content, such as, for example, a blog entry. Below is an example of an RSS document that couples a music file with a musician's blog:

```
<?xml version="1.0" ?>
- <rss version="2.0" xmlns:media=
"http://docs.yahoo.com/mediaModule">
  - <channel>
      <title>John's Band Page</title>
      <link>http://www.fooblog.com</link>
      <language>en-us</language>
      <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Notepad</generator>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
    - <item>
        <title>John's garage band</title>
        <link>http://www.fooblog.com/karaoke.html</link>
        <description>My own interpretation of the national
        anthem</description>
        <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
        <guid>http://www.fooblog.com/karaoke.html</guid>
        <enclosure url="http://www.foo.com/anthem.mpg"
          length="3200000" type="video/mpeg" />
        </item>
  </channel>
</rss>
```

[0058] Module **140** of **FIG. 1** illustrates one rendering of the sample code above.

[0059] Using one embodiment of Media RSS, structured metadata can be added to the known <item> element to further describe the media object and the content that is rendered by the media object. Therefore, in one embodiment, structured metadata can be added to the RSS code above that could further describe the song associated with the blog entry. For example, an additional Media RSS element describing the genre of the "anthem.mpg" song can be added to further describe the song. This additional information can be used in a number of ways. For example, in one embodiment, the song's genre information can help a search engine find the song on the Internet, thus making it more likely that the song is presented to an interested user as part of a search request from the user. Finding the song also leads to the interested user to the musician's blog, thereby provided the user with more desired information. In addition, in one embodiment, if an RSS feed comprises a number of songs from different genres, an aggregator can use the additional metadata to pick the songs a user enjoys.

[0060] In addition to blogs, other types of Internet media include, a text review about a movie, a news story, pictures related to a television show, and ID3 v1-like information about a song. Below is an example of an RSS feed for a movie reviewer's blog, which comprises an <enclosure> element and structured metadata describing the content of the media object referenced by the <enclosure> element:

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```
<?xml version="1.0" ?>
- <rss version="2.0" xmlns:media=
"http://docs.yahoo.com/mediaModule">
  - <channel>
      <title>John's Favorite Movies</title>
      <link>http://www.fooblog.com</link>
      <language>en-us</language>
      <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Notepad</generator>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
    - <item>
        <title>Blade: Is the sequel any good?</title>
        <link>http://www.fooblog.com/myreviews/blade.htm</link>
        <description>Just saw the Blade sequel the other
          day.</description>
        <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
        <guid>http://www.fooblog.com/myreviews/blade.htm#blade_
          trinity-tlr_480.mov</guid>
        <enclosure
          url="http://movies.apple.com/movies/newline/blade_trinity/
          blade_trinity-tlr_480.mov" length="3200000"
          type="video/quicktime" />
        <media:movie title="Blade: Trinity" cast="Wesley Snipes, Kris
          Kristofferson, Ryan Reynolds, Jessica Biel, Parker Posey"
          year="2004" contentType="trailer" />
      </item>
  </channel>
</rss>
```

[0061] Module **145** of **FIG. 1** illustrates one rendering of the sample code above. In one embodiment, an aggregator can show the user the title and cast of the movie in a popup window when the user places their mouse pointer over the module rendering the RSS feed. In one embodiment, the media RSS extensions can be used even if the item does not contain an enclosure or a media content link, e.g. a movie review blog.

[0062] Presented below is another example of an RSS feed with additional metadata, used to enhance the images found at an "actor fan club.":

```
<?xml version="1.0" ?>
- <rss version="2.0" xmlns:media=
"http://docs.yahoo.com/mediaModule">
  - <channel>
      <title>Mr. Incredible Paparazzi</title>
      <link>http://www.fooblog.com</link>
      <language>en-us</language>
      <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Notepad</generator>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
    - <item>
        <title />
        <link>http://www.fooblog.com/mrincredible.htm</link>
        <description>Our agent in the field caught a picture of
        Mr. Incredible
          filming his new reality television series, Superhero
          Lost</description>
        <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
        <guid>http://www.fooblog.com/karaoke.html</guid>
        <enclosure
          url="http://www.goodpictures.com/incredible101.jpg"
```

-continued

```
          length="3200000" type="image/jpeg" />
        <media:television title="Superhero Lost" cast="Mr. Incredible"
          director="Mrs. Incredible" year="2004"
          contentType="extras" />
      </item>
  </channel>
</rss>
```

[0063] Module **150** of **FIG. 1** illustrates one rendering of the sample code above. In one embodiment, a subscriber to this feed may only want images from the "Superhero Lost" show. Using the additional metadata, aggregators can now accommodate that desire.

[0064] In addition to descriptive information regarding the media file and the content of the media file. Legal information associating an intellectual property right with a media object can be used in conjunction with Media RSS. A known way to add a Creative Commons license to an RSS feed is described at http://backend.userland.com/creativeCommonsRssModule. Below is an example of a podcast RSS feed for "my latest song" that uses Creative Commons RSS extension to add a license to the work:

```
<?xml version="1.0" ?>
<rss version="2.0" xmlns:media="http://docs.yahoo.com/mediaModule"
xmlns:creativeCommons=
"http://backend.userland.com/creativeCommonsRssModule">
  - <channel>
      <title>Bored.net</title>
      <link>http://www.fooblog.com/Bored</link>
      <language>en</language>
      <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Notepad</generator>
      <ttl>180</ttl>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
    - <item>
        <title>Bored.net Audioblog/Podcast #1</title>
        <link>http://www.fooblog.com/bored.htm</link>
        <pubDate>Tue, 01 Dec 2004 12:00:00 GMT</pubDate>
      <guid
          isPermaLink="true">http://www.fooblog.com/bored/2004/
          12/01#1</guid>
        <enclosure url="http://www.foo.com/anthem.mp3"
          length="3200000" type="audio/mpeg" />
        <media:music artiste="John" album="Greatest Hits 2" song="The
          Start Spangled Banner" year="2004" contentType="full" />
          <creativeCommons:license>http://www.creativecommons.org/
          licenses/by-nc/1.0</creativeCommons:license>
      </item>
  </channel>
</rss>
```

[0065] Module **205** of **FIG. 2** illustrates one rendering of the sample code above. In one embodiment, an aggregator can append the letters "CC" to indicate the intellectual property right associated with the media object. In addition, in one embodiment, the Creative Commons element can be made into a subelement of the media <content> element. Thus, the Creative commons license is specifically applied to the media, instead of at a channel or item level. This technique can also be used to specify other types of associated intellectual property rights, and is useful when mul-

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tiple media objects in the same <item> element have different rights associated with them.

```
<media:content url="http://www.foo.com/anthem.mp3" length="3200000"
    type="audio/mpeg">
<creativeCommons:license>http://www.creativecommons.org/licenses/
by-nc/1.0</creativeCommons:license>
</media:content>
```

[0066] Enclosures work well for links to media content that can be downloaded and cached. Sometimes, one does not have access to an underlying file, or one does not want to make the underlying file available directly. In these cases, a Media <content> element, implemented in accordance with one embodiment of the invention, allows one to provide a player link instead of a direct link to a media object. In addition, information about the media embedded by the player can also be included. If the media object is a video, one can define a <keyframe> that can be used to represent the video. For example, the code below provides a link to a video player that plays the band's latest video and a keyframe to represent the video:

```
<?xml version="1.0" ?>
- <rss version="2.0" xmlns:media=
"http://docs.yahoo.com/mediaModule"
xmlns:creativeCommons="http://backend.userland.com/
creativeCommonsRssModule">
- <channel>
    <title>John's Band Page</title>
    <link>http://www.fooblog.com</link>
    <language>en-us</language>
    <pubDate>Tue, 30 Nov 2004 12:00:00 GMT</pubDate>
    <lastBuildDate>Tue, 30 Nov 2004 12:00:00 GMT</lastBuildDate>
    <docs>http://blogs.law.harvard.edu/tech/rss</docs>
    <generator>Notepad</generator>
    <managingEditor>editor@example.com</managingEditor>
    <webMaster>webmaster@example.com</webMaster>
  - <item>
      <title>Bored.net Audioblog/Podcast #1</title>
      <link>http://www.fooblog.com/bored.htm</link>
      <pubDate>Tue, 01 Dec 2004 12:00:00 GMT</pubDate>
      <guid
        isPermaLink="true">http://www.fooblog.com/bored/2004/1
        2/01#1</guid>
    - <media:content>
        <media:playerLink url="http://www.foo.com/cgi-
          bin/generate.pl?id=123456" />
        <media:contentInfo height="200" width="320"
        duration="220"
          type="video/mpeg" />
      </media:content>
        <media:keyframe>www.fooblog.com/img/anthem.jpg</
        media:keyframe>
      <media:music artist="John" album="Greatest Hits 2" song="The
        Start Spangled Banner" year="2004" contentType="full" />
        <creativeCommons:license>http://www.creativecommons.org/
        licenses/by-nc/1.0</creativeCommons:license>
    </item>
  </channel>
</rss>
```

[0067] Module **210** of **FIG. 2** illustrates one rendering of the sample code above. The keyframe image is displayed in the image/video section **211** of module **210**. While the module **210** shows the media player embedded in the personalized homepage **200**, other renderings of the RSS feed above may exclude the embedded media player and open the media in a separate media player program and/or browser window when the user selects the "music video" link **212**.

[0068] For some publishers of video content, its common practice to provide multiple formats and multiple levels of quality for a piece of content. Therefore, in one embodiment, more then one media object can be added the <item> element above. Module **215** of **FIG. 2** illustrates one rendering of an RSS feed with multiple formats and multiple levels of quality. As shown, the video is offered in "WMV" format in a high quality and a low quality, and the video is also offered in a "RM" format in a high quality and a low quality. Additionally, in one embodiment, the RSS feed can specify one of the media object choices as a default object. In one embodiment, the aggregator or the browser can determine which media object versions are most suitable for a user's computer and only render those objects.

[0069] In one embodiment of the invention, Media RSS can be used to preview a news article and provide access to media associated with article. Module **220** of **FIG. 2** illustrates one rendering of an RSS feed from a news organization. The feed comprises three items, the first item is titled "Breaking News" and comprises an accompanying image **221**, a space for a short description or excerpt of the article and three related media objects. The first object is a photo related to the news story, the second object is a video, for example a live video feed from the scene of the incident, and the third object is an audio podcast that can comprise, for example, the latest updates or commentary from the author. The video object also comprises a popup or drop down menu **222**, which a user can use to select the quality of the video.

[0070] **FIG. 3** illustrates a block diagram of a system **300** implemented in accordance with one embodiment of the invention. System **300** comprises a computer **350**, a network content provider one **326**, and a network content provider two **336**, each coupled to a network **390**, such as, for example, the Internet **390**. A network user can use computer **350** to access content and/or services, such as, for example, RSS feeds, from providers **326** and **336** through the network **390**.

[0071] Computer **350** comprises a processing module **366**, a communication module **368** and memory **352** coupled together by bus **364**. The modules of computer **350** can be implemented as any combination of hardware, software, hardware emulating software and reprogrammable hardware. The bus **364** is an exemplary bus illustrating the interoperability of the different modules of the computer **350**. In different embodiments, there may be more than one bus and in other embodiments, some modules can be directly coupled instead of coupled to a bus **364**. In alternate embodiments, computer **350** may be a desktop, a notebook computer, a Personal Digital Assistant (PDA), a handheld device, a wireless phone or any other device known or hereafter developed that is capable of performing functions as described herein.

[0072] The processing module **366** can be implemented as, in an exemplary embodiment, one or more Central Processing Units (CPUs), Field-Programmable Gate Arrays (FPGA), or any other component capable of executing computer applications. Communication module **368** comprises one or more I/O components used by the computer **350** to communicate with users and other devices. For

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example, components such as, a monitor, a keyboard, a mouse and a disk drive, can be used by a user to input and output information from the computer **350**.

[0073] In addition, the communication module **368** facilitates two way communication between the computer and other electronic devices or systems, such as, for example, server computers provided by a network content provider one **326** and/or two **336**. Components such as a modem, a network interface card (NIC), a wireless adapter, a Universal Serial Bus (BUS) adapter, etc., can be used by the computer **350** to communicate with the network **390**, and/or with peripheral devices. The computer **350** may be communicatively connected to the network **390** through the communication module **368**, for example, over one or more transmission media including but not limited to coaxial cable, copper wires and fiber optic cables. Communication between the computer **350** and the network **390** may also be accomplished wirelessly.

[0074] Memory **352** can be implemented as volatile memory, non-volatile memory, rewritable memory, etc., such as, for example, Random Access Memory (RAM), Read Only Memory (ROM) and/or flash memory. Memory **352** is illustrated as a single module in **FIG. 3**, but in some embodiments, memory **352** can comprise more than one memory module and some memory **352** can be part of other modules of computer **350**, such as, for example, processing module **366**.

[0075] In the embodiment illustrated in **FIG. 3**, memory **352** has stored thereon a browser **372**, a media player **374** and an electronic document **305**. A network user using computer **350** may gain access to content on the network **390** by using a browser **372**. For example, a network user browsing the Internet **390** can use Universal Resource Identifiers (URIs), such as, for example, Uniform Resource Locators (URLs), to locate and communicate with network content/service providers. In one embodiment of the invention, connection to the network **390** is provided through an Internet Service Provider (ISP). The media player **374** can be, in one embodiment, a plugin to the browser **372** and can play media objects retrieved from the Internet **390**. In one embodiment, the media player **374** can be an application that is separate from the browser **372**, which is called by the browser **372** when a media object is executed.

[0076] Electronic documents **305** can comprise a plurality of elements, such as, for example, Hypertext Markup Language (HTML), Extensible Markup Language (XML), electronic images, Portable Document Files (PDFs), flash files, etc. On the Internet, an electronic document can be a webpage and/or an RSS feed. Network content provider **336** can also have stored thereon, plug-ins, that can be downloaded onto the computer **350** and add functionality to the browser **372**. Examples of plug-ins are downloadable network toolbars, media players, etc.

[0077] Network content provider **326** comprises communication module **315**, processing module **325** and memory **310** coupled together by bus **320**. Network content provider **336** and network content provider **326** can be implemented as computers, such as, for example, servers, connected to the network **390**. Communication module **315**, processing module **325**, memory **310** and bus **320** can be implemented with components that are similar to the like named components of computer **350**. The memory **310** of network content provider **326** has stored thereon, network content **340** and an RSS aggregator **337**.

[0078] Network content provider one **326** can offer a plurality of web content and services, for example, network content **340** can comprise webpages **331**, RSS feeds **330** and media **335**, which can be downloaded by Internet users. The network content provider one **326** can also provide personalized homepages that can aggregate an Internet user's RSS feeds. The aggregator **337** determines an Internet user's subscribed feeds from user information **341**, and retrieves the feeds from a local computer and/or from a network. The aggregator renders the retrieved feeds onto a personalized homepage and sends the personalized homepage to the Internet user.

[0079] The placement of the modules **372**, **374**, **305**, **340**, **330**, **331**, **335**, **337**, **341** in **FIG. 3** illustrate one embodiment of the invention. In alternate embodiments, the network content **340**, user information **341** and the aggregator **337** can be located in a plurality of computers in a plurality of combinations across the network **390**. In one embodiment, the aggregator **337** can be located in the user computer and can present a user's feeds in a program separate from the browser **372**.

[0080] A specification for a Media RSS module implemented in accordance with one embodiment of the invention is now described with reference to **FIG. 4**. The namespace declaration for the module is xmlns:media="http://docs.yahoo.com/mediaModule/". The module comprises six elements, one primary element, <media:content>, and five optional elements, <media:keyframe>, <media:category>, <media:people>, <media:person> and <media:text>.

[0081] <media:content> is a subelement of <item>, which contains 8 attributes, all of which are optional. The <media:content> element identifies a media object and provides access to the object, for example, through a direct link and/or through a media player. Each <item> element can comprise a plurality of <media:content> subelements. Below is an example of a <media:content> element:

```
<media:content url="http://www.foo.com/movie.mov" length=
"12216320" type="audio/mpeg"
  playerUrl="http://www.foo.com/player?id=11" playerHeight="200"
  playerWidth="400"
  isDefault="true"
  expression="sample|full"
</media:content>
```

[0082] Attribute url, specifies the direct URL to the media object. If a URL is not included, a playerUrl must be specified. Attribute length, is the number of bytes of the media object. Attribute type is the standard MIME type of the object. AttributeplayerUrl is the url of a media player console. PlayerUrl can be used to limit a subscriber's direct access to a media file. Attribute playerHeight is the height of the window that the playerUrl should be opened in. Attribute playerWidth is the width of the window that the playerUrl should be opened in. Attribute is Default determines which media object is the default object for an <item> element. Attribute expression determines if the object is a sample or the full version of the object.

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[0083] The following elements are optional and can either be a sub-element of <item>, <enclosure>, or <media:content>. When used as a sub-element of <item>, it means that the element is applied to every media object in the <item>. When used as a sub-element of <media:content>, it only applies to that particular media object.

[0084] The <media:keyframe> element allows a particular image to be used as the representative image for the media object. An example is shown below:

[0085] <media:keyframe>http://www.foo.com/keyframe jpg</media:keyframe>

[0086] The <media:category> element allows a taxonomy to be set that gives an indication of the type of media content, and its particular contents. The taxonomy can be used by an aggregator and/or a search engine to categorize the media in an RSS feed and present targeted results to a user. An example is shown below:

```
<media:category>music/artist name/album/song</media:category>
<media:category>television/series/episode/episode number</
media:category>
```

[0087] The <media:people> element lists the notable entities, for example, people and/or businesses, who contributed to the creation of the media object. An example is shown below:

[0088] <media:people> important people associated with work</media:people>

[0089] The <media:person> element can be used as an alternative to the <media:people> element. <media:person> breaks down the contribution to an individual level. <media-:person> has one attribute: role. The role can be producer, artist, news anchor, cast member, and the like. An example is shown below:

[0090] <media:person role="producer">person's name</ media:person>

[0091] The <media:text> element allows the inclusion of a text transcript/close captioning/lyrics of the media content. An example is shown below:

[0092] <media:text>Oh, say, can you see, by the dawn's early light, . . . </media:text>

[0093] The following examples illustrate the use of the elements described above. **FIG. 4** illustrates one rendering of the examples in a personalized home page **400**. Below is an example of a known RSS document that uses the <enclosure> element, without any of the special media extensions. Module **405** of **FIG. 4** illustrates one rendering of the sample code.

```
<rss version="2.0">
<channel>
  <title>Title of page</title>
  <link>http://www.foo.com</link>
  <description>Description of page</description>
  ...
  <item>
```

-continued

```
    <title>Story about something</title>
    <link>http://www.foo.com/item1.htm</link>
    ...
    <enclosure url="http://www.foo.com/file.mov" length="320000"
    type="video/quicktime" />
  </item>
</channel>
</rss>
```

[0094] Below is an example of an RSS document for a movie review associated with a trailer. This example shows how Media RSS can be used to associate a media object with an <item> instead of the <enclosure> element. Module **410** of **FIG. 4** illustrates one rendering of the sample code.

```
<rss version="2.0" xmlns:media="http://docs.yahoo.com/mediaModule">
<channel>
  <title>My Movie Review Site</title>
  <link>http://www.foo.com</link>
  <description>I review movies.</description>
  ...
  <item>
    <title>Movie Title: Is this a good movie?</title>
    <link>http://www.foo.com/item1.htm</link>
    ...
    <media:content url="http://www.foo.com/trailer.mov"
length="12216320" type="video/quicktime"
          expression="sample|full">
    </media:content>
  </item>
</channel>
</rss>
```

[0095] Below is an example of an RSS document for a music video played through a media player. The document also comprises additional metadata related to the music video. As mentioned above the additional information can be used to, for example, sort the video and offer improved searches. Module **415** of **FIG. 4** illustrates one rendering of the sample code. In one embodiment, the additional information can be displayed to a user in a popup menu, when the user positions their mouse pointer over module **415**.

```
<rss version="2.0" xmlns:media="http://docs.yahoo.com/mediaModule">
<channel>
  <title>Music Videos 101</title>
  <link>http://www.foo.com</link>
  <description>Discussions of great videos</description>
  ...
  <item>
    <title>The latest video from an artist</title>
    <link>http://www.foo.com/item1.htm</link>
    ...
    <media:content url="http://www.foo.com/movie.mov"
          length="12216320" type="video/quicktime"
          playerUrl="http://www.foo.com/player?id=1111"
          playerHeight="200" playerWidth="400"
          expression="full">
  </media:content>
  <media:person role="producer">producer's name</media:person>
  <media:person role="artist">artist's name</media:person>
  <media:category>music/artist name/album/song</media:category>
  <media:text>Oh, say, can you see, by the dawn's early light....</
  media:text>
```

-continued

```
  </item>
</channel>
</rss>
```

[0096] Below is an example of an RSS document comprising a song for syndication. In this example, a single <item> element comprises the same song at different bitrates to accommodate the bandwidth and/or preference of different subscribers. The document also comprises additional information, for example, band members and the song's taxonomy. Using the song's taxonomy, a user can easily sort through the songs that interest them. Module **420** of **FIG. 4** illustrates one rendering of the sample code.

```
<rss version="2.0" xmlns:media="http://docs.yahoo.com/mediaModule">
<channel>
  <title>Song Site</title>
  <link>http://www.foo.com</link>
  <description>Songs galore at different bitrates</description>
  ...
  <item>
    <title>Cool song by an artist</title>
    <link>http://www.foo.com/item1.htm</link>
    ...
    <media:content url="http://www.foo.com/song64kbps.mp3"
          length="1000" type="audio/mpeg"
          isDefault="true"
          expression="full">
    </media:content>
    <media:content url="http://www.foo.com/song128kbps.mp3"
          length="2000" type="audio/mpeg"
          expression="full">
    </media:content>
    <media:content url="http://www.foo.com/song256kbps.mp3"
          length="4000" type="audio/mpeg"
          expression="full">
    </media:content>
    <media:people>members of band</media:people>
    <media:category>music/artist name/album/song</media:category>
  </item>
</channel>
</rss>
```

[0097] Below is an example of an RSS document for several different songs that are related to the same topic. The <media:content> element is not limited to grouping the same song in different quality levels. An <item> element can also use Media RSS to group related media objects. For example, in the sample code below a music listener groups songs that make them feel a certain way. Module **425** of **FIG. 4** illustrates one rendering of the sample code.

```
<rss version="2.0" xmlns:media="http://docs.yahoo.com/mediaModule">
<channel>
  <title>Song Site</title>
  <link>http://www.foo.com</link>
  <description>Discussion on different songs</description>
  ...
  <item>
    <title>These songs make me think about blah</title>
    <link>http://www.foo.com/item1.htm</link>
    ...
    <media:content url="http://www.foo.com/band1-song1.mp3"
          length="1000" type="audio/mpeg"
```

-continued

```
          expression="full">
        <media:people>members of band1</media:people>
        <media:category>music/band1/album/song</media:category>
      </media:content>
      <media:content url="http://www.foo.com/band2-song1.mp3"
          length="2000" type="audio/mpeg"
          expression="full">
        <media:people>members of band2</media:people>
        <media:category>music/band2/album/song</media:category>
      </media:content>
      <media:content url="http://www.foo.com/band3-song1.mp3"
length="4000" type="audio/mpeg"
          expression="full">
        <media:people>members of band3</media:people>
        <media:category>music/band3/album/song</media:category>
      </media:content>
    </item>
</channel>
</rss>
```

[0098] Another specification for a Media RSS module implemented in accordance with one embodiment of the invention is now described with reference to **FIG. 5**. The namespace declaration for the module is <rss version="2.0" xmlns:media="http://search.yahoo.com/mrss/">. The module comprises six elements, two primary elements, <media:content> and <media:group>, and thirteen optional elements, <media:adult>, <media:rating>, <media:title>, <media:description>, <media:keywords>, <media:thumbnail>, <media:category>, <media:hash>, <media:player>, <media:credit>, <media:copyright>, <media:text> and <media:restriction>.

[0099] The <media:content> element is a sub-element of either <item> or <media:group>. The <media:content> element is used to publish any type of media object. The sequence of these elements implies the order of presentation when an RSS document is rendered. <media:content> comprises fourteen optional attributes. While many of the attributes appear to be audio/video specific, this element can be used to publish any type of media. Below is an example of a <media:content> element:

```
<media:content
    url="http://www.foo.com/movie.mov"
    fileSize="12216320"
    type="video/quicktime"
    medium="video"
    isDefault="true"
    expression="full"
    bitrate="128"
    framerate="25"
    samplingrate="44.1"
    channels="2"
    duration="185"
    height="200"
    width="300"
    lang="en" />
```

[0100] The url attribute specifies the direct URL to the media object. If a url attribute is not included, a <media:player> element must be specified.

[0101] The fileSize attribute specifies the number of bytes in the media object.

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[0102] The type attribute is the standard MIME type of the object. It is an optional attribute.

[0103] The medium attribute is the type of the object, for example, image, audio, video, document, executable, and other media objects. While this attribute can at times seem redundant if type is supplied, it is included because it simplifies decision making on the reader side, as well as flushes out any ambiguities between MIME type and object type.

[0104] The is Default attribute determines if the media object identified by the <media:content> element is the default object that should be used for the <item> or <media:group>. There should only be one default object per <media:group>. The <media:group> element is described below.

[0105] The expression attribute determines if the object is a sample (sample), the full version of the object (full), or if it is a continuous stream (nonstop). The default value is 'full'.

[0106] The bitrate attribute is the kilobits per second rate of media object.

[0107] The framerate attribute is the number of frames per second for the media object.

[0108] The samplingrate attribute is the number of samples per second taken to create the media object. It is expressed in thousands of samples per second (kHz).

[0109] The channels attribute is the number of audio channels in the media object.

[0110] The duration attribute is the number of seconds the media object plays.

[0111] The height attribute is the height of the media object.

[0112] The width attribute is the width of the media object.

[0113] The lang attribute is the primary language encapsulated in the media object. Values for the lang attribute are detailed in RFC 3066. For example, "en" stands for English.

[0114] The <media:group> element is an optional sub-element of <item>. It allows grouping of <media:content> elements that are effectively the same content, yet different representations. For example, a same song recorded in a WAV format and an MP3 format can be placed in the same group.

[0115] The following elements are optional and may appear as sub-elements of <channel>, <item>, <media:content> and/or <media:group>. When an element appears at a shallow level, such as <channel> or <item>, it means that the element is applied to every media object within its scope. Duplicated elements appearing at deeper levels of the document tree have higher priority over other levels. For example, <media:content> level elements are favored over <item> level elements. The priority level is listed from strongest to weakest: <media:content>, <media:group>, <item>, <channel>.

[0116] The <media:adult> element indicates that the media object contains media for adults only. The function of this element can also be accomplished using <media:rating>.

[0117] The <media:rating> element declares the permissible audience for a media object. If this element is not included, it assumes that no restrictions are necessary. An example is shown below:

```
<media:rating scheme="urn:simple">adult</media:rating>
<media:rating scheme="urn:icra">r (cz 1 lz 1 nz 1 oz 1 vz
1)</media:rating>
<media:rating scheme="urn:mpaa">pg</media:rating>
<media:rating scheme="urn:v-chip">tv-y7-fv</media:rating>
```

[0118] The scheme attribute identifies the rating scheme used. For example, the movie rating scheme or the television rating scheme can be used. If this attribute is not included, the default rating is either adult or nonadult.

[0119] The <media:title> element specifies the title of the particular media object. It has one optional attribute. An example is shown below:

[0120] <media:title type="plain"> The Judy's—The Moo Song</media:title>

[0121] The optional type attribute specifies the type of text embedded. Possible values for the type attribute are either 'plain' or 'html'. The default value is 'plain'. All html must be entity-encoded.

[0122] The <media:description> element can be used to provide a description of the media object. It is typically a sentence in length, and can also comprise an optional type attribute. An example is shown below:

[0123] <media:description type="plain">This was some really bizarre band I listened to as a young lad.</media:description>

[0124] The <media:keywords> element can be used to include relevant keywords describing the media object. In this embodiment, there is a maximum limit of ten words and the keywords and phrases are comma delimited. An example is shown below:

[0125] <media:keywords>kitty, cat, big dog, yarn, fluffy</media:keywords>

[0126] The <media:thumbnail> element allows particular images to be used as representative images for the media object. If multiple thumbnails are included, and time coding is not at play, it is assumed that the images are in order of importance. The <media:thumbnail> element has 1 required attribute and 3 optional attributes. An example is shown below:

[0127] <media:thumbnail url="http://www.foo.com/keyframe.jpg" width="75" height="50" time="12:05:01.123"/>

[0128] The url attribute, which is a required attribute, specifies the URL of the thumbnail. The optional height and width attributes specifies the height and width of the thumbnail. The optional time attribute specifies a time offset in relation to the media object. Therefore, a preview of a video object displays a frame in the middle of the object instead of the first frame. Typically this is used when creating multiple keyframes within a single video. The format for this attribute can be in the DSM-CC's Normal Play Time (NPT) as used in RTSP [RFC 2326 3.6 Normal Play Time].

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[0129] NPT has a second or subsecond resolution. It is specified as H:M:S.h (npt-hhmmss) or S.h (npt-sec), where H=hours, M=minutes, S=second and h=fractions of a second. An alternative to NPT would be the Society of Motion Picture and Television Engineers (SMPTE) timecode.

[0130] The <media:category> element allows a taxonomy to be given to a media object to associate a category to the media object, and its particular contents. <media:category> has 2 optional attributes. Three examples are shown below:

```
<media:category scheme="http://search.yahoo.com/mrss/category_
schema">music/artist/album/song</media:category>
<media:category scheme="http://dmoz.org" label="Ace Ventura - Pet
Detective">Arts/Movies/Titles/A/Ace_Ventura_Series/Ace_Ventura_
-_Pet_Detective</media:category>
<media:category scheme="urn:flickr:tags">ycampark
mobile</media:category>
```

[0131] The optional scheme attribute specifies a URI that identifies the categorization scheme. If this attribute is not included, a default scheme is located at 'http://search.yahoo.com/mrss/category_schema'. The optional label attribute is the human readable label that can be displayed in end user applications.

[0132] The <media:hash> element is a hash of the binary media file. It can appear multiple times as long as each instance is created by a different algorithm. The <media:hash> element has 1 optional attribute. An example is shown below:

[0133] <media:hash algo="md5">dfdec888b72151965a34b4b59031290a</media:hash>

[0134] The optional algo attribute indicates the algorithm used to create the hash. Possible values include 'md5' and 'sha-1'. A default value is 'md5'.

[0135] The <media:player> element allows the media object to be accessed through a web browser media player console. This element is required only if a direct media url attribute is not specified in the <media:content> element. The <media:player> element has 1 required attribute, and 2 optional attributes. An example is shown below:

[0136] <media:player url="http://www.foo.com/player?id=1111" height="200" width="400"/>

[0137] The required url attribute is the URL of the player console that plays the media. The optional height and width attributes specify the height and width of the browser window that the url should be opened in.

[0138] The <media:credit> element specifies notable entities and their contribution to the creation of the media object. Current entities can include people, companies, locations, etc. Specific entities can have multiple roles, and several entities can have the same role. An example is shown below:

[0139] <media:credit role="producer" scheme="urn:ebu">entity name</media:credit>

[0140] The optional role attribute specifies the role the entity played. The optional scheme attribute identifies the scheme used to identify the roles. If this attribute is not included, the default scheme is the European Broadcasting Union Role Codes (urn:ebu). Example role comprise actor, anchor person, author, choreographer, composer, conductor, director, editor, graphic designer, grip, illustrator, lyricist, music arranger, music group, musician, orchestra, performer, photographer, producer, reporter and vocalist.

[0141] The <media:copyright> element can be used to specify the copyrights associated with the media object. An example is shown below:

```
<media:copyright url="http://blah.com/additional-info.html">2005
FooBar Media</media:copyright>
```

[0142] The optional url attribute can be used to specify a URL pointing to a webpage comprising the terms of use or additional copyright information. If the media is operating under a Creative Commons license, the Creative Commons module can be used.

[0143] The <media:text> element allows the inclusion of a text transcript, closed captioning, or lyrics of the media content. The timing of when certain text is relevant to the media object can be included in the element as an optional attribute. An example is shown below:

```
<media:text type="plain" lang="en" start="00:00:03.000"
end="00:00:10.000"> Oh, say, can you see</media:text>
<media:text type="plain" lang="en" start="00:00:10.000"
end="00:00:17.000">By the dawn's early light</media:text>
```

[0144] The optional type attribute specifies the type of text embedded. The optional lang attribute specifies the primary language encapsulated in the media object. The optional start and end attributes specify the start time offset that the text starts being relevant to the media object and the end time when the text is no longer relevant. Start and end time can be used for closed captioning. <media:text> elements can have overlapping start and end times.

[0145] The <media:restriction> element allows restrictions to be placed on the aggregator rendering the media in the feed. Currently, restrictions are based on distributor and country codes. This element is purely informational and no obligation can be assumed or implied. Only one <media:restriction> element of the same type can be applied to a media object, all others are ignored. Entities in this element should be space separated. To allow the producer to explicitly declare his/her intentions, two literals are reserved: 'all', 'none'. These literals can only be used once. An example is shown below:

[0146] <media:restriction relationship="allow" type="country">au us</media:restriction>

[0147] The required relationship attribute indicates the type of relationship that the restriction represents. The value of the relationship attribute include allow and deny. In the example above, the media object should only be syndicated in Australia and the United States. If the "allow" element is empty and the type is relationship is "allow", it is assumed that the empty list means "allow nobody" and the media should not be syndicated.

[0148] The optional type attribute specifies the type of restriction that is identified in the element. For example, the

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type can identify restricted countries or restricted URIs. If the value of type is "country", the <media:restriction> element includes a country where the media should not be syndicated. If the value of type is "uri", the <media:restriction> element includes a uri where the media should not be syndicated.

[0149] The following examples illustrate the use of the elements described above. Below is an example of an RSS document for a recently created movie using the <enclosure> element and without using Media RSS. Module **505** of **FIG. 5** illustrates one rendering of the sample code.

```
<rss version="2.0">
<channel>
<title>Title of page</title>
<link>http://www.foo.com</link>
<description>Description of page</description>
    <item>
        <title>Story about something</title>
        <link>http://www.foo.com/item1.htm</link>
        <enclosure url="http://www.foo.com/file.mov"
        length="320000" type="video/quicktime"/>
    </item>
</channel>
</rss>
```

[0150] Below is an example of an RSS document that uses the elements described above in conjunction with a Creative Commons license. Module **510** of **FIG. 5** illustrates one rendering of the sample code.

```
<rss version="2.0">
<channel>
<title>My Movie Review Site</title>
<link>http://www.foo.com</link>
<description>I review movies.</description>
    <item>
        <title>Movie Title: Is this a good movie?</title>
        <link>http://www.foo.com/item1.htm</link>
        <media:content url="http://www.foo.com/trailer.mov"
        fileSize="12216320" type="video/quicktime"
        expression="sample"/>
        <creativeCommons:license>
        http://www.creativecommons.org/licenses/by-nc/1.0
        </creativeCommons:license>
        <media:rating>nonadult</media:rating>
    </item>
</channel>
</rss>
```

[0151] Below is an example of an RSS document that syndicates a music video through a link to a player window. In addition, the same code includes additional metadata about the video. Module **515** of **FIG. 5** illustrates one rendering of the sample code. Some or all of the metadata can be used by the aggregator to tailor the rendering of the document to a specific user's specifications. In addition, some or all of the metadata can be presented to the user in an additional window when the user positions their mouse pointer over the rendered module **515**.

```
<rss version="2.0">
<channel>
<title>Music Videos 101</title>
<link>http://www.foo.com</link>
```

-continued

```
<description>Discussions of great videos</description>
    <item>
        <title>The latest video from an artist</title>
        <link>http://www.foo.com/item1.htm</link>
        <media:content url="http://www.foo.com/movie.mov"
        fileSize="12216320"
        type="video/quicktime" expression="full">
        <media:player url="http://www.foo.com/player?id=1111"
        height="200" width="400"/>
        <media:hash algo="md5"
        >dfdec888b72151965a34b4b59031290a</media:hash>
        <media:credit role="producer">producer's name</
        media:credit>
        <media:credit role="artist">artist's name</media:credit>
        <media:category scheme="http://blah.com/scheme">music/
        artist name/album/song</media:category>
        <media:text type="plain">
        Oh, say, can you see, by the dawn's early light
        </media:text>
        <media:rating>nonadult</media:rating>
        <dcterms:valid>
            start=2002-10-13T09:00+01:00;
            end=2002-10-17T17:00+01:00;
            scheme=W3C-DTF
        </dcterms:valid>
        </media:content>
    </item>
</channel>
</rss>
```

[0152] Below is an example of an RSS document that syndicates several different songs that relate to the same topic. Module **520** of **FIG. 5** illustrates one rendering of the sample code. The adult rated song "band3-song1" is clearly marked for "adults only."

```
<rss version="2.0">
<channel>
<title>Song Site</title>
<link>http://www.foo.com</link>
<description>Discussion on different songs</description>
    <item>
        <title>These songs make me think about blah</title>
        <link>http://www.foo.com/item1.htm</link>
        <media:content url="http://www.foo.com/band1-song1.mp3"
        fileSize="1000" type="audio/mpeg" expression="full">
        <media:credit role="musician">member of band1</
        media:credit>
        <media:category>music/band1/album/song</media:category>
        <media:rating>nonadult</media:rating>
        </media:content>
        <media:content url="http://www.foo.com/band2-song1.mp3"
        fileSize="2000" type="audio/mpeg" expression="full">
        <media:credit role="musician">member of band2</
        media:credit>
        <media:category>music/band2/album/song</media:category>
        <media:rating>nonadult</media:rating>
        </media:content>
        <media:content url="http://www.foo.com/band3-song1.mp3"
        fileSize="1500" type="audio/mpeg" expression="full">
        <media:credit role="musician">member of band3</
        media:credit>
        <media:category>music/band3/album/song</media:category>
        <media:rating>adult</media:rating>
        </media:content>
    </item>
</channel>
</rss>
```

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[0153] Below is an example of an RSS document that syndicates one song at different bitrates and encodings. Module **525** of **FIG. 5** illustrates one rendering of the sample code.

```
<rss version="2.0">
<channel>
<title>Song Site</title>
<link>http://www.foo.com</link>
<description>Songs galore at different bitrates</description>
    <item>
        <title>Cool song by an artist</title>
        <link>http://www.foo.com/item1.htm</link>
        <media:group>
            <media:content url="http://www.foo.com/song64kbps.mp3"
            fileSize="1000" bitrate="64" type="audio/mpeg"
            isDefault="true" expression="full"/>
            <media:content url="http://www.foo.com/
            song128kbps.mp3"
            fileSize="2000" bitrate="128" type="audio/mpeg"
            expression="full"/>
            <media:content url="http://www.foo.com/
            song256kbps.mp3"
            fileSize="4000" bitrate="256" type="audio/mpeg"
            expression="full"/>
            <media:content url="http://www.foo.com/
            song512kbps.mp3.torrent"
            fileSize="8000" type="application/
            x-bittorrent;enclosed=audio/mpeg"
            expression="full"/>
            <media:content url="http://www.foo.com/song.wav"
            fileSize="16000" type="audio/x-wav" expression="full"/>
            <media:credit role="musician">band member 1</
            media:credit>
            <media:credit role="musician">band member 2</
            media:credit>
            <media:category>music/artist name/album/song</
            media:category>
            <media:rating>nonadult</media:rating>
        </media:group>
    </item>
</channel>
</rss>
```

[0154] **FIG. 6** illustrates an video web search results page **600** implemented in accordance with one embodiment of the invention. The search results page **600** comprises a title section **605**, a search section **610**, a view options section **615** and a content display area **620**. An Internet user can search the web for videos by selecting the video button in the search section **610** and typing a search term into the field in the search section **610**. The results of the search are displayed in the content display area **620**.

[0155] Using the additional metadata provided by Media RSS, a search engine can find and present to an Internet user multiple versions of the same movie. The different versions can be the same video in different quality settings, expressions and/or encoding schemes. An Internet user can use view options **615** to change the view of the search results and to sort the search results. Search results page **600**, gives the user the option to view all results, low quality video, medium quality video and high quality video. In one embodiment, the search results can be sorted based on any of the additional metadata related to the media object and the content of the media object.

[0156] The search results in search results page **600**, also comprises a button **625**, which can be used to provide additional information to a user. **FIG. 7** illustrates one embodiment of additional drop down windows **705**, **710** that provide additional information to a user. When a user selects button **625**, window **705** appears including additional information from the RSS feed. In addition, window **705** provides a link to subscribe to the feed. The window **705** also comprises an additional information button **725** next to the actor. When button **725** is selected, window **710**, which comprises the results of a search on the actor, is displayed.

[0157] It will be recognized that while the features and functions described above are described in relation to network components and user side components, such features and functions can be implemented at any point in the network, on single or multiple computers and/or servers, and network functions can also be duplicated at the user computer for functioning independent of the network if desired. Thus user side changes and or network side changes can be synchronized and or synchronized when a user returns to the network in manners known in the art or hereafter to become known.

[0158] While the description of the various embodiments of the invention are described in a server/client network environment, alternate embodiments of the invention can be performed in a peer-to-peer network or other interconnectivity schemes now known or hereafter to become known.

[0159] While there have been shown and described and pointed out fundamental novel features of the invention as applied to preferred embodiments thereof, it will be understood that various omissions and substitutions and changes in the form and detail of the disclosed invention may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

What is claimed:

1. An electronic document comprising:

a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and

a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising,

descriptive information, the descriptive information being related to the media object's content, and

a predefined tag that identifies a predefined type of the descriptive information.

2. The electronic document of claim 1, wherein the second element further comprises legal information that sets forth an intellectual property right associated with the media object.

3. The electronic document of claim 1, wherein the descriptive information comprises a keyword that describes the media object's content.

4. The electronic document of claim 1, wherein the descriptive information identifies an image that describes the media object.

5. The electronic document of claim 1, wherein the descriptive information is a universal resource identifier that identifies an image associated with the media object.

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6. The electronic document of claim 1, wherein the descriptive information comprises a taxonomy of the media object, wherein the taxonomy of the media object is used to categorize the media object.

7. The electronic document of claim 1, wherein the descriptive information comprises at least one entity that contributed to the creation of the media object.

8. The electronic document of claim 1, wherein the descriptive information comprises a text transcript of the words embodied in the media object.

9. The electronic document of claim 1, wherein the descriptive information comprises a bitrate.

10. The electronic document of claim 1, wherein the descriptive information comprises information identifying any one or more than one of an actor's role, a title, a cast, an artist, a director, a producer, a studio, a publisher, an album or a year associated with the media object.

11. The electronic document of claim 1, wherein the first element identifies the media object via a universal resource identifier.

12. The electronic document of claim 1, wherein the second element identifies the media object via a universal resource identifier.

13. The electronic document of claim 1, further comprising a namespace declaration.

14. The electronic document of claim 1, wherein the tag has a syntax comprising a less than symbol, a namespace, a colon, the predefined type and a greater than symbol.

15. The electronic document of claim 14, wherein the tag comprises the following syntax <media:content>.

16. The electronic document of claim 14, wherein the tag comprises the following syntax <media:category>.

17. The electronic document of claim 14, wherein the tag further comprises an attribute.

18. The electronic document of claim 1, wherein the second element is a sub-element of the first element.

19. The electronic document of claim 1, wherein the first element is an enclosure element.

20. The electronic document of claim 1, wherein at least one of the first element and the second element further comprises at least one attribute, the attribute comprising the descriptive information.

21. A computer application, comprising computer code defining at least one routine, the at least one routine being operable to render an electronic document, the electronic document comprising:

a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and

a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising,

descriptive information, the descriptive information being related to the media object's content, and

a predefined tag that identifies a predefined type of the descriptive information.

22. The computer application of claim 21, wherein the second element further comprises legal information that sets forth an intellectual property right associated with the media object.

23. The computer application of claim 21, wherein the computer application is a real simple syndication aggregator.

24. The computer application of claim 21, wherein the computer application is a browser.

25. The computer application of claim 21, wherein if a pointer is positioned over a rendered element, the computer application renders an additional user perceptible object.

26. The computer application of claim 25, wherein the additional user perceptible object is a window overlaid over the rendered element, the window comprising the descriptive information.

27. The computer application of claim 21, wherein the computer application is an extension to a second computer application.

28. The computer application of claim 27, wherein the extension is a media player plugin.

29. A system for syndicating media comprising:

a syndicating computer, the syndicating computer being operable to transmit to a user computer an electronic document comprising,

a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and

a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising,

descriptive information, the descriptive information being related to the media object's content, and

a predefined tag that identifies a predefined type of the descriptive information.

30. The system of claim 29, wherein the second element further comprises legal information that sets forth an intellectual property right associated with the media object.

31. A method of syndicating media comprising:

transmitting an electronic document to a computer, the electronic document comprising,

a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and

a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising,

descriptive information, the descriptive information being related to the media object's content, and

a predefined tag that identifies a predefined type of the descriptive information.

32. The method of claim 31, wherein the second element further comprises legal information that sets forth an intellectual property right associated with the media object.

33. The method of claim 32, wherein the first element identifies the media object via a universal resource identifier, and wherein the universal resource identifier further identifies a media player, the media player being operable to render the media object into a user perceptible form, the method further comprising:

receiving at least some part of the universal resource identifier; and

transmitting the media object to the media player.

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34. A method of searching media comprising:

searching descriptive information within an electronic document comprising,

a first element written in a computer language, the language comprising a real simple syndication syntax, the element identifying a media object; and

a second element, written in the computer language and parsable by a real simple syndication aggregator, the second element comprising,

descriptive information, the descriptive information being related to the media object's content, and

a predefined tag that identifies a predefined type of the descriptive information.

35. The method of claim 34, wherein the second element further comprises legal information that sets forth an intellectual property right associated with the media object.

36. The method of claim 34, further comprising:

receiving a search request from a user, the search request comprising a search term;

searching a database of electronic documents; and

returning at least one search result to the user.

37. The method of claim 36, wherein the at least one search result identifies a media object associated with a real simple syndication document.

38. The method of claim 36, wherein search results are sorted based on the descriptive information.

* * * * *

(11) Application No. AU 2010202741 B1

(19) AUSTRALIAN PATENT OFFICE

(54) Title

Dynamic chunking for media streaming

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ABSTRACT OF THE DISCLOSURE

Systems and methods for chunking a media file for streaming over a network are disclosed. These systems and methods provide for receiving requests for chunks of a media file and responding to these requests by generating the requested chunks dynamically. The chunks can then be provided to the requesting entity. These systems and methods, which can be utilized with a dynamic file index generator, enable a high degree of flexibility in streaming chunked media files and preclude the need to chunk the media files and store the chunks prior to streaming.

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APPLICANT: **UNICORN MEDIA, INC.**

Invention Title: **DYNAMIC CHUNKING FOR MEDIA STREAMING**

The following statement is a full description of this invention, including the best method of performing it known to me:

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DYNAMIC CHUNKING FOR MEDIA STREAMING

BACKGROUND OF THE INVENTION

[0001] This disclosure relates in general to cloud-based computer processing and, but not by way of limitation, to indexing and chunking media files for use in media streaming.

[0002] The delivery of media over networks such as the Internet can be accomplished in many ways, including progressive downloading or streaming. Streaming is often preferred to progressive downloading because it offers additional features such as content protection and the ability to seek to undownloaded parts of a media file. The process of preparing a media file for streaming typically involves "chunking" the file, or dividing files up into smaller segments for delivery. Information including where chunks may be accessed can be stored in an index file. This index file can be delivered to a client, such as a media player application, for use in streaming.

[0003] The processes of chunking and indexing files for streaming present challenges to a content delivery network or content provider desiring to host media files for streaming. For example, a significant amount of preprocessing is required to prepare media for streaming. Media content may be encoded into several different files to accommodate several different sub-streams. Each of these files typically are chunked, stored, and indexed before the media content is available for streaming. This preprocessing leaves little flexibility for inserting an advertisement during streaming and can require a large amount of storage space to store the preprocessed chunks of media.

[0004] The inventions embodied herein address these and other problems.

BRIEF SUMMARY OF THE INVENTION

[0005] Systems and methods for chunking a media file for streaming over a network are disclosed. These systems and methods may be part of a larger media servicing network that can be used to, among other things, process uploaded media content, provide it for streaming, and collect metric information regarding the streaming. The disclosed systems and methods provide for receiving requests for chunks of a media file from, for example, a content delivery network (CDN), and responding to these requests by generating the requested chunks dynamically and

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providing the chunks to the requesting entity. These systems and methods, which can be utilized with a dynamic file index generator, enable a high degree of flexibility in streaming chunked media files and preclude the need to chunk the media files and store the chunks prior to streaming.

[0006] In other words, systems and methods disclosed herein provide for communicating a media file having a plurality of segments by receiving a request for a first segment of the media file and determining a starting point and an ending point of the requested first segment based, at least in part, on the request. A first portion of the media file having a first format, the first portion including at least the requested first segment of the media file, is retrieved. The requested first segment is generated, having a second format and being generated, at least in part, from the first portion of the media file. The requested first segment of the media file is then provided. A similar process is followed upon receiving a request for a second segment of the media file.

[0007] Embodiments of the present invention can further allow for the first and second portions of the media file being stored in memory can comprising the same portion of the media file. Moreover, the requested first segment of the media file and the requested second segment of the media file can comprise contiguous segments of the media file. Embodiments further allow for the first format including one or more of an audio compression format, a video compression format, and/or an image compression format. The second format can include a media container format.

[0008] Embodiments of the present invention additionally contemplate the process described above being executed during playback of the media file by a device communicatively linked to the network. The segments for a first media file may be of a different length than the segments of a second media file, and the requests for segments may be received from a Content Delivery Network (CDN).

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present disclosure is described in conjunction with the appended figures:

[0010] FIG. 1 illustrates a block diagram of a media servicing system.

[0011] FIG. 2A illustrates a block diagram of an embodiment of a kernel application center connected with application centers.

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[0012] FIG. 2B illustrates a block diagram of an alternative embodiment of a kernel application center.

[0013] FIG. 3 illustrates a block diagram of an embodiment of an application center.

[0014] FIG. 4 illustrates a block diagram of processes and objects utilized by a cloud-hosted integrated multi-node pipelining system for media ingestion.

[0015] FIG. 5A illustrates a simplified block diagram of an embodiment of a system configured to provide dynamic indexing and chunking for media streaming.

[0016] FIG. 5B illustrates a simplified block diagram of another embodiment of a system configured to provide dynamic indexing and chunking for media streaming.

[0017] FIG. 5C illustrates a simplified block diagram of another embodiment of a system configured to provide dynamic indexing and chunking for media streaming, utilizing a redirector.

[0018] FIG. 6 illustrates a simplified flowchart of an embodiment of a method for implementing a dynamic index for media streaming.

[0019] FIG. 7 illustrates a simplified flowchart of an embodiment of a method for dynamically chunking a media file for streaming.

[0020] FIG. 8 illustrates a simplified swim lane flowchart describing the interaction of components in a system configured to provide dynamic indexing and chunking for media streaming, according to one embodiment.

[0021] In the appended figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The ensuing description provides preferred exemplary embodiment(s) only, and is not intended to limit the scope, applicability or configuration of the disclosure. Rather, the ensuing description of the preferred exemplary embodiment(s) will provide those skilled in the art with

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an enabling description for implementing a preferred exemplary embodiment. It is understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope as set forth in the appended claims.

[0023] The increased availability of media content over data communications networks such as the Internet has mirrored the increased bandwidth for these networks. Because media has recently taken a more prominent role in data communications, the distribution of media and the data associated with such distribution has become increasingly important, particularly to media content providers. Media streaming has become a widely-used method of media distribution, but the preprocessing associated with streaming can be burdensome. Certain protocols, including forms of Hypertext Transfer Protocol (HTTP) streaming, require chunking and storing media assets, and generating a corresponding index files. These requirements can deprive a content provider of the ability to dynamically insert additional media such as advertisements into a media stream, and can consume a large amount of storage space to store chunks of media for a media asset, including chunks for any alternative sub-streams (e.g., streams with alternative bitrates, captions, alternative languages, etc.). Certain systems and methods can be utilized, however, to introduce the desired functionality back into the system.

[0024] A traditional approach to preprocessing media for streaming involves chunking and storing media assets, then creating corresponding index files to indicate where chunks may be located to download for streaming. Streaming protocols often provide for frequently updating an index file for instances where the corresponding media is frequently updated, such as during live streaming. Thus, an index file does not need to contain all chunks for a requested media asset. In addition, because media files are frequently stored in a format that requires little additional processing to chunk, the chunks can be created in real time, during the streaming of a media file. The systems and methods disclosed herein take advantage of these features to enable dynamic index file creation and dynamic media file chunking.

[0025] For instance, rather than preprocess media assets for streaming by chunking and indexing all files with relevant sub-streams prior to streaming the media, a server can dynamically create and update an index file during streaming. The dynamically-created index file can contain information regarding a next chunk of media in the various available sub-streams. The next chunk of media may not be cached at a location specified in the index file, in which case a chunk may be dynamically created by pulling all or part of the media file of interest

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from a media file origin, chunking it, and making it available for download. The chunk also may be cached, thereby eliminating the need to create the chunk again if it is requested at some later time.

[0026] Because the chunks are created during streaming, a content provider and/or media distributer can have more information and control during the streaming process. Rather than generate single index file for a given media asset, an instance of the index file generator may be created at the beginning of the media streaming to provide individualized media content to a particular end user and unique information regarding the streaming session to a content provider. The file index generator can vary the length of each chunk by, for example, indicating starting and ending points in the index file. Thus, the file index generator may determine a uniform chunk length for a media asset, varying the length of the chunks for different media assets, or the file index generator may adjust the length of the chunks within a single media asset. The index file generator can further insert additional media, such as an advertisement, at any time during the streaming by specifying the location of the additional media in the index file. The determination to insert advertisements can be based on any information, including data collected during the streaming session.

[0027] As the index file generator receives requests for and generates index files, it can further gather data regarding the streaming session for reporting to a content provider. Content providers often rely on beaconing data collected from media player applications to determine when an end user stops, plays, pauses, skips, etc., the streaming media content. Such information can be vital in determining the value of the media.

[0028] Because not all media player applications provide this beaconing data, the data gathered by the index file generator can serve as a substitute for or complement to the beaconing data. For example, if a request is made for a chunk that does not immediately follow a previously-requested chunk, a skip was made. If the amount of time elapsed between a previous request and a subsequent request exceeds the time for playback of the previously-requested chunk, a pause was made. If a request is not received within a certain time since a prior request, it can be determined that a stop was made.

[0029] As illustrated above, the state of a client may be determined from a variety of factors. This can include when the request for the index file is received, when the index file is provided, a length of time to play back the segment of media for streaming, and/or the starting and/or ending

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point of the segment of media for streaming. The determined state of a client may also be based on whether the request for the index file has been received within a certain amount of time since receipt of a previous request for an index file, whether the segment of media for streaming includes media other than the media file, and more. The state of a client and/or the data from which it was determined, may be used to create reporting data to serve as a substitute or complement to beaconing data from a client media player application. Because the index file generator can determine the length of the chunks, it therefore can determine the frequency of subsequent index file requests and the resolution of the reporting data based on the requests. The index file generator may log the reporting data and/or transmit the reporting data over a network during streaming.

[0030] The determined state of a client may be used by the index file generator and/or other services for various purposes. For example, it may be used in behavioral advertisement targeting and enforcement of session advertisement behavior, adjusting advertisement content and playback based on the behavior of a user as determined by the stated of a client. The state of a client further may be used to support resume features on a per client basis, allowing a user to continue playback of a media asset from a point at which the user had previously stopped playback. The state of a client also may be used to support individual encryption keys in an encryption scheme and allow the index file generator to return secure URLs (e.g., time expiring or Internet Protocol (IP) allowed) for chunks to support functions such as payment services.

[0031] Additionally or alternatively, the tasks of generating the index file and providing a location a requested chunk can be split up, thereby enabling the system to determine which chunks are actually requested. For example, a system may be configured to dynamically create an index file having links to one or more redirectors on the system. These redirectors can be configured to issue the location of the chunk, which can be created dynamically. The redirectors can further determine which chunk is actually requested, thereby enabling, among other things, calculation of Quality of Service (QOS) metrics, an increase the accuracy of reporting data, a decrease the frequency of index file generation if efficient to do so, and the ability to more easily handle keys of an encryption scheme.

[0032] While the above embodiments may be implemented in a variety of different systems, some particular embodiments may be implemented as part of a media service system. **FIG. 1** is a block diagram illustrating a media servicing system 100, according to some embodiments of

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the present invention. The system may deliver media content to the end user device 140 through a network such as the Internet 120. The end user device 140 can be one of any number of devices configured to receive media over the Internet 120, such as a mobile phone, tablet computer, personal computer, portable media device, etc. A media asset provided by a content provider 130 can be processed and indexed by cloud-hosted integrated multi-node pipelining system (CHIMPS) 110, and further stored on content delivery network (CDN) 150. Additionally or alternatively, the CHIMPS 110 may also be adapted to store the media asset.

[0033] The media servicing system further enables a content provider 130 or other entity to gather information regarding user behavior during media playback. For example, a content provider 130 can be provided with data indicating that end users tend to stop watching a video at a certain point in playback, or that users tended to follow links associated with certain advertisements displayed during playback. With this data, a content provider 130 can adjust factors such as media content, advertisement placement and content, etc., to increase revenue associated with the media content and provide the end user device 140 with a more desirable playback experience.

[0034] End user device 140 can request a media asset to stream with a client program executed by the end user device 140. The client program can be, for example, a media player, browser, or other application adapted to request and/or play media assets. In response to a request for a media asset, the CHIMPS 110 can utilize any number of application centers 112 and/or kernel application center(s) 111 to provide the client program with a data object concerning the requested media asset. The data object can include information about the media asset, including where the media asset can be located, such as within the CDN 150 or within the CHIMPS 150 itself. Location information may be provided by Universal Resource Indicator (URI), a Universal Resource Locator (URL) or other indicator. During playback of the media asset, the CHIMPS 150 can collect data regarding the playback through beaconing provided by a client program executed by the end user device 140 and/or indexing service from within the CHIMPS and/or CDN. The CHIMPS 150 can subsequently provide the data and/or any analytics information derived from the data to the content provider 130.

[0035] **FIG. 2A** is a block diagram illustrating an embodiment of a kernel application 111-1 center connected with application centers from within the CHIMPS 110-1. The kernel application center 111-1 and application centers 112 can be geographically distant and can be

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connected via the Internet 120, wide area network (WAN), and/or other data communication network. Because application centers can be geographically separated, DNS services (not shown) can be used to allow an end user device 140 to connect to the nearest available application center 112. The kernel application center 111-1 can connect with application centers 112 within the CHIMPS 110-1 through an internal interface 270, thereby enabling the application centers 112 access to the various components within the kernel application center 111-1.

[0036] Components within the kernel application center 111-1 can communicate through network 260 such as a local area network (LAN) and can include one or more origin servers 240 and a storage array 230 with which data objects and/or media assets may be stored and distributed. The storage array 230 may also be utilized by services running on processing server(s) 220 and/or transcoding server(s) 250 that may require temporary or long-term storage. Kernel server 210 can utilize processing server(s) 220, transcoding server(s) 250 to provide various functional capabilities to the CHIMPS 110.

[0037] For example, as described in more detail below, the CHIMPS 110-1 can provide transcoding service for media assets provided by a content provider 130 for syndication. Such a service can allow a content provider 130 to upload a media asset to an application center 112, after which the application center 112 would notify the kernel server 210 that the media asset has been uploaded. The kernel server can then notify services running on the processing server(s) 220 of the upload. These services can utilize transcoding server(s) to transcode the media asset, which can then be moved to a CDN and/or stored locally by storage array 230 and origin server(s) 240. Services running on the processing server(s) 220 can also update the associated data object stored by the storage array 230 and origin server(s) 240.

[0038] **FIG. 2B** is a block diagram illustrating an alternative embodiment of a kernel application center 111-2. In addition to the components of the embodiment of FIG. 2A, this embodiment incorporates an application center 112 within the kernel application center 111-2. The application center 112 incorporated within kernel application center 111-2 may be located at or near the other components of the kernel application center 111-2, and can be communicatively connected to the other components via network 260. The incorporated application center 112 can therefore have faster access to kernel application center functionality because it does not need to communicate over long distances. In consideration of this advantage, it will be

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understood that the CHIMPS 110 can include multiple kernel centers with one or more application centers incorporated therein. Additionally or alternatively, components of the kernel application center may be incorporated into one or more application centers 112 in the CHIMPS 110 to provide quicker access to certain functionality.

[0039] **FIG. 3** is a block diagram illustrating an embodiment of an application center 112. The application center 112 can include caching server(s) 330 and a storage array 310 for storing and distributing data objects of media assets requested by end user devices through end user interface 360. Caching server(s) 330 and storage array 310 can also be used to collect, process, and/or store metrics information from beaconing data, media chunk requests, and/or other data sources, including data collected through end user interface 360. The application center can further include ingest server(s) 320 for ingesting uploaded media assets from a content provider 130 through a content provider interface 370. The media assets may be stored on the storage array 310. As with the kernel application center 111, the components of the application center 112 can be communicatively linked through a network 340, such as a LAN. The application center can further include an internal interface 350, providing a communication link from the application center to the rest of the CHIMPS. It is through internal interface 350, for example, that media assets stored on storage array 310 can be made available to a kernel application center 111 for services such as transcoding.

[0040] **FIG. 4** is a block diagram 400 of processes and objects utilized by the CHIMPS 110 for media ingestion, according to some embodiments. Although FIG. 4 further indicates the physical systems in which my execute or store these processes and objects, it will be understood that the processes and objects disclosed may be executed or stored on more than one system, including systems not disclosed in FIG. 4. In other words, the processes and objects shown in FIG. 4 allow for a variety of implementations through one or more of hardware, software, firmware, microcode, etc.

[0041] Media can be ingested into the CHIMPS 110 when a content provider 130 uploads a media asset to ingestion server(s) 410 in an application center 112 by utilizing a client 405. The client 405 can be a stand-alone application or browser based, for example, and can communicate with ingest server(s) 410 through an application programming interface (API) configured for the ingestion of media assets.

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[0042] Ingest server(s) 410 can communicate with devices in the kernel application center 111 executing programs such as kernel server 425 and file replication service 430. The kernel server 425 can be configured organize the workflow among services such as transcoding 440 file system manager 435, and other services 445 (e.g., analytics, dynamic API, etc.) Upon a particular event, for example, the kernel server can be configured to notify the relevant services of the event, causing the services to process tasks associated with the event.

[0043] The file replication service 430, under direction of the kernel server 425, can coordinate the movement of the media assets between services. For example, retrieving the uploaded media asset from the ingest server(s) 410 and storing it on the file archive 450, or retrieving transcoded media assets from transcoding server(s) 460 and storing them in the media asset origin.

[0044] The data object updater 420 keeps the data object origin 415 up to date in response to any changes in the system. When, for example, a file is uploaded, transcoded, and stored in media asset origin 455, the location and other metadata concerning the transcoded media assets need to be created or updated in the data object origin 415 to ensure an end user device that accesses the object in the data object origin 415 has the correct information regarding the related media asset. Because the data object updater 420 receives updates from the kernel server 425 (which is notified when a transcoded media asset is stored in the media asset origin 455, the system ensures the data objects in the data object origin are constantly up to date.

[0045] The upload of a media asset to the ingest server(s) 410, as described above, can provide an example of how the kernel server 425 may coordinate workflow. For instance, in response to the upload, the ingest server(s) 410 can notify the kernel server 425 that a media asset has been uploaded. The kernel server 425 informs the file replication service 430 of the uploaded media asset, and the file replication service 430 moves the uploaded media asset into the file archive 450 and notifies the kernel server 425 of the move. In response, the kernel server 425 notifies the file replication service 430, the file system manager 435, and the transcoding master 440 of the move. The file replication service 430 then will know it can delete the uploaded media asset from the ingest server(s) 410, the file system manager 435 will update the file system accordingly, and the transcoding master 440 will notify transcoding service(s) 460 of different transcoding tasks to be performed. The transcoding service(s) 460 can then retrieve the uploaded media asset from the file archive 450 to create transcoded media assets. The transcoding service(s) 460 notify the kernel server 425 once transcoding is complete, and the kernel server

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425 relays this information to the file replication service 430. The file replication service 425 then takes the transcoded media assets from the transcoding services 460 and moves them to the media asset origin 455. Once the file replication service 430 notifies the kernel server 425 of the move, the kernel server 425, in turn, notifies the file replication service 430 and the data object updater 420. The data object updater 420 which updates the data object origin 415 accordingly, and the file replication service 430 deletes the transcoded media assets from the transcoding services 460.

[0046] The modular nature of the system enables all tasks associated with an event to be completed quickly. As illustrated in the example above, workflow relating to a particular event, such as a media asset upload, can be spread among the various services simultaneously. Moreover, because the system's modularity enables it to be scaled to accommodate differing hardware capacities, and because the system can be configured to dynamically allocate hardware to different services according to the needs of the system, the speed of completing tasks relating to a particular event can further be increased. For example, a server of the CHIMPS 110 can be configured to dynamically switch its purpose based on external conditions such as load and overall system performance, providing functions such as transcode, upload, metrics collection, application web service, and more, on an as-needed basis.

[0047] Embodiments of such systems may include other systems that manage various requests from end users. For example, a system for dynamic index file generation an media file chunking. Referring to **FIG. 5A**, shows an embodiment of such a system 500-1. Media may be streamed to end user device 140 though a client 510. As mentioned above, the client 510 can be stand-alone media player, a plug-in, a browser, or other application, which can be executed on a personal computer or other electronic device.

[0048] An index file generator 530, as discussed previously, can be a program instantiated for media streaming to a particular client 510. The index file generator 530 can be executed on a server or other computing device within an application center 112 of the CHIMPS 110. Index files generated by the index file generator can include a wide variety of information such as starting, ending, and or run times for media chunks and locations for media chunks. This information can be embedded in a single string of data, such as a URI or a URL. If media includes various sub-streams (e.g., streams with alternative bitrates, captions, alternative languages, etc.) the index file can include data for chunks corresponding to each of the

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alternative sub-streams, as well as information regarding the bitrate and/or other unique information for each stream. Alternatively or in addition, index files indicating alternative sub-streams may be separate from index files indicating one or more media chunks for streaming.

[0049] It should be understood that the index file can further comprise a wide variety of formats, which can depend on the particular protocol. HTTP streaming may, for example, require index files to comprise one or more of M3U, M3U8, XML, and XML-based formats. Of course, other formats can be used in accordance with relevant streaming protocols.

[0050] **Table 1** illustrates a simplified example of an generated index file in M3U9 format, indicating chunk of media for streaming. The index file in this example provides a URI for a chunk of media. The URI indicates the chunk is to be generated by dynamic segmentor 550, the chunk being 10 seconds long, starting at 9 seconds into the media file and ending 19 seconds into the media file.

Table 1: Example Index File Contents

```
#EXTM3U
#EXT-X-MEDIA-SEQUENCE:1
#EXT-X-TARGETDURATION:10
#EXTINF:10,
http://video.example.com/seg/9/19/seg1.ts
```

[0051] Referring again to FIG. 5A, the index file generator 530 can also include an indicator within an index file to indicate whether a chunk of media is to be dynamically created. If, for example, it is determined that a requested media asset has not been chunked and that the asset will be chunked dynamically, the index file generator can include the indicator in data corresponding to a chunk of media to be created. The indicator, which can be as simple as including the term "/seg/" in a URL, will indicate that a requested chunk of media needs to be generated.

[0052] The chunks of media can be generated during media streaming by a dynamic segmentor 550, which can be incorporated into an HTTP service 540. The HTTP service 540, as well as the media asset origin 560 can be located within a kernel application center 111 of the CHIMPS 110 on, for example, a media asset origin server. The system 500-1 can be configured such that the kernel application center 111 provides dynamically-created chunks of media to a CDN 150 for

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delivery to client 510. The CDN 150 can store the chunks locally in, for example, a media asset cache 520, thereby forgoing the need to dynamically create a chunk again if the same chunk is requested in the future.

[0053] In sum, the system for dynamic index file generation and media asset chunking 500-1 can, after receiving a request for an index file from a client 510, dynamically generate an index file with an index file generator 530. The index file can, among other things, indicate where a next chunk of media may be located. A client can then request the chunk from the location indicated by the index file, which can comprise a media asset cache 520 in a CDN 150. If the chunk is not found in the media asset cache 520, the cache miss can redirect the request to a segmentor 550 of an HTTP service 540, which can dynamically generate the requested chunk of media by accessing the corresponding media asset in the media asset origin 560. The requested media chunk can then be provided to the CDN 150 for storage in the media asset cache 520 and delivery to the client 510. If the same chunk is requested at a later point in time, the CDN 150 can deliver the chunk from the media asset cache 520, thereby forgoing the need to redirect the request to the segmentor 550 to regenerate the chunk.

[0054] **FIG. 5B** illustrates an alternative embodiment 500-2 of a system for dynamic index file generation an media file chunking. Rather than utilize a CDN, this embodiment 500-2 includes a media caching server within an application center 112 of the CHIMPS 110. The media caching server can receive chunk requests from and provide the corresponding chunks to a client. It will be understood that such a media caching server(s) or similar device(s) can be located anywhere within the CHIMPS and/or in a system(s) communicatively linked to the CHIMPS.

[0055] **FIG. 5C** illustrates an embodiment 500-3 of a system for index file generation used in conjunction with a redirector 590. As discussed above, an index file generator 530 may create an index file having one or more URIs or other location information directing the client 510 to one or more redirectors 590. Redirector 590, can then provide the URI of the requested chunk with a redirect, such as a redirect under HTTP status code 302. The URI can be located on a CDN 520 or other location (such as a media caching server 570) and/or dynamically created by the dynamic segmentor 550. It will be understood that there can be any number of redirectors 590, which can be at any location, including locations of the CHIMPS 110 such as the application center 112 (as shown in FIG. 5C) or the kernel application center 111. It also will be understood that the URI or other location information provided by redirector 590 can be generated by or

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provided to the redirector 590 in any number of ways. The URI can be generated, for example, based on the request received by redirector 590 from client 510. Finally, it will be understood that the CHIMPS 110 can be configured to dynamically implement any combination of embodiments 500-1, 500-2, and 500-3, further choosing whether to utilize one or more redirectors based on factors such as, for example, a detected type of client 510.

[0056] Embodiments utilizing one or more redirectors can have several advantages. For example, and not by way of limitation, if a certain client were implemented in such a way that it "reads ahead" to request chunks, it could result in incorrect reporting data. Thus, it would be advantageous to determine which chunk is actually requested by the client. Additionally or alternatively, where chunks are available in various sub-streams with different bitrates, determining the actual requested chunk can be useful in calculating Quality of Service (QOS) metrics. Furthermore, it there may be scenarios in which it is more efficient to create larger index files having many chunks comprising large segments of media, reducing the number of index files required to stream a media asset, and thereby reducing the processing requirements to create the index files. If encryption is used having, for example, a rotating key or a per client key encryption scheme in which a valid key might change during playback of a media asset, it also may be advantageous to incorporate redirector(s) for handling legacy keys for some period of time.

[0057] **FIG. 6** illustrates a simplified flowchart of an embodiment of a method 600 for implementing a dynamic index for media streaming. The method 600, which can be executed by the index file generator 530, begins at block 610, where a request for an index file is received from a client 510. According to media streaming protocols contemplated by this embodiment, if data regarding a chunk of media is not provided in an initial index file, the client will continue to request or refresh an index file until it reaches an indicator in the index file that signals the end of a stream. Thus, the method can be assured to receive more than one request for an index file from a client provided that an initial index file does not include an indicator signaling the end of the stream.

[0058] At block 615, the method 600 additionally provides for receiving input from an advertising service. According to some embodiments, this input could be the availability of an advertisement, and can be provided by a service inside or outside the CHIMPS. In other embodiments, the input could come from a service that factors in any of a variety of factors to

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indicate that a specific advertisement or type of advertisement should be shown. Or that any advertisement should be shown.

[0059] At block 620, a determination is made whether to include an advertisement in the next chunk. According to some embodiments, this determination can be made with or without input from an advertisement service. It should be known that this determination can include the factors used by an advertisement service to provide the input of block 615. Whether the determination includes input from an advertisement service of block 615 or not, the determination can still include factors such as information about an end user collected before or during streaming of the media. This can include behavior of the end user during streaming of the media (as determined, for example, by machine-based logic through beaconing data and/or requested chunks of media provided by a client 510). Factors can also include information regarding the media asset used for streaming (such as type of content or preferred points within the media for an advertisement), preference(s) and/or selection(s) of an end user, when a previous advertisement was shown, time of day, and more. It can further include information regarding the source of a media asset, such as who created and/or provided the asset for viewing by an end user. It will be understood that other embodiments contemplate include secondary media, other than advertisements into the media stream in this manner. Moreover, the secondary media and/or advertisement can be of any length and also may be chunked. Thus, it may be determined that the next chunk includes all, or a select portion, of an advertisement of any specific length.

[0060] An index file is created based on the request as well as the determination of whether media, such as an advertisement, should be streamed, indicated by block 625. As discussed above, the index file can assume a variety of formats and include any amount of information regarding a next chunk of media for streaming. For example, HTTP streaming can utilize index files having the URLs of available chunks of media. Information can be embedded in these URLs to indicate a location to download the corresponding chunk of media, starting point and/or ending point of a chunk of media, an indicator to indicate whether the chunk is to be dynamically created by a segmentor 550, a location of an advertisement to be streamed, and more. This information is included in the index file and sent to the client at block 630.

[0061] At block 635, reporting data can be created based on information included in the index file. As previously discussed, information included in an index file and/or index file request can

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indicate the behavior of an end user device 140 during streaming, such as a pause, stop, skip, play, etc. of the media. According to some embodiments, this information can be extracted from requests for an index file and/or providing the requested index file. The information can be gathered in addition to or as a substitute for beaconing data provided by a client 510. Moreover, if beaconing data is provided, the creation of reporting data may be omitted altogether.

[0062] Reporting data can include any amount of information regarding end user behavior, as indicated through index file requests and/or provided index files. This can include a particular action and when it was performed. Additionally or alternatively, the data may be kept in a more rudimentary form, depending on the application or embodiment, indicating the data included in a index file request and/or an index file. This reporting data may be stored in a log file for reporting after streaming and/or transmitted during streaming to a relevant service that collects such metrics.

[0063] As indicated by block 640, the reporting data may be sent to a metrics collector for analytics. A metrics collector, according to certain embodiments, may be an application executed by a server from within the application center 112 in which the index file generator 530 is executed, or it may be executed elsewhere, such as in a kernel application center 111 or in a system outside the CHIMPS 110. Depending on the form of the reporting data, the metrics collector can further process and store the information.

[0064] **FIG. 7** illustrates a simplified flowchart of an embodiment of a method for dynamically chunking a media file for streaming 700. This method can be employed by a variety of systems and/or programs. For example, it may be executed by a dynamic segmentor 550 of an HTTP service 540 running on a server located in a kernel application center 111 of the CHIMPS 110.

[0065] The method 700 can begin at block 710, when a request for a chunk of media is received from a CDN 150. As discussed above, this request may be made in response to a cache miss at the CDN 150 and/or because an indicator was included in the request for the chunk of media that the chunk was to be created dynamically. As discussed herein, if the CDN 150 has the requested chunk cached from a prior request, the CDN 150 can provide the requested chunk and preclude the need to send the request to a dynamic segmentor 550 to generate the chunk. It should be understood that the request may come from sources other than a CDN 150 according to alternative embodiments. One such source includes the media caching server 570 of embodiment 500-2, as shown in FIG. 5B.

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[0066] The starting and ending points of a requested chunk of media are then determined at block 715. This information can be included directly in the request or derived from the request, a previous request, and/or other sources. At block 720, the information, as well as information identifying the requested chunk of media, can be used to retrieve all or part of the relevant media asset from a media asset origin 560. The retrieved portion will include at least the relevant media from the starting point to the ending point of the requested chunk of media.

[0067] At block 725, the requested media chunk is generated by converting the relevant portion of the media asset into a deliverable chunk. The media asset, as stored in the media asset origin, may not be chunked; it may be stored in its entirety as a media file (or group of alternative files corresponding to alternative sub-streams). Generating the chunk therefore can require determining the starting and ending points from the retrieved portion of the media asset and converting the resulting segment of media into a deliverable chunk.

[0068] Although the generation of the deliverable chunk may involve transcoding, it may not. The media asset can be stored in a format where transcoding may not be needed, thereby reducing the processing requirements for creating chunks of media during streaming. For example, media assets may be stored such as H.264 or MPEG-4 video format and/or AAC, HE-AAC, or MP3 audio format. According to some streaming protocols, such as some forms of HTTP streaming, chunks of media in these formats would not need transcoding before being wrapped in an MPEG-2 transport stream container format. Instead, such a conversion essentially would require the addition of metadata to create the streaming format from the format of the stored media asset. In other words, generating a deliverable chunk of media may only require identifying the stored media asset, extracting the relevant segment of the media from the media asset, and adding certain metadata in accordance with a container format. This process requires little processing power and can be easily performed on the fly during streaming. Once the deliverable chunk of media is generated, it is sent to the CDN 150 or other requesting entity, at block 730.

[0069] **FIG. 8** illustrates a simplified swim lane flowchart describing the interaction of components in a system configured to provide dynamic indexing and chunking for media streaming, according to one embodiment. In this embodiment, a client can send a request for an index file 805, the request received by an index file generator 810. A particular request may be made to initiate the streaming of a media asset, or it may be during streaming. Depending on the

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streaming protocol, the request may be made while a client plays a chunk of media previously downloaded during streaming.

[0070] The index file generator generates an index file to indicate the next chunk of media 815. As described above, this chunk may include an advertisement, and the index file can include any amount of information about a chunk of media, including information regarding alternative sub-streams for streaming. The dynamic index file generator can include information regarding existing chunks of media, and, when used in conjunction with a dynamic segmentor may also include information regarding chunks of media that may need to be created. As detailed above, if a chunk of media is to be generated dynamically, the index file generator may indicate this by including an indicator in the generated index file, such as in a URL for one or more chunks described within the index file. Once the index file is generated, the index file generator sends the index file 820, which is received by the client 825.

[0071] Alternative embodiments may provide for the generation of index files containing more than a next chunk of media. For example, an index file generator may generate an index file containing information regarding several chunks of media, in which case the chunks of media can be dynamically generated by a dynamic segmentor when requested by the client. The determination of whether to include information regarding more than a next chunk of media can include factors such as whether the index generator is generating reporting data, the desired frequency of such reporting data, and more.

[0072] Using information contained in the index file, the client can then request the next chunk of media 830, and this request can be received by a CDN 835. The CDN then checks to see if the chunk is already stored in the cache 840. If so, the CDN can provide the requested chunk to the client, blocks 845 and 850. The requested chunk may be found in a CDN's cache if the chunk was created and stored in the CDN during preprocessing or if a the chunk was dynamically created and stored in the CDN from an earlier request.

[0073] If the chunk is not found on the CDN, the chunk can be requested of the dynamic segmentor, which receives the request 855 and retrieves the corresponding media asset from an asset origin server 860. As discussed above, the entirety of the relevant media asset does not need to be retrieved as long as at least the portion containing the relevant segment for the requested chunk is retrieved. It will be understood that alternative embodiments can provide for

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the media asset being stored in a variety of locations accessible, directly or indirectly, to the dynamic segmentor.

[0074] The dynamic segmentor can then generate the requested chunk by converting the retrieved media into a deliverable chunk. That is, the dynamic segmentor converts the retrieved media into an acceptable format for streaming, which can vary depending on the streaming protocol utilized. The dynamic segmentor can then return the requested chunk 870 to the CDN, which can cache the chunk and return it to the client 875. Once the chunk is received by the client 880, the client can play the chunk to an end user.

[0075] It should be noted that the methods, systems, and devices discussed above are intended merely to be examples. It must be stressed that various embodiments may omit, substitute, or add various procedures or components as appropriate. For instance, it should be appreciated that, in alternative embodiments, the methods may be performed in an order different from that described, and that various steps may be added, omitted, or combined. Also, features described with respect to certain embodiments may be combined in various other embodiments. Different aspects and elements of the embodiments may be combined in a similar manner. Also, it should be emphasized that technology evolves and, thus, many of the elements are examples and should not be interpreted to limit the scope of the invention.

[0076] Specific details are given in the description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, well-known circuits, processes, algorithms, structures, and techniques have been shown without unnecessary detail in order to avoid obscuring the embodiments. This description provides example embodiments only, and is not intended to limit the scope, applicability, or configuration of the invention. Rather, the preceding description of the embodiments will provide those skilled in the art with an enabling description for implementing embodiments of the invention. Various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the invention.

[0077] Also, it is noted that the embodiments may be described as a process which is depicted as a flow diagram or block diagram. Although each may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be rearranged. A process may have additional steps not included in

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the figure. Furthermore, embodiments of the methods may be implemented by hardware, software, firmware, middleware, microcode, hardware description languages, or any combination thereof. When implemented in software, firmware, middleware, or microcode, the program code or code segments to perform the necessary tasks may be stored in a computer-readable medium such as a storage medium. Processors may perform the necessary tasks.

[0078] Having described several embodiments, it will be recognized by those of skill in the art that various modifications, alternative constructions, and equivalents may be used without departing from the spirit of the invention. For example, the above elements may merely be a component of a larger system, wherein other rules may take precedence over or otherwise modify the application of the invention. Also, a number of steps may be undertaken before, during, or after the above elements are considered. Accordingly, the above description should not be taken as limiting the scope of the invention.

[0079] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

[0080] The reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any form of suggestion that the prior art forms part of the common general knowledge in Australia.

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WHAT IS CLAIMED IS:

1. A server for communicating, with a network, a media file having a plurality of segments of a certain length, the server comprising:

an interface for communicating with the network;

a memory configured to store:

one or more of the plurality of media file segments; and

a plurality of instructions for communicating the media file over the network;

a processor communicatively coupled with the memory and the interface, the processor further configured to execute the plurality of instructions, the plurality of instructions configured to cause the server to:

receive, with the interface, a request for a first segment of the media file;

determine a starting point and an ending point of the requested first segment of the media file, wherein the determination is based, at least in part, on the request for the first segment of the media file;

retrieve a first portion of the media file from the memory, wherein:

the first portion of the media file includes at least the requested first segment of the media file, and

the first portion of the media file includes a first format;

generate the requested first segment of the media file, wherein:

the requested first segment of the media file has a second format, and

the requested first segment of the media file is generated, at least in part, from the first portion of the media file;

provide, with the interface, the requested first segment of the media file;

receive, with the interface, a request for a second segment of the media file;

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determine a starting point and an ending point of the requested second segment of the media file, wherein the determination is based, at least in part, on the request for the second segment of the media file;

retrieve a second portion of the media file from the memory, wherein:

the second portion of the media file includes at least the requested second segment of the media file, and

the second portion of the media file includes the first format;

generate the requested second segment of the media file, wherein:

the requested second segment of the media file has the second format, and

the requested second segment of the media file is generated, at least in part, from the second portion of the media file; and

provide, with the interface, the requested second segment of the media file.

2. The server of claim 1 further having instructions configured to cause the server to retrieve the first and second portions of the media file with the interface and store the first and second portions of the media file in the memory.

3. The server of claim 1 wherein the second portion of the media file is the same as the first portion of the media file.

4. The server of claim 1 wherein the requested first segment of the media file and the requested second segment of the media file comprise contiguous segments of the media file

5. The server of claim 1 wherein at least a portion of the instructions are executed during playback of the media file by a device communicatively linked to the network.

6. The server of claim 1 wherein the first format includes one or more of an audio compression format, a video compression format, and an image compression format.

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7. The server of claim 1 wherein the second format includes a media container format.

8. The server of claim 1 further configured to receive the requests for the first and second segments of the media file from a Content Delivery Network (CDN).

9. The server of claim 1 wherein the plurality of segments of a first media file have a different length than a plurality of segments of a second media file.

10. A method for providing, with a data network, a plurality of segments of a media file, the segments having a certain size, the method comprising:

receiving a request for a first segment of the media file;

determining a starting point and an ending point of the requested first segment of the media file, wherein the determination is based, at least in part, on the request for the first segment of the media file;

retrieving a first portion of the media file, wherein:

the first portion of the media file includes at least the requested first segment of the media file, and

the first portion of the media file includes a first format;

generating the requested first segment of the media file, wherein:

the requested first segment of the media file has a second format, and

the requested first segment of the media file is generated, at least in part, from the first portion of the media file;

providing the requested first segment of the media file;

receiving a request for a second segment of the media file;

determining a starting point and an ending point of the requested second segment of the media file, wherein the determination is based, at least in part, on the request for the second segment of the media file;

retrieving a second portion of the media file, wherein:

the second portion of the media file includes at least the requested second segment of the media file, and

the second portion of the media file includes the first format;

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generating the requested second segment of the media file, wherein:

the requested second segment of the media file has the second format, and

the requested second segment of the media file is generated, at least in part, from the second portion of the media file; and

providing the requested second segment of the media file.

11. The method of claim 10 wherein the first portion of the media file is the same as the second portion of the media file.

12. The method of claim 10 wherein the first format includes one or more of an audio compression format, a video compression format, and an image compression format.

13. The method of claim 10 wherein the second format includes a media container format.

14. The method of claim 10 wherein the requests for the first and second segments of the media file are received from a CDN.

15. The method of claim 14 wherein the requested first and second segments of the media file are provided to the CDN.

16. The method of claim 10 wherein the receiving the requests for the first and second segments of the media file and the providing the requested first and second segments of the media file occur during playback of the media file by a device communicatively linked to the data network.

17. The method of claim 10 wherein the data network comprises a first network and the retrieving at least a portion of the media file from a data origin occurs over a second network.

18. A system for communicating, with a network, a media file having a plurality of segments of a certain size, the system comprising:

a data storage configured to store the media file having a first format;

a processing server communicatively coupled with the data storage, the processing server configured to:

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receive, with a network, a request for a first segment of the media file;

determine a starting point and an ending point of the requested first segment of the media file, wherein the determination is based, at least in part, on the request for the first segment of the media file;

retrieve a first portion of the media file from the data storage, wherein:

the first portion of the media file includes at least the requested first segment of the media file, and

the first portion of the media file includes the first format;

generate the requested first segment of the media file, wherein:

the requested first segment of the media file has a second format, and

the requested first segment of the media file is generated, at least in part, from the first portion of the media file;

provide, with a network, the requested first segment of the media file;

receive, with a network, a request for a second segment of the media file;

determine a starting point and an ending point of the requested second segment of the media file, wherein the determination is based, at least in part, on the request for the second segment of the media file;

retrieve a second portion of the media file from the data storage, wherein:

the second portion of the media file includes at least the requested second segment of the media file, and

the second portion of the media file includes the first format;

generate the requested second segment of the media file, wherein:

the requested second segment of the media file has the second format, and

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the requested second segment of the media file is generated, at least in part, from the second portion of the media file; and

provide, with the interface, the requested second segment of the media file.

19. The system of claim 18 further comprising a media caching server configured to:

send the requests for the first and second segments of the media file with the network to the processing server;

receive the requested first and second segments of the media file with the network from the processing server; and

store the requested first and second segments of the media file in a memory.

20. The system of claim 19 wherein the media caching server is further configured to provide the requested first and second segments of the media file to a device communicatively coupled with the media caching server.

21. The system of claim 19 configured such that the media caching server will not send the requests for the a segment of the media file with the network to the processing server if the media caching server has the segment of the media file stored in the memory.

22. A server for communicating, with a network, a media file having a plurality of segments of a certain length substantially as herein described.

23. A method for providing, with a data network, a plurality of segments of a media file, the segments having a certain size substantially as herein described.

24. A system for communicating, with a network, a media file having a plurality of segments of a certain size substantially as herein described.

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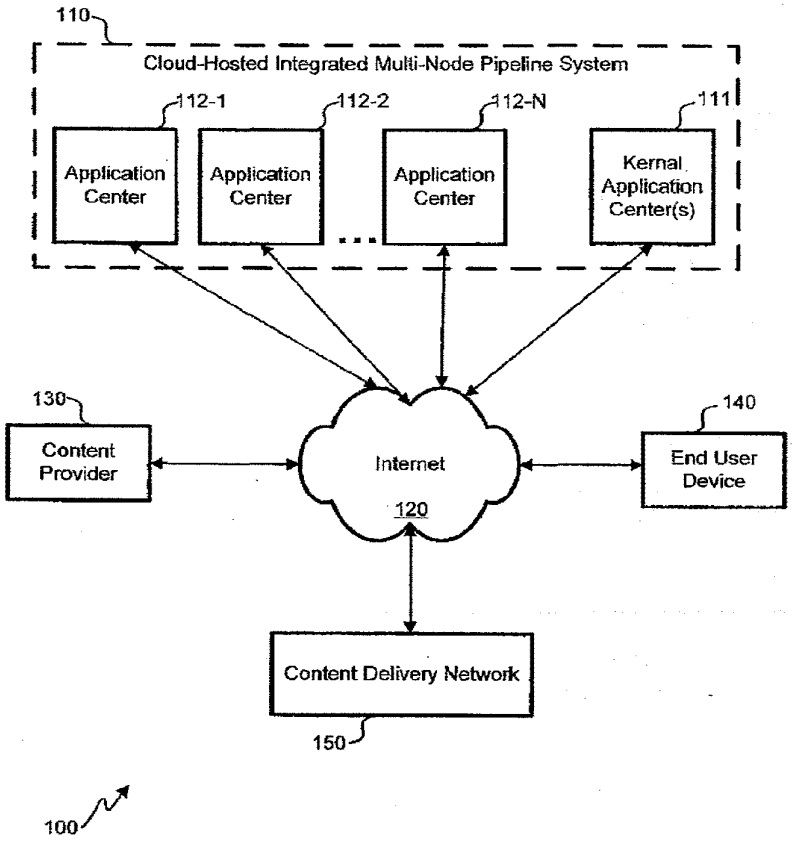


FIG. 1

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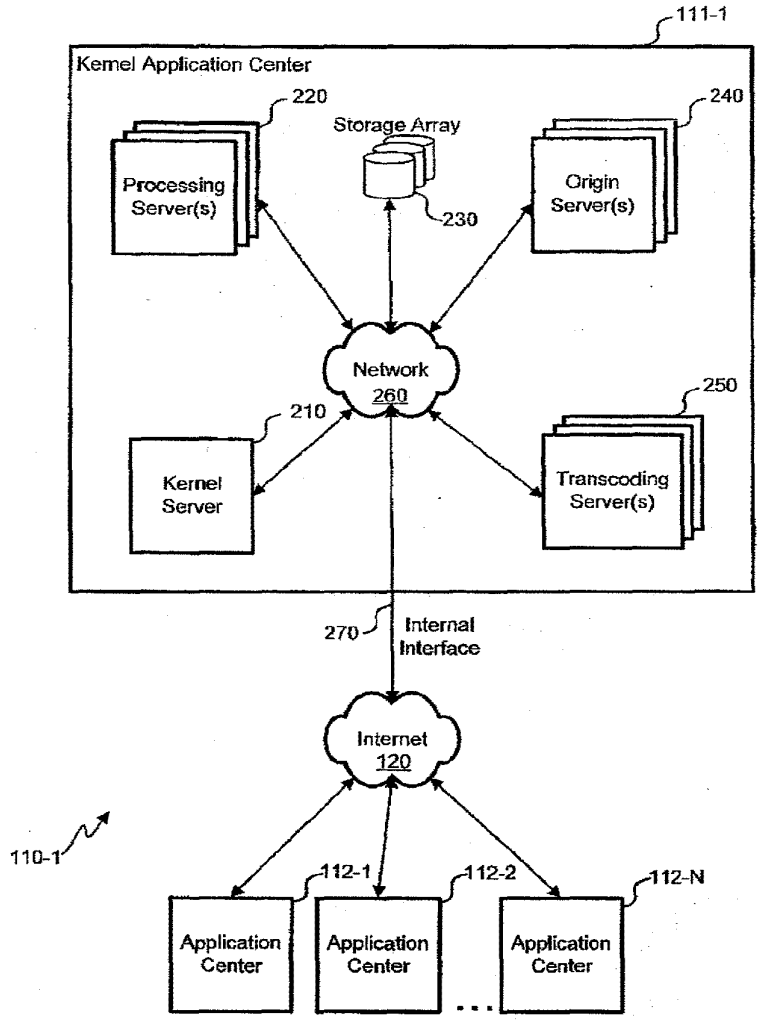


FIG. 2A

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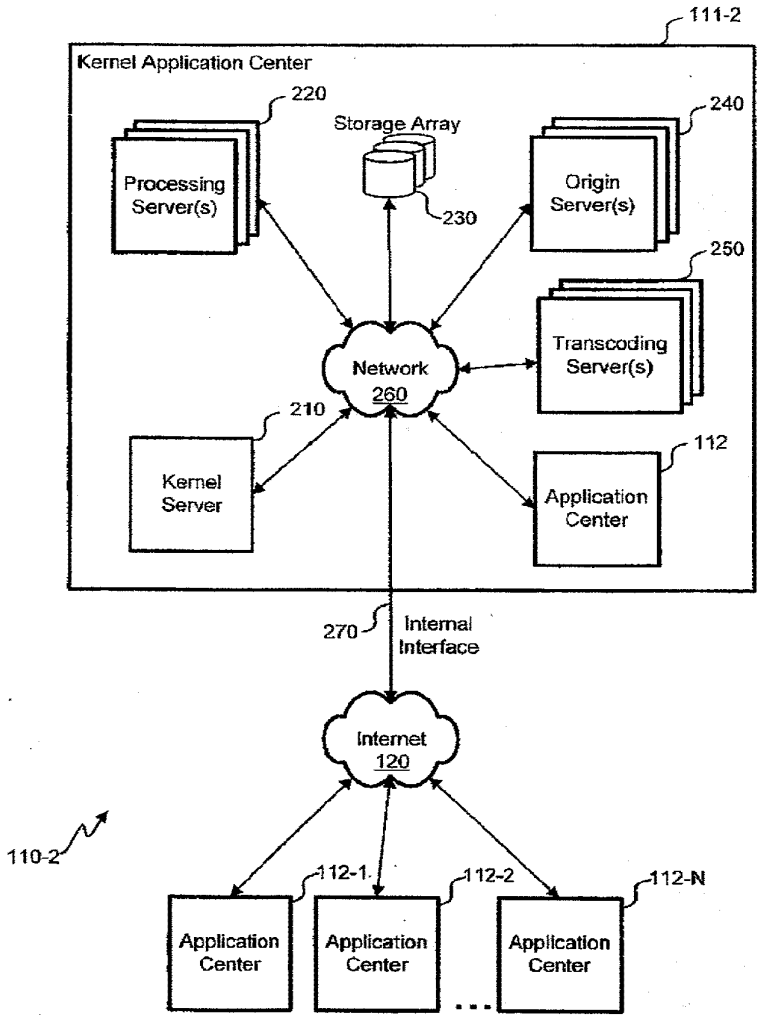


FIG. 2B

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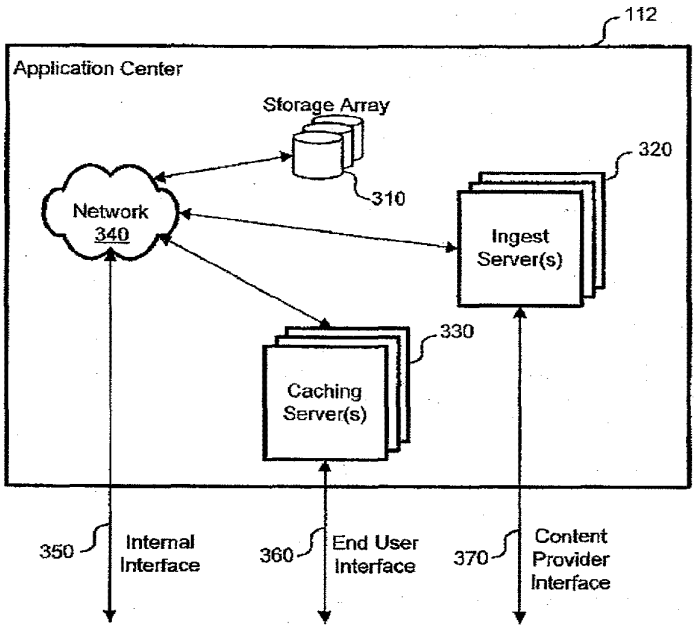


FIG. 3

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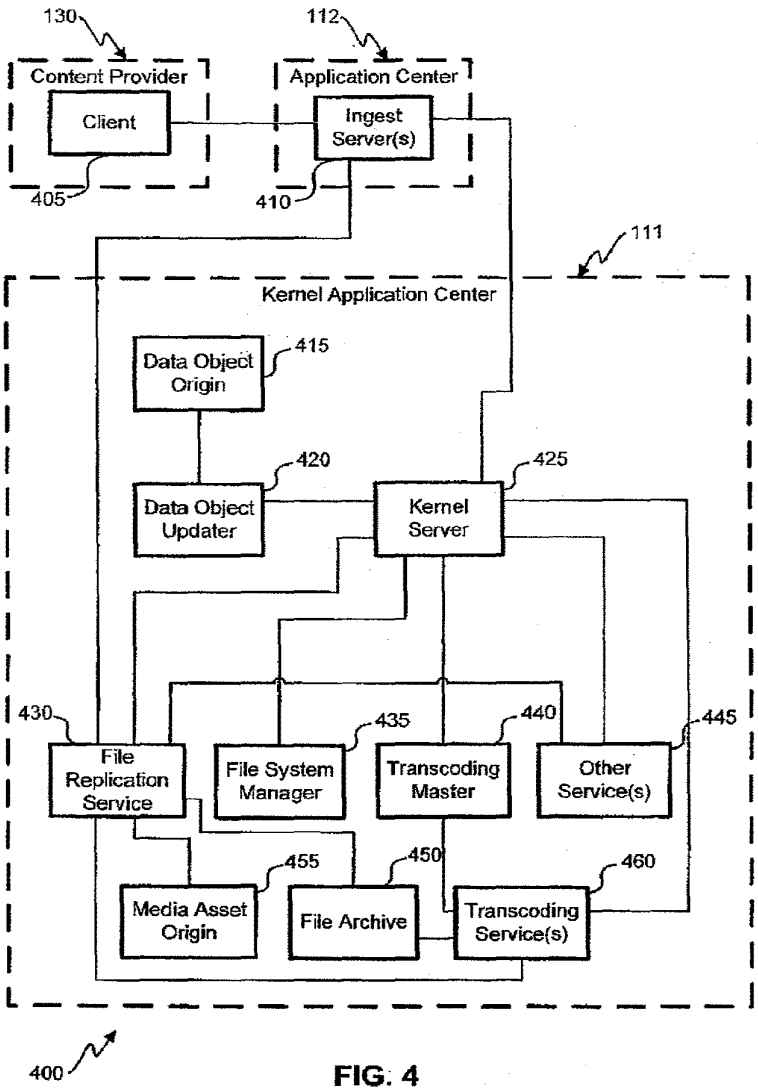


FIG. 4

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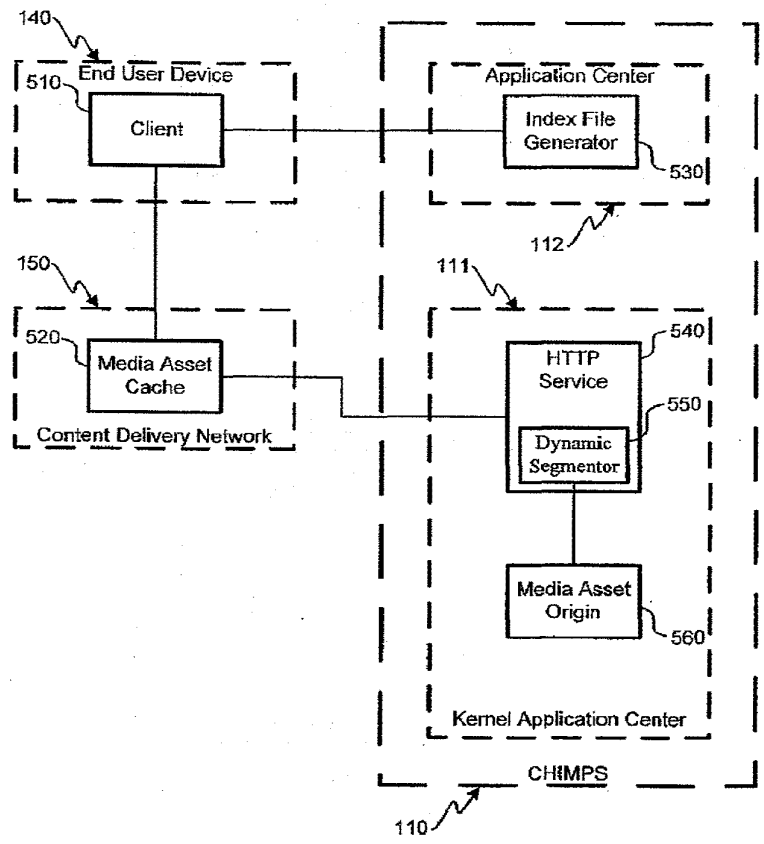


FIG. 5A

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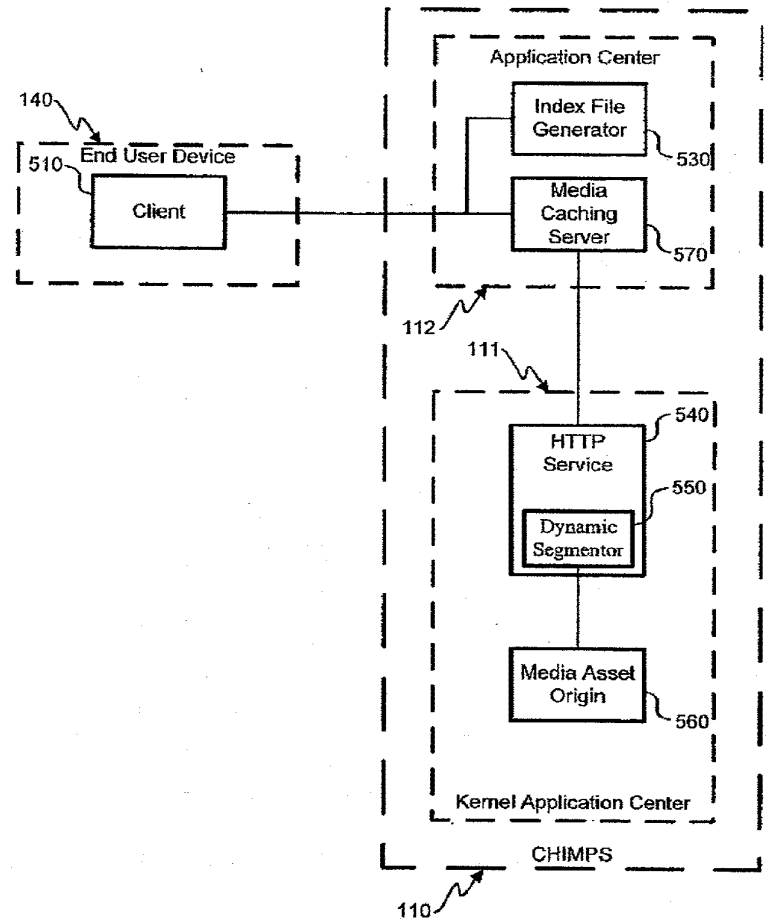


FIG. 5B

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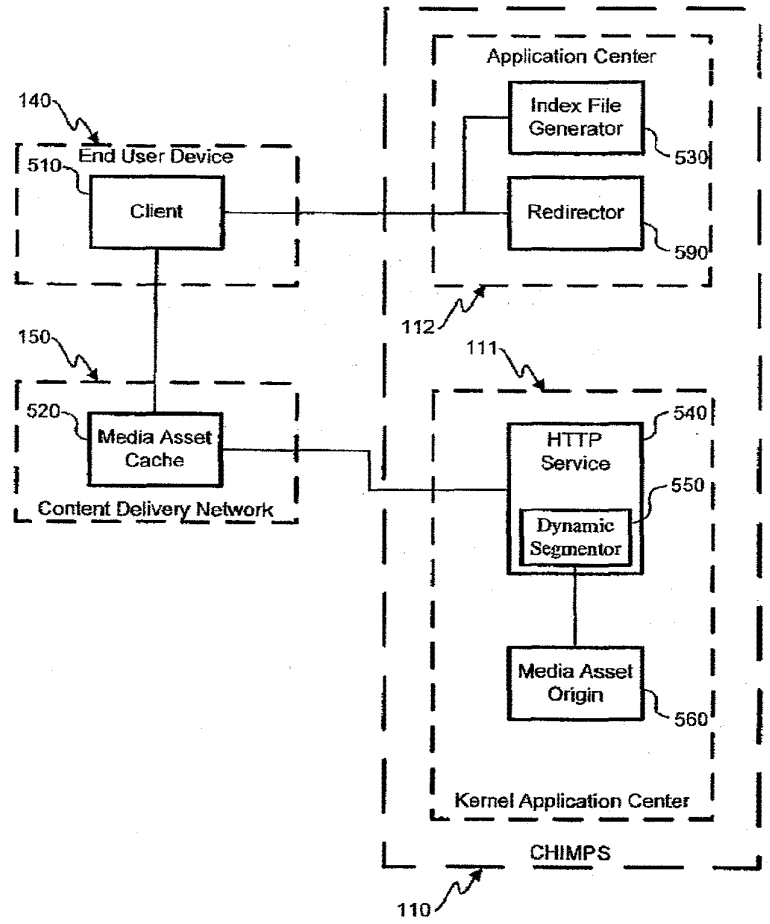
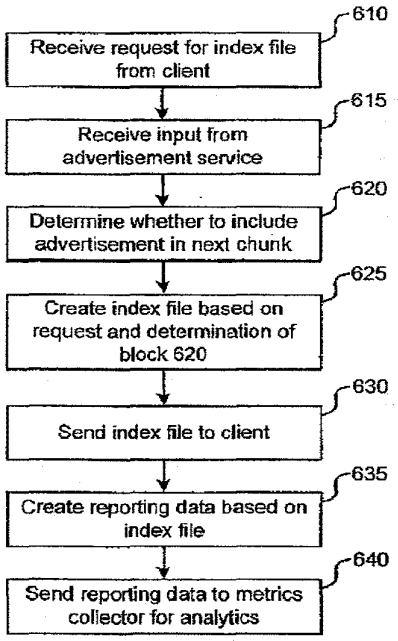


FIG. 5C

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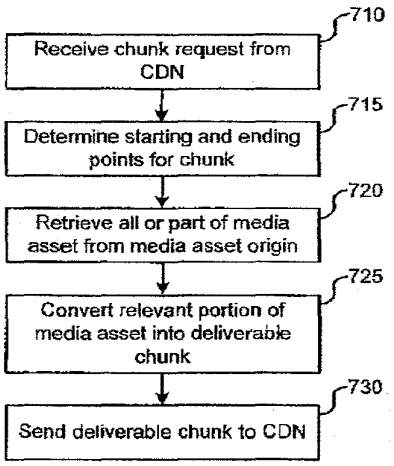


600

FIG. 6

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700

FIG. 7

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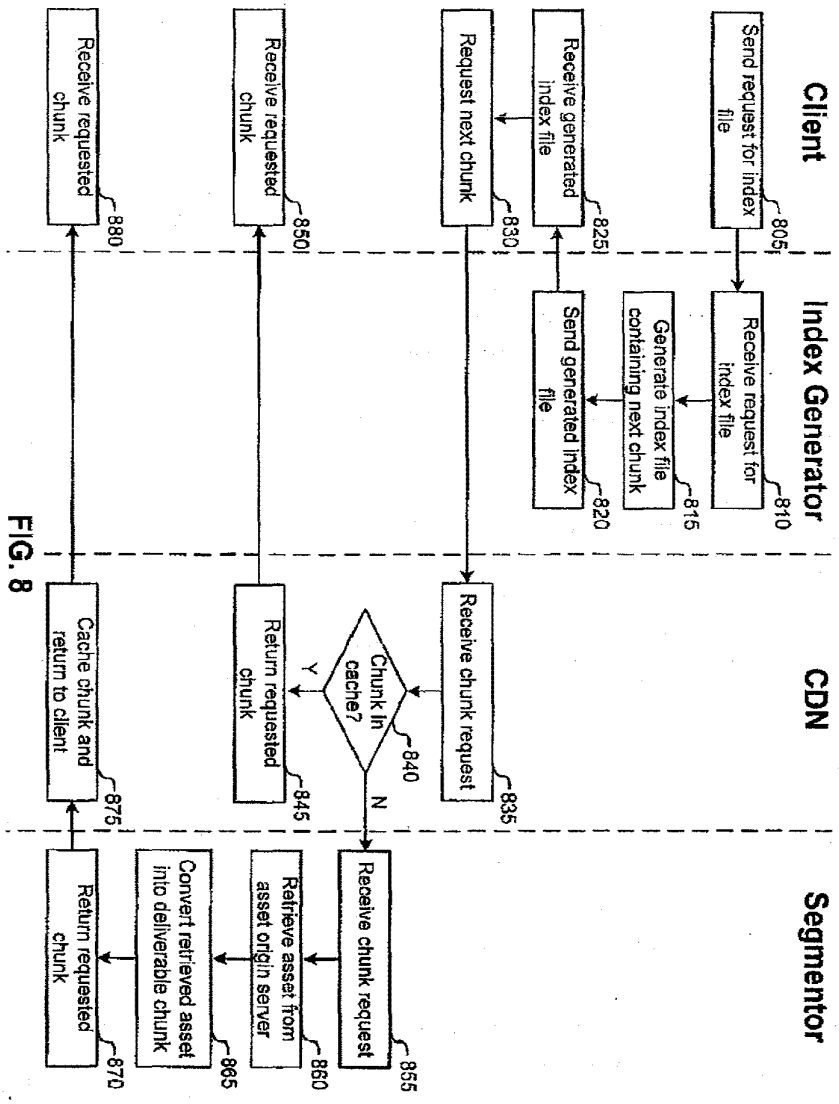


FIG. 8

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US 20010029525A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2001/0029525 A1**

Lahr (43) **Pub. Date: Oct. 11, 2001**

(54) **METHOD OF UTILIZING A SINGLE UNIFORM RESOURCE LOCATOR FOR RESOURCES WITH MULTIPLE FORMATS**

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(21) Appl. No.: **09/770,682**

(22) Filed: **Jan. 29, 2001**

Related U.S. Application Data

(63) Non-provisional of provisional application No. 60/178,751, filed on Jan. 28, 2000.

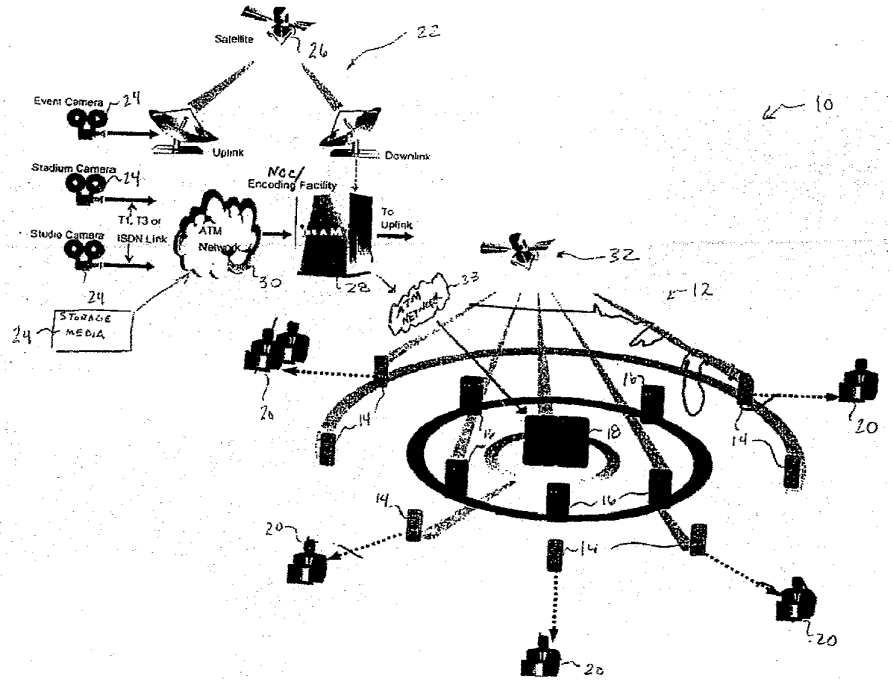
Publication Classification

(51) **Int. Cl.**[7] **G06F 15/16**

(52) **U.S. Cl.** **709/218**; 709/231; 709/219

(57) **ABSTRACT**

A broadcast system for streaming media is provided. A tiered hierarchy of network components each receive broadcast media streams, store popular content, and serve media to clients. The system allows for content hosting for resources having multiple formats and employs a single URL for a resource having multiple formats. A testing component uses information regarding the client and service provider provided in the metafile corresponding to a resource request to determine the type of client and to redirect the client to a server that can service the request.



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FIG. 1

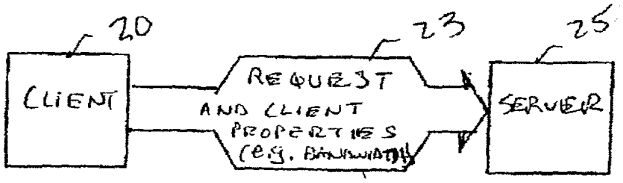
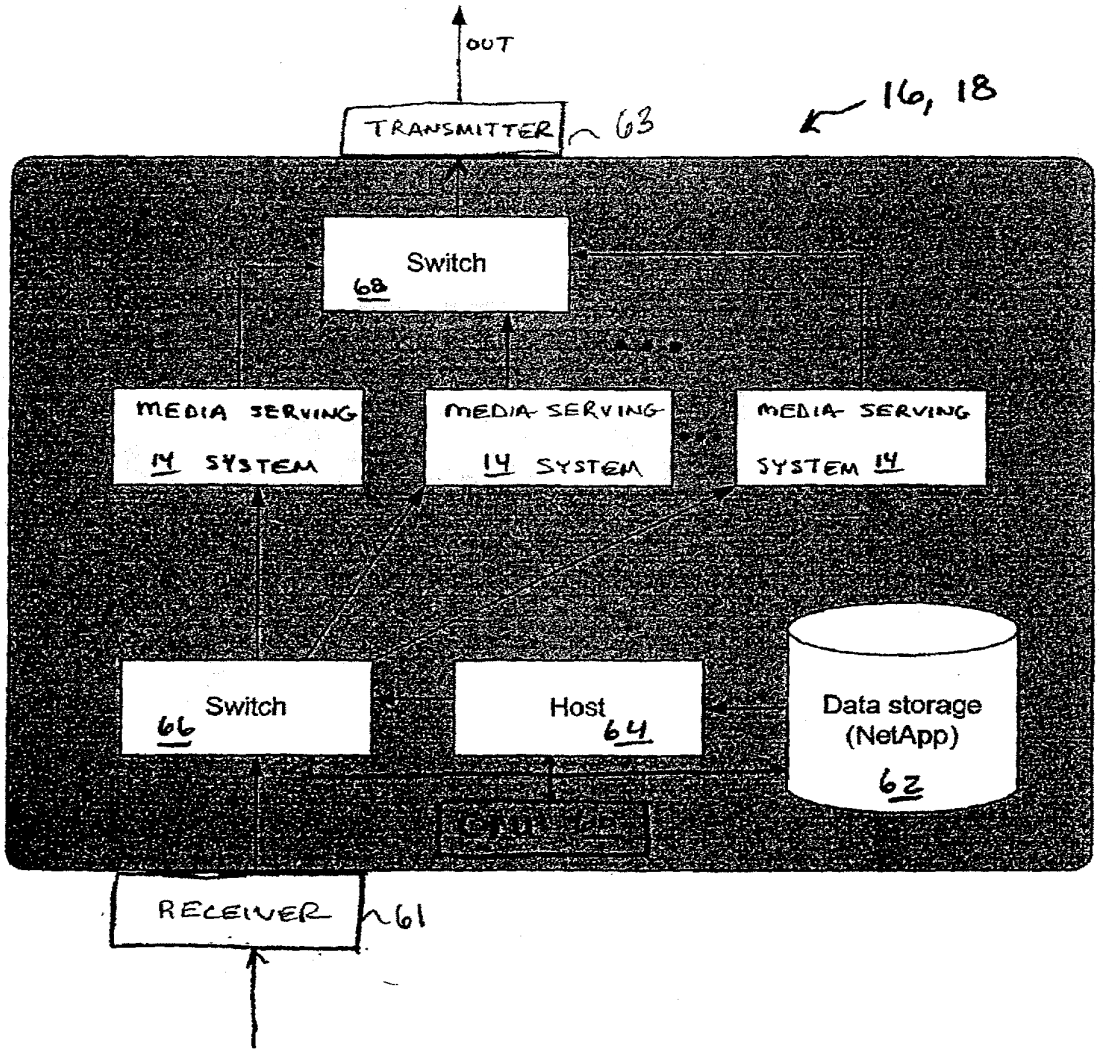

20
23
25
CLIENT
REQUEST
AND CLIENT
PROPERTIES
(e.g. BANDWIDTH)
SERVER

FIG. 4


OUT
TRANSMITTER
63
16, 18
Switch
68
MEDIA SERVING
14 SYSTEM
MEDIA SERVING
14 SYSTEM
MEDIA SERVING
SYSTEM 14
Switch
66
Host
64
Data storage
(NetApp)
62
RECEIVER
61

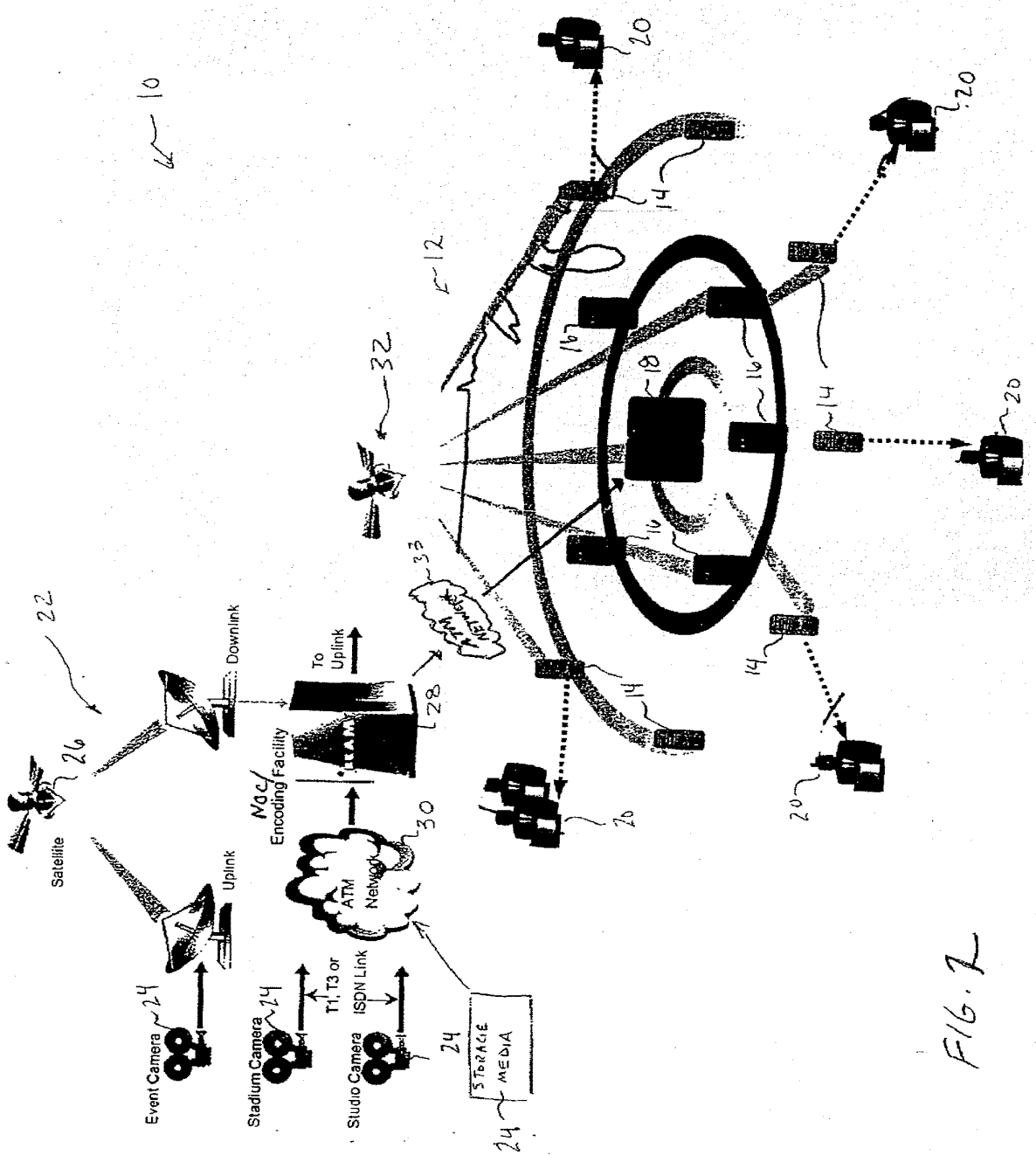
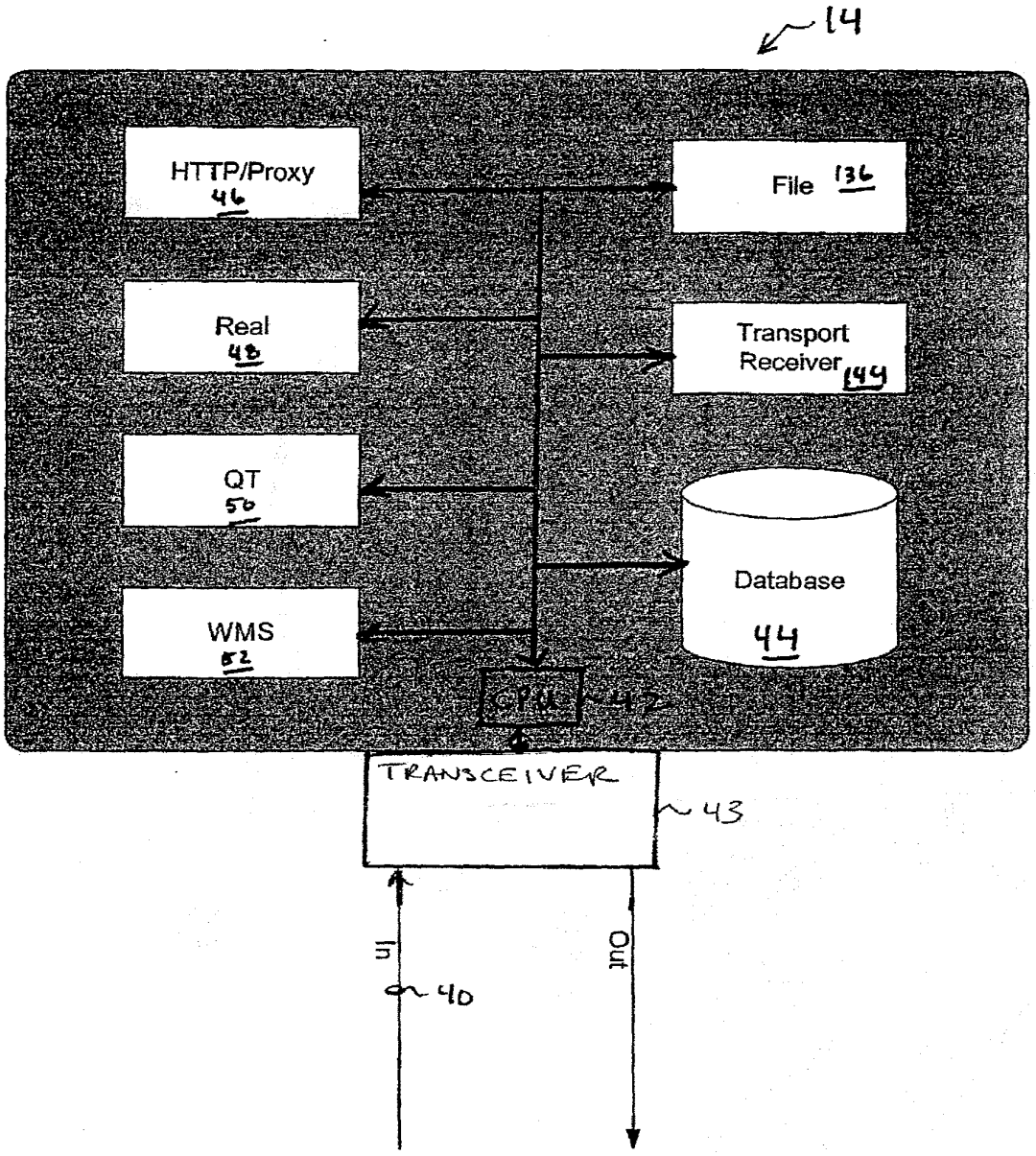

10
12
14
16
18
20
22
24
26
28
30
32
34
Satellite
Downlink
Uplink
To Uplink
MPEG Encoding Facility
ATM Network
T1, T3 or ISDN Link
Event Camera
Stadium Camera
Studio Camera
STORAGE MEDIA

FIG. 2

FIG. 3


14
HTTP/Proxy
46
Real
48
QT
50
WMS
52
File
136
Transport
Receiver
144
Database
44
CPU
42
TRANSCEIVER
43
in
40
out

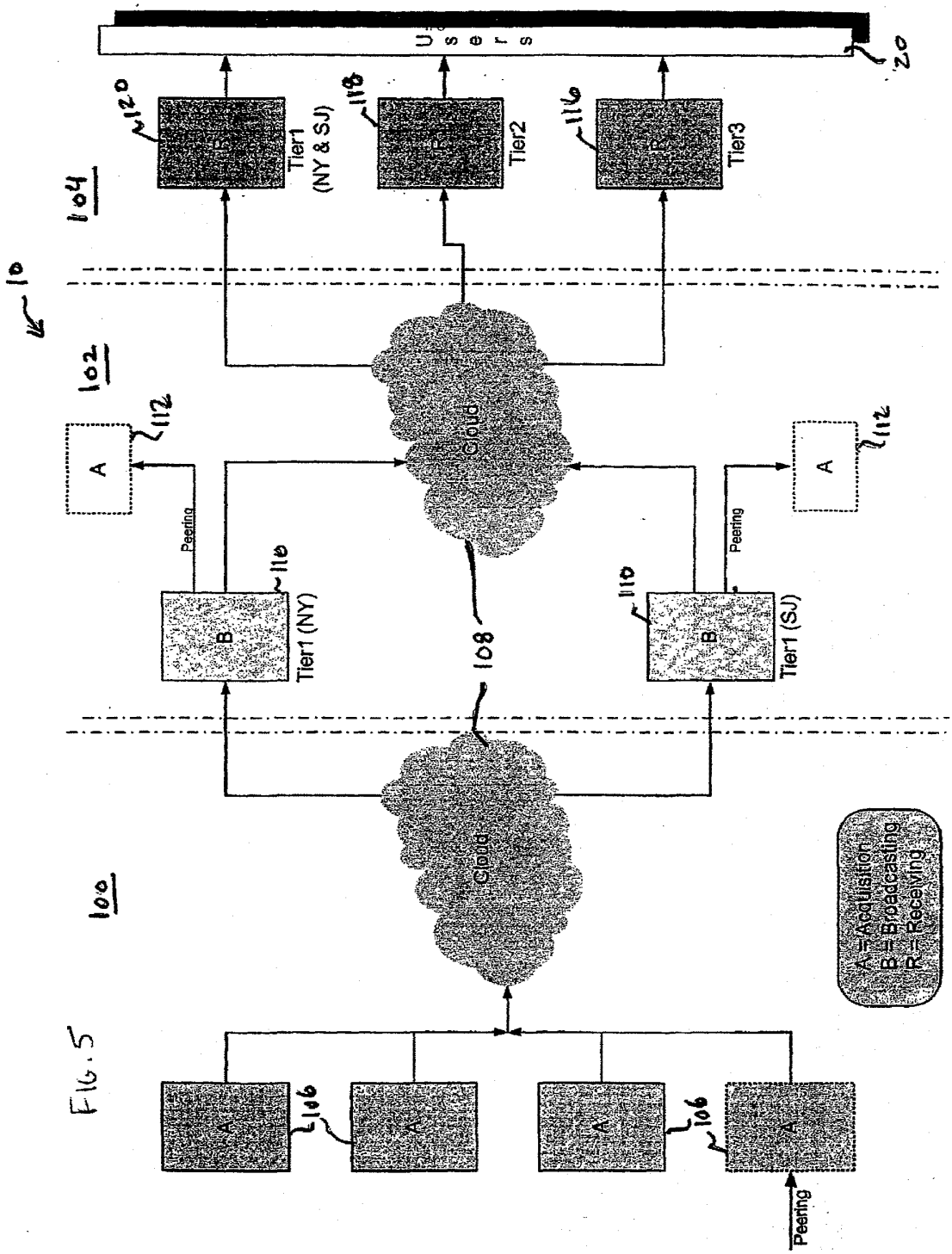

Users
20
120
Tier1 (NY & SJ)
118
Tier2
116
Tier3
104
10
102
Cloud
112
A
Peering
116
B
Tier1 (NY)
108
110
Tier1 (SJ)
Cloud
100
A = Acquisition
B = Broadcasting
R = Receiving
106
Peering

FIG. 5

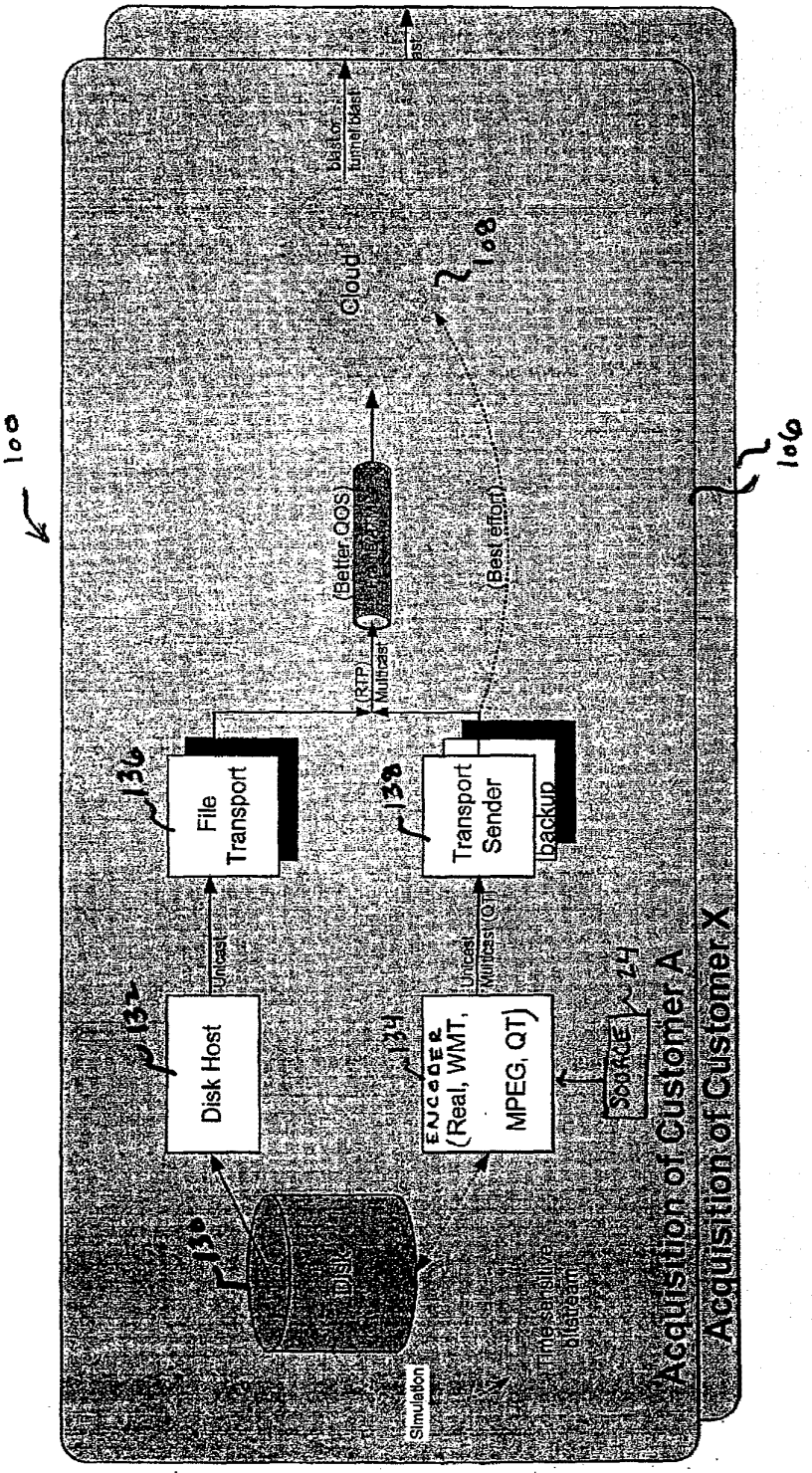

100
Acquisition of Customer A
Acquisition of Customer X
106
Disk Host
132
Encoder
(Real, WMT, MPEG, QT)
134
Source
Unicast
Multicast (QT)
File Transport
136
Transport Sender
138
backup
Unicast
Multicast (RTP)
(Better QOS)
(Best effort)
Cloud
108
Simulation

Fig. 6

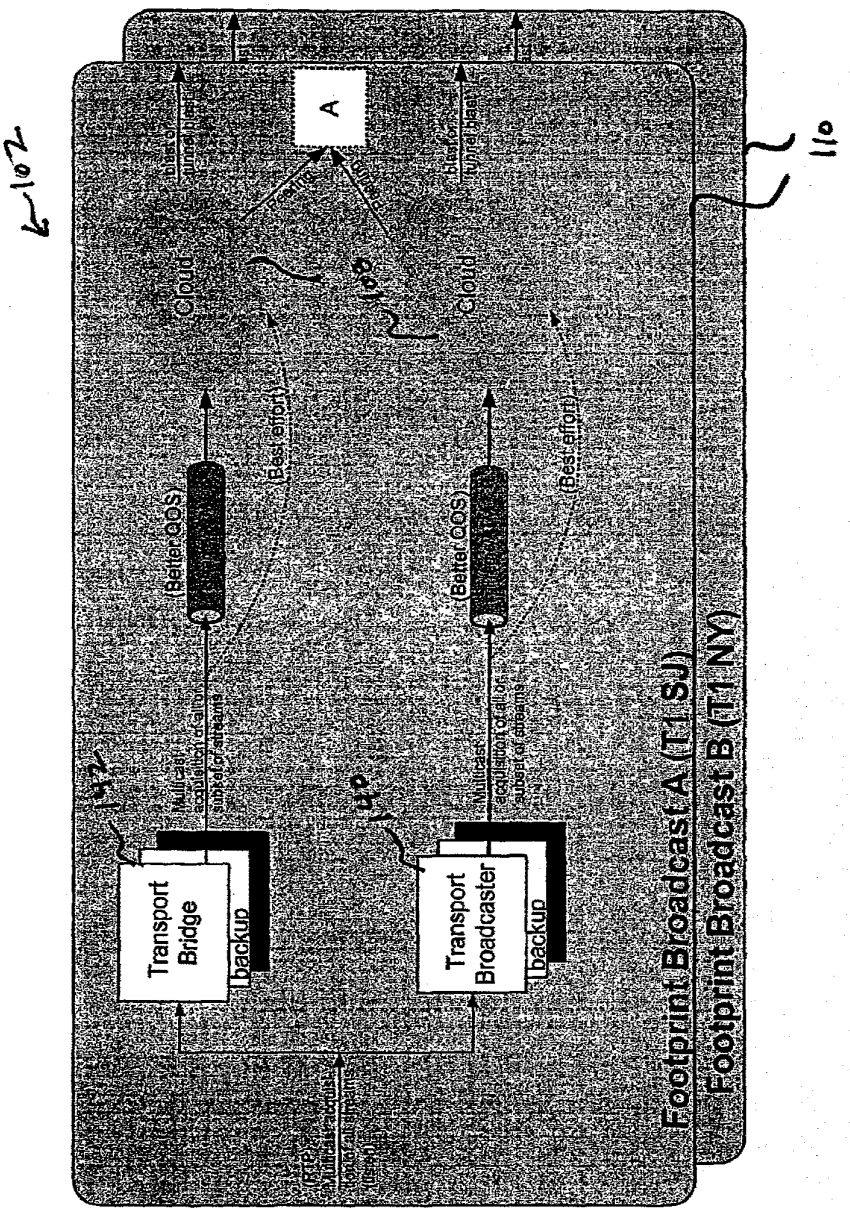

Footprint Broadcast A (T1 SJ)
Footprint Broadcast B (T1 NY)
Transport Bridge
backup
Transport Broadcaster
backup
Multicast acquisition of all or subset of streams
Multicast acquisition of all or subset of streams
(Better QoS)
(Best effort)
(Better QoS)
(Best effort)
Cloud
Cloud
A
110
102
112
114
106

Fig. 7

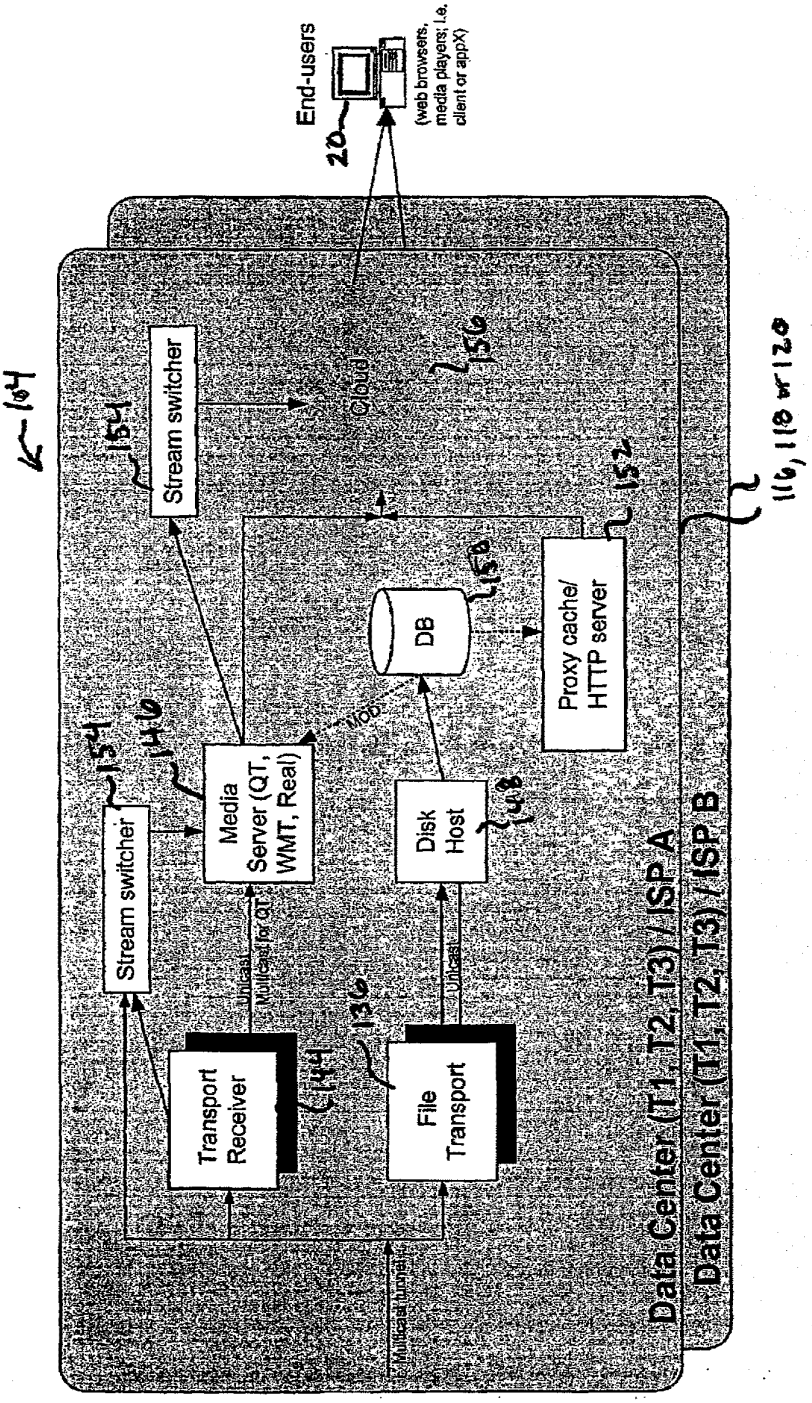

End-users
20
(web browsers, media players; i.e. client or appX)
Cloud
Stream switcher
154
Stream switcher
154
Media Server (QT, WMT, Real)
148
Transport Receiver
144
Unicast
Multicast for QT
Unicast
File Transport
136
Disk Host
148
DB
158
Proxy cache/ HTTP server
152
156
Data Center (T1, T2, T3) / ISP A
Data Center (T1, T2, T3) / ISP B
116, 118 or 120
104

FIG. 8

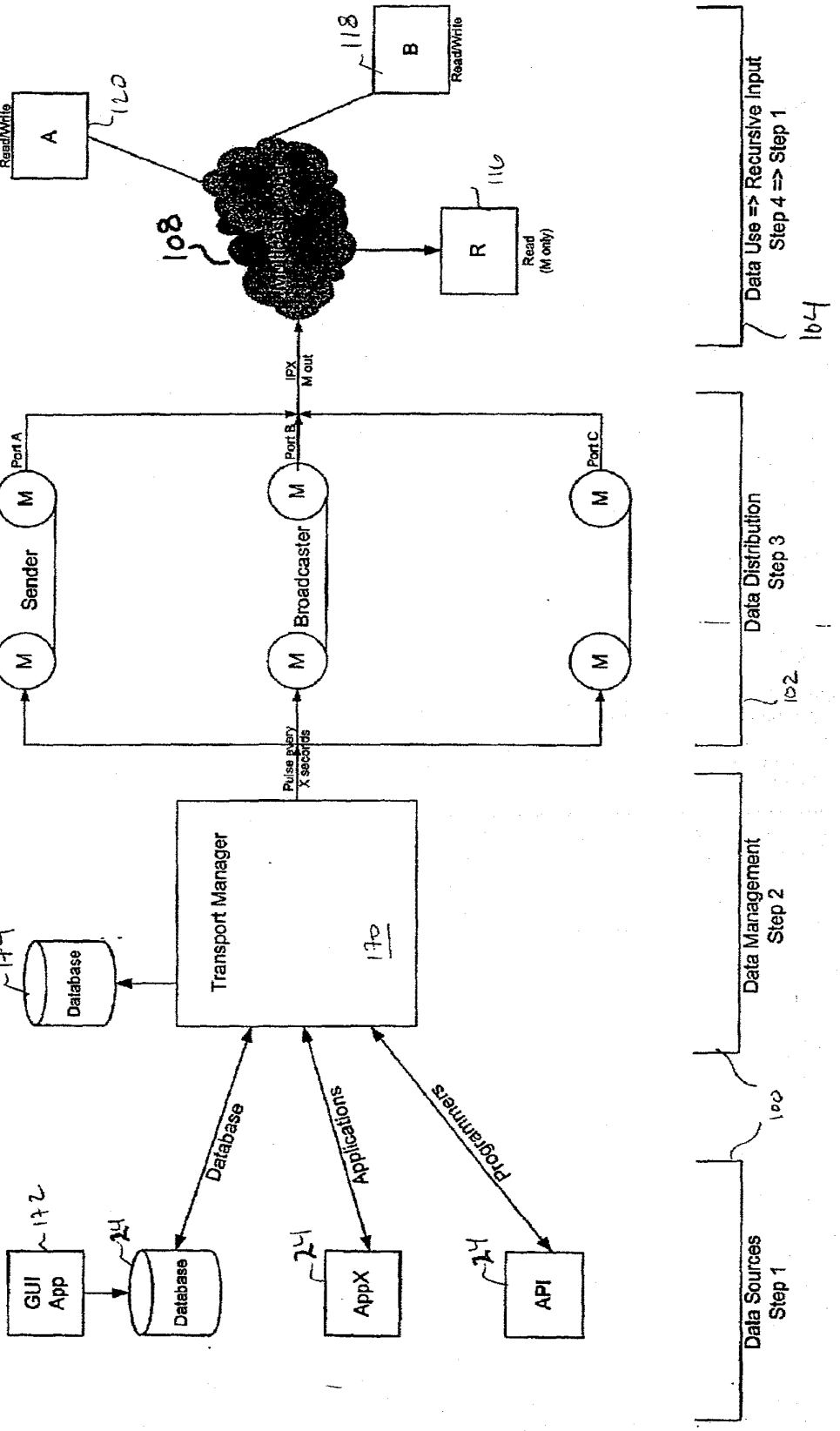

Data Sources
Step 1
Data Management
Step 2
Data Distribution
Step 3
Data Use => Recursive Input
Step 4 => Step 1
100
102
104
GUI App
172
Database
174
Database
Applications
AppX
Programmers
API
Transport Manager
170
Database
Pulse every X seconds
IPX M out
Port A
Port B
Port C
Sender
Broadcaster
M
Multicast Network
108
A
Read/Write
120
B
Read/Write
118
R
Read (M only)
116

FIG. 9

METHOD OF UTILIZING A SINGLE UNIFORM RESOURCE LOCATOR FOR RESOURCES WITH MULTIPLE FORMATS

[0001] This application claims the benefit of U.S. provisional application Ser. No. 60/178,751, filed Janu. 28, 2000.

CROSS REFERENCE TO RELATED APPLICATIONS

[0002] Related subject matter is disclosed in co-pending U.S. patent application of Nils B. Lahr et al., filed Sep. 28, 1998, entitled "Streaming Media Transparency" (attorney's file IBC-P001); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "Method and Apparatus for Encoder-Based Distribution of Live Video and Other Streaming Content" (attorney's file 39512A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "A System and Method for Rewriting Media Resource Request and/or Response Between Origin Server and Client" (attorney's file 39511A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "Method and Apparatus for Client-Side Authentication and Stream Selection in a Content Distribution System" (attorney's file 39505A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "Method and System for Distributed Data Mining and Analysis for Networks" (attorney's file 39510A); in co-pending U.S. patent application of Nils B. Lahr et al., filed even date herewith, entitled "A System and Method for Mirroring and Caching Compressed Data in a Content Distribution System" (attorney's file 39565A); in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "A System and Method for Determining Optimal Server in a Distributed Network for Serving Content Streams" (attorney's file 39551A); and in co-pending U.S. patent application of Nils B. Lahr, filed even date herewith, entitled "A System and Method for Performing Broadcast-Enabled Disk Drive Replication in a Distributed Data Delivery Network" (attorney's file 39564A); the entire contents of each of these applications being expressly incorporated herein by reference.

FIELD OF THE INVENTION

[0003] The present invention relates to method of providing and utilizing a single Uniform Resource Locator for a resource which may be provided in a plurality of different formats and via different servers via the Internet.

BACKGROUND OF THE INVENTION

[0004] A Uniform Resource Locator (URL) is an address of a resource or file accessible on the Internet. The URL contains the name of the protocol required to access the resource, a domain name that identifies a specific computer or server on the Internet, and a hierarchical description of a file location on that computer or server. Presently, a single URL is associated with a single resource available on the Internet. There are many different types of Internet resources or client-server applications that are provided in different formats. If a resource is hosted in multiple formats, then a separate link to each format must be provided. This is problematic in that it can greatly complicate content management and create extra work. Moreover, as more formats are introduced, the problem increases.

SUMMARY OF THE INVENTION

[0005] In accordance with the present invention, a method and system are provided to supply content hosting for resources having multiple formats by providing a single URL for a resource having multiple formats.

[0006] In accordance with an aspect of the present invention, a testing component uses information regarding the client and service provider provided in the metafile corresponding to the request to determine the type of client from which the request originated and to redirect the client to a server that can service the request.

[0007] In accordance with another aspect of the present invention, the testing component is implemented in a server.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and other objects, advantages and novel features of the invention will be more readily appreciated from the following detail description when read in conjunction with the accompanying drawing, in which:

[0009] **FIG. 1** illustrates a client-side testing and stream selection device constructed in accordance with an embodiment of the present invention;

[0010] **FIG. 2** illustrates an Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention;

[0011] **FIG. 3** is a block diagram of a media serving system constructed in accordance with an embodiment of the present invention;

[0012] **FIG. 4** is a block diagram of a data center constructed in accordance with an embodiment of the present invention;

[0013] **FIG. 5** illustrates data flow in a Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention;

[0014] **FIGS. 6, 7** and **8** illustrate acquisition, broadcasting and reception phases, respectively, employed in a Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention; and

[0015] **FIG. 9** illustrates transport data management in a Internet broadcast system for streaming media constructed in accordance with an embodiment of the present invention.

[0016] Throughout the drawing figures, like reference numerals will be understood to refer to like parts and components.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS:

[0017] In accordance with the present invention, a testing component **27** is provided between a client **20** and a server **25**, as shown in **FIG. 1**. The testing component **27** is operable to receive a request from the client **20** for access and to selectively establish a network connection **29** with the server **25**. As described below, the request is analyzed to determine information regarding the client with which to logically redirect the client to a server for serving a particular media type.

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[0018] The testing component **27** can be implemented as an add-on software and/or hardware component provided that it can be configured to selectively establish or intercept a network connection **29** between the client **20** and the server **25**. The client-server relationship is described herein for illustrative purposes in connection with a content distribution system. An overview of an exemplary content distribution system **10** follows. The system **10** employs data transport protocols to implement the testing component **27** in accordance with the present invention. It is to be understood that implementation of the invention is not limited to the architecture of the illustrative system **10** described herein.

[0019] 1. System Component Overview

[0020] With reference to **FIG. 2**, a system **10** is provided which captures media (e.g., using a private network), and broadcasts the media (e.g., by satellite) to servers located at the edge of the Internet, that is, where users **20** connect to the Internet such as at a local Internet service provider or ISP. The system **10** bypasses the congestion and expense associated with the Internet backbone to deliver high-fidelity streams at low cost to servers located as close to end users **20** as possible.

[0021] To maximize performance, scalability and availability, the system **10** deploys the servers in a tiered hierarchy distribution network indicated generally at **12** that can be built from different numbers and combinations of network building components comprising media serving systems **14**, regional data centers **16** and master data centers **18**. The system also comprises an acquisition network **22** that is preferably a dedicated network for obtaining media or content for distribution from different sources. The acquisition network **22** can operate as a network operations center (NOC) which manages the content to be distributed, as well as the resources for distributing it. For example, content is preferably dynamically distributed across the system network **12** in response to changing traffic patterns in accordance with the present invention. While only one master data center **18** is illustrated, it is to be understood that the system can employ multiple master data centers, or none at all and simply use regional data centers **16** and media serving systems **14**, or only media serving systems **14**.

[0022] An illustrative acquisition network **22** comprises content sources **24** such as content received from audio and/or video equipment employed at a stadium for a live broadcast via satellite **26**. The broadcast signal is provided to an encoding facility **28**. Live or simulated live broadcasts can also be rendered via stadium or studio cameras, for example, and transmitted via a terrestrial network such as a T1, T3 or ISDN or other type of a dedicated network **30** that employs asynchronous transfer mode (ATM) or other technology. In addition to live analog or digital signals, the content can include analog tape recordings, and digitally stored information (e.g., media-on-demand or MOD), among other types of content. Further, in addition to a dedicated link **30** or a satellite link **26**, the content harvested by the acquisition network **22** can be received via the Internet, other wireless communication links besides a satellite link, or even via shipment of storage media containing the content, among other methods. The encoding facility **28** converts raw content such as digital video into Internet-ready data in different formats such as the Microsoft Windows Media (MWM), RealNetworks G2, or Apple QuickTime (QT) formats. The system **10** also employs unique encoding methods to maximize fidelity of the audio and video signals that are delivered via multicast by the distribution network **12**.

[0023] With continued reference to **FIG. 2**, the encoding facility **28** provides encoded data to the hierarchical distribution network **12** via a broadcast backbone which is preferably a point-to-multipoint distribution network. While a satellite link indicated generally at **32** is used, the broadcast backbone employed by the system **10** of the present invention is preferably a hybrid fiber-satellite transmission system that also comprises a terrestrial network **33**. The satellite link **32** is preferably dedicated and independent of a satellite link **26** employed for acquisition purposes. The tiered network building components **14**, **16** and **18** are each equipped with satellite transceivers to allow the system **10** to simultaneously deliver live streams to all server tiers **14**, **16** and **18** and rapidly update on-demand content stored at any tier. When a satellite link **32** is unavailable or impractical, however, the system **10** broadcasts live and on-demand content though fiber links provided in the hierarchical distribution network **12**. Where the feed is pulled from in case of a failure is based on a set of routing rules that include priorities, weighting, and so on. In other words, the feed is pulled in a manner similar to the way routers currently operate, but at the actual stream level.

[0024] The system **10** employs a director agent to monitor the status of all of the tiers of the distribution network **12** and redirect users **20** to the optimal server, depending on the requested content. The director agent can originate, for example, from the NOC/encoding facility **28**. The system employs an Internet Protocol or IP address map to determine where a user **20** is located and then identifies which of the tiered servers **14**, **16** and **18** can deliver the highest quality stream, depending on network performance, content location, central processing unit load for each network component, application status, among other factors. Cookies and data from other databases can also be employed to facilitate this system intelligence.

[0025] Media serving systems **14** comprise hardware and software installed in ISP facilities at the edge of the Internet. The media serving systems preferably only serve users **20** in its subnetwork. Thus, the media serving systems **14** are configured to provide the best media transmission quality possible because the end users **20** are local. A media serving system **14** is similar to an ISP caching server, except that the content served from the media serving system is controlled by the content provider that input the content into the system **10**. The media serving systems **14** each serve live streams delivered by the satellite link **32**, and store popular content such as current and/or geographically-specific news clips. Each media serving system **14** manages its storage space and deletes content that is less frequently accessed by users **20** in its subnetwork.

[0026] Content that is not stored at the media serving system **14** can be served from regional data centers.

[0027] With reference to **FIG. 3**, a media serving system **14** comprises an input **40** from a satellite and/or terrestrial signal transceiver **43**. The media serving system **14** can output content to users **20** in its subnetwork or control/feedback signals for transmission to the NOC or another hierarchical component in the system **10** via a wireline or

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wireless communication network. The media serving system **14** has a central processing unit **42** and a local storage device **44**. A file transport module **136** and a transport receiver **144**, which are described below with reference to **FIG. 8**, are provided to facilitate reception of content from the broadcast backbone. The media serving system **14** also preferably comprises one or more of an HTTP/Proxy server **46**, a Real server **48**, a QT server **50** and a WMS server **52** to provide content to users **20** in a selected format. The media serving system can also support Windows and Real caching servers, allowing direct connections to a local box regardless of whether the content is available. The content in the network **12** is then located and cached locally for playback. This allows for split live feeds by a local media serving system **14** regardless of whether is being sent via a broadcast or feed mechanism. Thus, pull splits from a media serving system **14** are supported, as well as broadcast streams that are essentially push splits with forward caching. Also, the database **44** and file system **136** can be local or remote, depending on where the media serving system **14** is installed.

[0028] The regional data centers **16** are located at strategic points around the Internet backbone. With reference to **FIG. 4**, a regional data center **16** comprises a satellite and/or terrestrial signal transceiver, indicated at **61** and **63**, to receive inputs and to output content to users **20** or control/feedback signals for transmission to the NOC or another hierarchical component in the system **10** via wireline or wireless communication network. A regional data center **16** preferably has more hardware than a media serving system **14** such as gigabit routers and load-balancing switches **66** and **68**, along with high-capacity servers (e.g., plural media serving systems **14**) and a storage device **62**. The CPU **60** and host **64** are operable to facilitate storage and delivery of less frequently accessed on-demand content using the servers **14** and switches **66** and **68**. The regional data centers **16** also deliver content if a standalone media serving system **14** is not available to a particular user **20**. The director agent software preferably continuously monitors the status of the standalone media serving systems **14** and reroutes users **20** to the nearest regional data center **16** if the nearest media serving system **14** fails, reaches its fulfillment capacity or drops packets. Users **20** are typically assigned to the regional data center **14** that corresponds with the Internet backbone provider that serves their ISP, thereby maximizing performance of the second tier of the distribution network **12**. The regional data centers **14** also serve any users **20** whose ISP does not have an edge server.

[0029] The master data centers **18** are similar to regional data centers **16**, except that they are preferably much larger hardware deployments and are preferably located in a few peered data centers and co-location facilities, which provide the master data centers with connections to thousands of ISPs. With reference to **FIG. 4**, master data centers **18** comprises multiterabyte storage systems (e.g., a larger number of media serving systems **14**) to manage large libraries of content created, for example, by major media companies. The director agent automatically routes traffic to the closest master data center **18** if a media serving system **14** or regional data center **16** is unavailable. The master data centers **18** can therefore absorb massive surges in demand without impacting the basic operation and reliability of the network.

[0030] Transmissions can occur out of the data centers **16** and **18**. In the case of the satellite **32**, however, transmissions can also be implemented by taking what is being received and routing a copy thereof directly to the uplink system without first passing through the media serving systems **14**.

[0031] 2. System Operation Overview

[0032] With reference to **FIG. 5**, the Internet broadcast system **10** for streaming media generally comprises three phases, that is, acquisition **100**, broadcasting **102** and receiving **104**. In the acquisition phase **100**, content is provided to the system **10** from different sources such as Internet content providers (ICPs) or event or studio content sources. As stated previously, content can be received from audio and/or video equipment employed at a stadium for a live broadcast. The content can be, for example, live analog signals, live digital signals, analog tape recordings, digitally stored information (e.g., media-on-demand or MOD), among other types of content. The content can be locally encoded or transcoded at the source using, for example, file transport protocol (FTP), MSBD, or real-time transport protocol/real-time streaming protocol (RTP/RTSP). The content is collected using one or more acquisition modules **106**, which are described in more detail below in connection with **FIG. 6**. The acquisition modules **106** represent different feeds to the system **10** in the acquisition network **12** and can be co-located or distributed. Generally, acquisition modules **106** can perform remote transcoding or encoding of content using FTP, MSBD, or RTP/RTSP or other protocols prior to transmission to a broadcaster **110** for multicast to edge devices and subsequent rendering to users **20** located relatively near to one of the edge devices. The content is then converted into a broadcast packet in accordance with an aspect of the present invention. This process of packaging packets in a manner to facilitate multicasting, and to provide insight at reception sites as to what the packets are and what media they represent, constitutes a significant advantage of the system **10** over other content delivery systems.

[0033] Content obtained via the acquisition phase **100** is preferably provided to one or more broadcasters **110** via a multicast cloud or network(s) **108**. The content is unicast or preferably multicast from the different acquisition modules **106** to the broadcasters via the cloud **108**. As stated above, the cloud **108** is preferably a point-to-multipoint broadcast backbone. The cloud **108** can be implemented as one or more of a wireless network such as a satellite network or a terrestrial or wireline network such as optical fiber link. The cloud **108** can employ a dedicated ATM link or the Internet backbone, as well as a satellite link, to multicast streaming media. The broadcasters **110** are preferably in tier **120**, that is, they are master data centers **18** that receive content from the acquisition modules **106** and, in turn, broadcast the content to other receivers in tiers **116**, **118** and **120**.

[0034] During the broadcasting phase **102**, broadcasters **110** operate as gatekeepers, as described below in connection with **FIG. 7**, to transmit content to a number of receivers in the tiers **116**, **118** and **120** via paths in the multicast cloud **108**. The broadcasters **110** support peering with other acquisition modules indicated generally at **112**. The peering relationship between a broadcaster **110** and an acquisition module **112** is via a direct link and each device agrees to forward the packets of the other device and to otherwise share content directly across this link, as opposed to a standard Internet backbone.

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[0035] During the reception phase **104**, high-fidelity streams that have been transmitted via the broadcasters **110** across the multicast cloud **108** are received by servers **14**, **16** and **18** located as close to end users as possible. The system **10** is therefore advantageous in that streams bypass congestion and expense associated with the Internet backbone. As stated previously, the servers are preferably deployed in a tiered hierarchy comprising media serving systems **14**, regional data centers **16** and master data centers **18** that correspond to tiers **116**, **118** and **120**, respectively. The tiers **116**, **118** and **120** provide serving functions (e.g., transcoding from RTP to MMS, RealNet, HTTP, WAP or other protocol), as well as delivery via a local area network (LAN), the Internet, a wireless network or other network to user devices **122** for rendering (e.g., PCs, workstations, set-top boxes such as for cable, WebTV, DTV, and so on, telephony devices, and the like). The tiers in the reception phase are described in further detail below in connection with **FIG. 8**.

[0036] 3. Data Transport Management

[0037] With reference to **FIGS. 6, 7** and **8**, hardware and/or software components associated with the acquisition **100**, broadcasting **102** and reception phases **104** will now be described. These hardware and/or software components comprise various transport components for supporting MOD or live stream content distribution in one or more multicast-enabled networks in the system **10**. The transport components can be, but are not limited to, a file transport module, a transport sender, a transport broadcaster, and a transport receiver. The content is preferably characterized as either live content and simulated/scheduled live content, or MOD (i.e., essentially any file). Streaming media such as live content or simulated/scheduled live content are managed and transported similarly, while MOD is handled differently.

[0038] Acquisition for plural customers A through X is illustrated in **FIG. 6**. By way of an example, acquisition for customer A involves an encoder, as indicated at **134**, which can employ Real, WMT, MPEG, QT, among other encoding schemes with content from a source **24**. The encoder also encodes packets into a format to facilitate broadcasting in accordance with the present invention. A disk **130** stores content from different sources and provides MOD streams, for example, to a disk host **132**. The disk host **132** can be proxying the content or hosting it. Live content, teleconferencing, stock and weather data generating systems, and the like, on the other hand, is also encoded. The disk host **132** unicasts the MOD streams to a file transport module **136**, whereas the encoder **134** provides the live streams to a transport sender **138** via unicast or multicast. The encoder can employ either unicast or multicast if QT is used. Conversion from unicast to multicast is not always needed, but multicast-to-multicast conversion can be useful. The file transport module **136** transfers MOD content to a multicast-enabled network. The transport sender **138** pulls stream data from a media encoder **134** or an optional aggregator and sends stream announcements (e.g., using session announcement protocol and session description protocol (SAP/SDP)) and stream data to multicast Internet protocol (IP) addresses and ports received from a transport manager. The transport manager is described below with reference to **FIG. 9**. When a Real G2 server is used to push a stream, as opposed to a pulling scheme, an aggregator can be used to convert from a push scheme to a pull scheme. The components described in connection with **FIG. 6** can be deployed at the encoding center **28** or in a distributed manner at, for example, content provider facilities.

[0039] **FIG. 7** illustrates an exemplary footprint for one of a plurality of broadcasts. As shown in **FIG. 7**, the broadcasting phase **102** is implemented using a transport broadcaster **140** and a transport bridge **142**. These two modules are preferably implemented as one software program, but different functions, at a master data center **18** or network operations center. The transport broadcaster **140** performs transport path management, whereas the transport bridge **142** provides for peering. The broadcaster **140** and bridge **142** get data from the multicast cloud (e.g., network **108**) being guided by the transport manager and forward it to an appropriate transport path.

[0040] One transport broadcaster **140**, for example, can be used to represent one transport path such as satellite uplink or fiber between data centers or even a cross-continental link to a data center in Asia from a data center in North America. The broadcaster **140** and bridge **142** listen to stream announcements from transport senders **138** and enable and disable multicast traffic to another transport path, accordingly. They can also tunnel multicast traffic by using TCP to send stream information and data to another multicast-enabled network. Thus, broadcasters **110** transmit corresponding subsets of the acquisition phase streams that are sent via the multicast cloud **108**. In other words, the broadcasters **110** operate as gatekeepers for their respective transport paths, that is, they pass any streams that need to be sent via their corresponding path and prevent passage of other streams. Transmission can also be accomplished using TCP to another receiver regardless whether the system that the receiver is in is multicast-enabled. Thus, multicast operation can be disabled and the broadcast is still routed and distributed, although not quite as effectively or inexpensively as multicast.

[0041] **FIG. 8** illustrates the reception phase **104** at one of a plurality of servers or data centers. As stated above, the data centers are preferably deployed in a tiered hierarchy **116**, **118** and **120** comprising media serving systems **14**, regional data centers **16** and master data centers **18**, respectively. The tiers **116**, **118** and **120** each comprise a transport receiver **144**. Transport receivers can be grouped using, for example, the transport manager. Each transport receiver **144** receives those streams from the broadcasters **110** that are being sent to a group to which the receiver belongs. The transport receiver listens to stream announcements, receives stream data from plural transport senders **138** and feeds the stream data to media servers **146**. The transport receiver **144** can also switch streams, as indicated at **154** (e.g., to replace a live stream with a local MOD feed for advertisement insertion purposes). The stream switch **154** can be a plug-in in the Media Server **14** or exist in the server itself to enable switching per end-user **20**. The plug-in can interact with an advertisement platform to inject advertisements into streams. The MOD streams are received via the file transport **136** and stored, as indicated via the disk host **148**, database **150** and proxy cache/HTTP server **152**. The servers **146** and **152** provide content streams to users **20**.

[0042] The transport components described in connection with **FIGS. 6, 7** and **8** are advantageous in that they generalize data input schemes from encoders and optional

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aggregators to data senders, data packets within the system **10**, and data feeding from data receivers to media servers, to support essentially any media format. The transport components preferably employ RTP as a packet format and XML-based remote procedure calls (XBM) to communicate between transport components.

[0043] The transport manager will now be described with reference to **FIG. 9** which illustrates an overview of transport data management. The transport manager is preferably a software module deployed at the encoding facility **28** or other facility designated as a NOC. As shown in **FIG. 10**, multiple data sources **14** (e.g., database content, programs and applications) provide content as input into the transport manager **170**. Information regarding the content from these data sources is also provided to the transport manager such as identification of input source **14** and output destination (e.g., groups of receivers). Decisions as to where content streams are to be sent and which groups of servers are to receive the streams can be predefined and indicated to the transport manager **170** as a configuration file or XBM function call in real-time. This information can also be entered via a graphical user interface (GUI) **172** or command line utility. In any event, the information is stored in a local database **174**. The database **174** also stores information for respective streams relating to defined maximum and minimum IP address and port ranges, bandwidth usage, groups or communities intended to receive the streams, network and stream names, as well as information for user authentication to protect against unauthorized use of streams or other distributed data.

[0044] With continued reference to **FIG. 9, a** customer requests to stream content via the system **10** using, for example, the GUI **172**. The request can include the customer's name and account information, the stream name to be published (i.e., distributed) and the IP address and port of the encoder or media server from which the stream can be pulled. Requests and responses are sent via the multicast network (e.g., cloud **108**) using separate multicast addresses for each kind of transport component (e.g., a transport sender channel, a broadcaster channel, a transport manager channel and a transport receiver channel), or one multicast address and different ports. IP and port combinations can be used for TCP transmissions. An operator at the NOC **28** can approve the request if sufficient system resources are available such as bandwidth or media server capacity. Automatic approval can be provided by a scheduling system configured to provide immediate responses to attempted broadcasts. The transport manager **170** preferably pulls stream requests periodically. In response to an approved request, the transport manager **170** generates a transport command in response to the request (e.g., an XML-based remote procedure call (XBM)) to the transport sender **138** corresponding to that customer which provides the assigned multicast IP address and port that the transport sender is allowed to use in the system **10**.

[0045] The transport sender **138** receives the XBM call and responds by announcing the stream that is going to be sent. All of the transport components listen to the announcement. Once the transport sender **138** commences sending the stream into the assigned multicast IP address and port, the corresponding transport broadcaster **140** filters the stream. The transport receiver **144** joins the multicast IP address and receives the data or stream if the stream is intended for a group to which the receiver **144** belongs. As stated above in connection with **FIG. 5**, the receiver converts the steam received via the cloud **108** and sends it to the media server available to the users **20**. The data is then provided to the media server associated with the receiver. Receivers **144** and broadcasters **140** track announcements that they have honored using link lists.

[0046] As stated above, the transport components described with reference to FIGS. **5-9** preferably use RPT as a data transport protocol. Accordingly, Windows Media, RealG2 and QT packets are wrapped into RTP packets. The acquisition network **22** preferably employs an RTP stack to facilitate processing any data packets, wrapping the data packets with RTP header and sending the data packets. RTSP connection information is generally all that is needed to commence streaming.

[0047] RTP is used for transmitting real-time data such as audio and video, and particularly for time-sensitive data such as streaming media, whether transmission is unicast or multicast. RTP employs User Datagram Protocol (UDP), as opposed to Transmission Control Protocol (TCP) that is typically used for non-real-time data such as file transfer and e-mail. Unlike with TCP, software and hardware devices that create and carry UDP packets do not fragment and reassemble them before they have reached their intended destination, which is important in streaming applications. RTP adds header information that is separate from the payload (e.g., content to be distributed) that can be used by the receiver. The header information is merely interpreted as payload by routers that are not configured to use it.

[0048] RTSP is an application-level protocol for control over the delivery of data with real-time properties and provides an extensible framework to enable controlled, on-demand delivery of real-time data including live feeds and stored clips. RTSP can control multiple data delivery sessions, provide means for choosing delivery channels such as UDP, multicast UDP and TCP, and provide means for choosing delivery mechanisms based on RTP. HTTP is not suitable for streaming media because it is more of a store-and-forward protocol that is more suitable for web pages and other content that is read repeatedly. Unlike HTTP, RTSP is highly dynamic and provides persistent interactivity between the user device (hereinafter referred to as a client) and server that is beneficial for time-based media. Further, HTTP does not allow for multiple sessions between a client and server, and travels over only a single port. RTP can encapsulate HTTP data, and can be used to dynamically open multiple RTP sessions to deliver many different streams at the same time.

[0049] The system **10** employs transmission control software deployed at the encoding facilities **28**, which can operate as a network operations center (NOC), and at broadcasters **110** (e.g., master data centers **120**) to determine which streams will be available to which nodes in the distribution system **12** and to enable the distribution system **12** to support one-to-one streaming or one-to-many streaming. The extensible language capabilities of RTSP augment the transmission control software at the edge of the distribution network **12**. Since RTSP is a bi-directional protocol, its use enables encoders **134** and receivers **144** to talk to each other, allowing for routing, conditional access (e.g., authentication) and bandwidth control in the distribution network

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12. Standard RTSP proxies can be provided between any network components to allow them to communicate with each other. The proxy can therefore manage the RTSP traffic without necessarily understanding the actual content.

[0050] For every RTSP stream, there is an RTP stream. Further, RTP sessions support data packing with timestamps and sequence numbers. They can also be used for carrying stereo information, wide screen versions of requested media, different audio tracks, and so on. RTP packets are wrapped in a broadcast protocol. Applications in the receiving phase **104** can use this information to determine when to expect the next packet. Further, system operators can use this information to monitor network **12** and satellite **32** connections to determine the extent of latency, if any.

[0051] Encoders and data encapsulators written with RTP as the payload standard are advantageous because off-the-shelf encoders (e.g., MPEG2 encoders) can be introduced without changing the system **10**. Further, encoders that output RTP/RTSP can connect to RTP/RTSP transmission servers. In addition, the use of specific encoder and receiver combinations can be eliminated when all of the media players support RTP/RTSP.

[0052] 4. Testing Component

[0053] As stated above, transport management facilitates requests for streaming content by system customers (e.g., content providers). The use of RTP/RTSP between transport components also facilitates communication between servers and users requesting to receive content from the servers.

[0054] Media resource requests from a client **22** can occur inside of an RTSP connection or via a simple HTTP request. Responses to media resource requests can be metafiles, but can also occur inside of a binary file or via the protocol being used between the client **22** and server (e.g., server **14**, **16** or **18**). In each of these instances, responses are similar to a response served by an Internet client-server application to allow sending links to a resource rather than having to send the resource itself. These files and/or response information indicate to the client **22** the location of requested media, i.e., where it should connect to and in what order. In video serving applications, metafiles allow content providers to create playlists of video clips, but metafiles can also be used to help define events and other information such as the author or resource owner. Further, the contents of metafiles can be written as more of a scriptable language to handle conditions and other more dynamic needs. In other words, RTSP can enable encoders **134**, receivers **144**, and servers or data centers **14**, **16** and **18** to communicate with each other to allow for routing, conditional access (e.g., authentication) and bandwidth control in the distribution network **12**, in accordance with the present invention. For example, standard RTSP proxies can be provided between any network components to allow them to communicate with each other.

[0055] With reference to the illustrative Internet broadcast system **10** for streaming media, the testing component **27** is implemented as a combination of software modules and hardware components in the system **10** and is operable to review properties of the client **20** in real-time using RTP/RTSP communications to determine, for example, the type of client (e.g., which media player is to be used), as well as the bandwidth and capability of the client. Information relating to these properties can be provided in a metafile corresponding to the request. The metafile can also provide information relating to the ISP such as client subscription type and priority to be provided the requested stream based on contracts between companies using the ISP and content providers. For example, a content provider can pay an ISP for higher quality of service. The testing component **27** is configurable to analyze requests and place higher priority to the content provider's connections than other requested traffic. The information for authenticating client requests can come from other sources via the internet than the metafile associated with the request, such as from an ISP or other database.

[0056] In accordance with the preferred embodiment of the present invention, a single URL is assigned to an Internet resource that is provided in a plurality of formats. In particular, rather than assign a separate URL for each available format of a resource, all formats of a resource are assigned the same URL.

[0057] In operation, when a client makes a request for a particular resource using a URL assigned to the resource, the type of resource format which the client can accept is determined by the testing component **27** based on the type of client making the request. The type of format that a particular client or customer can utilize can be known in advance or determined at the time of the request. The type of resource format that the client can accept is then compared to the available resource formats and based on the comparison, the resource is provided/served to the client in a proper format. Accordingly, by determining the type of client making a request for a resource, the system **10** is able to host a resource in multiple formats while still only providing one URL to customers for that resource. The testing component **27** can be implemented in the server **25** in accordance with one embodiment of the present invention.

[0058] While a server can host multiple media formats, each format is typically hosted by a different server. In accordance with another aspect of the invention, a client can be re-directed to a selected one of multiple servers, which respectively carry the different formats needed to fulfill a user request using the client information, in order to serve the specific media type needed for the client.

[0059] By way of an example, a content provider that wishes to stream media via the system **10** provides the NOC **28** with the URL The URL is translated at the NOC into publishing points or mount points into selected servers **14**, **16** and/or **18** in the distribution system **12**. When a client types that URL (e.g., http://www.ibeam.com/test), the initial connection is accepted, and the request is analyzed. If it is determined by the testing component **27** that the request came from a QuickTime player, the testing component **27** engages RTP/RTSP protocol signaling to generate a response that either informs the client to reconnect directly to the QuickTime server for '/test/', or redirects the initial connection to the QuickTime server in a manner similar to a proxy server.

[0060] Although the present invention has been described with reference to a preferred embodiment thereof, it will be understood that the invention is not limited to the details thereof. Various modifications and substitutions will occur to those of ordinary skill in the art. All such substitutions are intended to be embraced within the scope of the invention as defined in the appended claims.

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What is claimed is:

1. A method for processing client media requests in a content distribution network comprising the steps of:

preparing media for delivery via said content distribution system by storing multiple formats of said media and applying a uniform resource locator common to said multiple formats;

accepting a connection initiated by a client device;

analyzing a resource request from the client device;

determining the type of media player used by said client device from auxiliary information transmitted with said resource request; and

generating a response to said resource request substantially in real-time providing information for obtaining the requested resource in one of said multiple formats corresponding to said type of media player.

2. A method as claimed in claim 1, wherein said generating step comprises instructions for said client device to reconnect directly to a server supporting said type of media player indicated in said resource request using said uniform resource locator.

3. A method as claimed in claim 1, wherein said generating step comprises the step of redirecting said connection to a server supporting said type of media player indicated in said resource request using said uniform resource locator.

4. A method as claimed in claim 3, wherein said redirecting step is performed using a proxy server.

5. A method as claimed in claim 1, wherein said accepting step, said analyzing step, said determining step and said generating step are performed by a server.

* * * * *

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 92853-897679	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2014/013724	International filing date *(day/month/year)* 30 January 2014 (30.01.2014)	Priority date *(day/month/year)* 12 February 2013 (12.02.2013)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant UNICORN MEDIA, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 18 August 2015 (18.08.2015)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt05.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/013724	30.01.2014	12.02.2013

International Patent Classification (IPC) or both national classification and IPC
INV. H04N21/2343 G06F17/30 H04N21/6583

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Boubal, Olivier Telephone No. +31 70 340-8435

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4-6, 11, 12, 17, 18
	No:	Claims	1-3, 7-10, 13-16, 19, 20
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

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1 **Re Item VIII**

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT.

1.1 Claim 1 defines "sending, via the communications interface, a notification that the media content is available for delivery using at least the first set of media profiles".

This feature does not define to which entity the notification is sent. In view of claim 1 as a whole it would be straightforward that this notification is sent to the devices requesting the content in a first media profile format. However, this notification could also be sent to the entity requesting the file to be made available.

Therefore the scope of protection of claim 1 is not clear (Article 6 PCT).

The same objection applies to claims 9 and 15.

In the following this feature will be interpreted in its broadest sense.

1.2 Claim 5 defines "the request includes notification information" and "sending the notification based on the notification information". It is not clear how "notification information" is defined and how the sending of the notification can be based on the notification information included in the request.

Therefore claim 5 is not clear contrary to Article 6 PCT.

The same objection applies to claims 12 and 18.

From the application's description page 12, lines 25-32, it is however clear that the notification information is information stating "how (the requesting entity) would like to receive the notification". In the following opinion, this feature will be interpreted as explained in this passage of the description.

2 **Re Item V**

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

2.1 Reference is made to the following documents:

D1 US 2008/091845 A1 (MILLS BRENDON W [US] ET AL) 17 April 2008 (2008-04-17)

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D2 US 2010/318672 A1 (BOUAZIZI IMED [FI]) 16 December 2010 (2010-12-16)

D3 US 2005/209927 A1 (AALTONEN JANNE LA [FI] ET AL) 22 September 2005 (2005-09-22)

2.2 The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.

D1 discloses (the references in parentheses applying to D1):

- A method of making media content available for delivery via a data communications network, the method comprising: (paragraphs [0004-0005])

- receiving, via a communications interface, a request to make media content available for delivery; (paragraph [0020] - "requests to upload")

- obtaining, via the communications interface, a media file having the media content; (paragraph [0019], "content may be streamed from an appropriate content source to CTR" or paragraph [0023], "Content from content source is uploaded through the network to content store")

- determining a plurality of media profiles, based on the request, wherein the plurality of media profiles includes: a first set of media profiles, and a second set of media profiles; (paragraph [0048], "CTR may determine, in any suitable manner and based on input from any appropriate components, the proper format and characteristics for the modified content requested by the requesting client")

- transcoding, with a processing unit, the media file in accordance with the first set of media profiles; (paragraph [0045], "CTR may be able to begin modifying a first content file for delivery to a first client")

- sending, via the communications interface, a notification that the media content is available for delivery using at least the first set of media profiles; (paragraph [0045], implicitly disclosed in "for delivery to a first client" - see also point 1.1 above)

- and transcoding the media file in accordance with the second set of media profiles. (paragraph [0045], "while simultaneously modifying a second content file for delivery to a second client", disclosing two files being transcoded for two clients and paragraph [0035], "application

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server may, in particular embodiments, generate URIs or other identifiers representing the various formats in which an uploaded content file will be made available to users" showing that a single content is made available in different format)

Therefore claim 1 is not new (Article 33(2) PCT).

It is drawn to the attention of the applicant that the same reasoning could be made using D2 (see further citations in the International Search Report).

2.3 Dependent claims 2-8, do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

2.3.1 Claim 2 defines the content as comprising video. This feature is disclosed in D1 (see D1, lines 3-7 of paragraph [0017]).

Therefore claim 2 is not new (Article 33(2) PCT).

2.3.2 Claim 3 defines the reception as the media file with the request. This feature is disclosed in D1 (see D1, lines 5-11 of paragraph [0026]).

Therefore claim 3 is not new (Article 33(2) PCT).

2.3.3 Claim 4 defines the request as having information indicative of the location of the media file (see also point 1.2 above). This feature is not disclosed in D1 but is a well-known alternative to the skilled person whishing to transmit a file (see also D1, paragraph [0028] which discloses URI identifiers to locate the transcoded content).

Therefore the subject-matter of claim 4 is not inventive (Article 33(3) PCT).

2.3.4 Claim 5 defines the sending of notification using part of the request. This feature is not disclosed in D1. However, notifying the sender of a request to upload content that the content has been correctly uploaded is known to the

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skilled person (see for example D4, paragraph [0093] which discloses such acknowledgement and paragraph paragraph [0085] which discloses that the upload request comprises addressing information).

Therefore claim 5 is not inventive (Article 33(3) PCT).

2.3.5 Claim 6 defines the notification information as for example a URL. This feature is not disclosed in D1 but well known in the context of HTTP requests (see also D4 paragraphs [0085] and [0101]).

Therefore claim 6 is not inventive (Article 33(3) PCT).

2.3.6 Claims 7 and 8 do not appear to add any feature to the ones already defined in claim 1.

Therefore claims 7 and 8 are not new (Article 33(2) PCT).

2.4 The subject matter of independent claims 9 (server), 15 (computer readable medium) and dependent claims 10-14 and 16-20 corresponds to the subject matter of claims 1-8 and therefore the same reasoning as given in points 2.2 and 2.3 above for claims 1-8 will apply mutatis mutandis.

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PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
McMillan, Scott
Kilpatrick Townsend & Stockton LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
ETATS-UNIS D'AMERIQUE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 27 May 2014 (27-05-2014)
Applicant's or agent's file reference 92853-897679	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2014/013724	International filing date *(day/month/year)* 30 January 2014 (30-01-2014)

Applicant

UNICORN MEDIA, INC.

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	DE JONG, Coen Tel: +31 (0)70 340-2015

Form PCT/ISA/220 (July 2010)

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
92853-897679		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2014/013724	30 January 2014 (30-01-2014)	12 February 2013 (12-02-2013)
Applicant		
UNICORN MEDIA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language,** the international search was carried out on the basis of:

[X] the international application in the language in which it was filed

[ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**

[X] the text is approved as submitted by the applicant

[ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

[X] the text is approved as submitted by the applicant

[ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**

a. the figure of the **drawings** to be published with the abstract is Figure No. 4

[X] as suggested by the applicant

[ ] as selected by this Authority, because the applicant failed to suggest a figure

[ ] as selected by this Authority, because this figure better characterizes the invention

b. [ ] none of the figures is to be published with the abstract

Petitioner Disney Ex-1004, 0859

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/013724

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N21/2343 G06F17/30 H04N21/6583
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N G06F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2008/091845 A1 (MILLS BRENDON W [US] ET AL) 17 April 2008 (2008-04-17) paragraph [0004] - paragraph [0005] paragraph [0015] - paragraph [0023] paragraph [0025] - paragraph [0039] paragraph [0044] - paragraph [0048] paragraph [0078] paragraph [0101] - paragraph [0103]	1-20
X	US 2010/318672 A1 (BOUAZIZI IMED [FI]) 16 December 2010 (2010-12-16) paragraph [0017] paragraph [0020] paragraph [0042] - paragraph [0045] paragraph [0053] - paragraph [0058] paragraph [0061] - paragraph [0063]	1-20

-/--

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

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 May 2014	27/05/2014

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

1

Form PCT/ISA/210 (second sheet) (April 2005)

International application No
PCT/US2014/013724

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/209927 A1 (AALTONEN JANNE LA [FI] ET AL) 22 September 2005 (2005-09-22) figures 6,7 paragraph [0001] paragraph [0037] - paragraph [0038] paragraph [0059] - paragraph [0069] paragraph [0071] paragraph [0074] paragraph [0084] - paragraph [0086] paragraph [0089] paragraph [0093] paragraph [0096] paragraph [0100] - paragraph [0101] paragraph [0110] -----	1-20
A	US 2011/252082 A1 (COBB JONATHAN [US] ET AL) 13 October 2011 (2011-10-13) abstract paragraph [0023] - paragraph [0037] paragraph [0041] - paragraph [0052] paragraph [0064] - paragraph [0068] -----	1-20
A	DVB ORGANIZATION: "TM-IPI-2552r12-CDS-Specification_clean.doc", DVB, DIGITAL VIDEO BROADCASTING, C/O EBU - 17A ANCIENNE ROUTE - CH-1218 GRAND SACONNEX, GENEVA - SWITZERLAND, 11 September 2008 (2008-09-11), XP017811009, sections 3.1-3.2 section 4; page 20 section 4.2.2.2 section 4.2.4 section 5.2.5 -----	1-20

Petitioner Disney Ex-1004, 0861

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/013724

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008091845 A1	17-04-2008	NONE	
US 2010318672 A1	16-12-2010	CN 102804818 A	28-11-2012
		EP 2443849 A1	25-04-2012
		KR 20120036868 A	18-04-2012
		US 2010318672 A1	16-12-2010
		WO 2010146440 A1	23-12-2010
US 2005209927 A1	22-09-2005	BR PI0509241 A	04-09-2007
		CN 1957585 A	02-05-2007
		EP 1730933 A1	13-12-2006
		US 2005209927 A1	22-09-2005
		US 2013097280 A1	18-04-2013
		WO 2005091597 A1	29-09-2005
US 2011252082 A1	13-10-2011	AU 2010201379 A1	27-10-2011
		CN 102948125 A	27-02-2013
		EP 2556486 A2	13-02-2013
		US 2011252082 A1	13-10-2011
		WO 2011127263 A2	13-10-2011

Petitioner Disney Ex-1004, 0862

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/013724	30.01.2014	12.02.2013

International Patent Classification (IPC) or both national classification and IPC
INV. H04N21/2343 G06F17/30 H04N21/6583

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Boubal, Olivier Telephone No. +31 70 340-8435

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

   ☐ on paper

   ☐ in electronic form

   b. (time)

   ☐ in the international application as filed

   ☐ together with the international application in electronic form

   ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4-6, 11, 12, 17, 18
	No:	Claims	1-3, 7-10, 13-16, 19, 20
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

Petitioner Disney Ex-1004, 0864

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Petitioner Disney Ex-1004, 0865

1 **Re Item VIII**

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT.

1.1 Claim 1 defines "sending, via the communications interface, a notification that the media content is available for delivery using at least the first set of media profiles".

This feature does not define to which entity the notification is sent. In view of claim 1 as a whole it would be straightforward that this notification is sent to the devices requesting the content in a first media profile format. However, this notification could also be sent to the entity requesting the file to be made available.

Therefore the scope of protection of claim 1 is not clear (Article 6 PCT).

The same objection applies to claims 9 and 15.

In the following this feature will be interpreted in its broadest sense.

1.2 Claim 5 defines "the request includes notification information" and "sending the notification based on the notification information". It is not clear how "notification information" is defined and how the sending of the notification can be based on the notification information included in the request.

Therefore claim 5 is not clear contrary to Article 6 PCT.

The same objection applies to claims 12 and 18.

From the application's description page 12, lines 25-32, it is however clear that the notification information is information stating "how (the requesting entity) would like to receive the notification". In the following opinion, this feature will be interpreted as explained in this passage of the description.

2 **Re Item V**

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

2.1 Reference is made to the following documents:

D1 US 2008/091845 A1 (MILLS BRENDON W [US] ET AL) 17 April 2008 (2008-04-17)

Petitioner Disney Ex-1004, 0866

D2 US 2010/318672 A1 (BOUAZIZI IMED [FI]) 16 December 2010 (2010-12-16)

D3 US 2005/209927 A1 (AALTONEN JANNE LA [FI] ET AL) 22 September 2005 (2005-09-22)

2.2 The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.

D1 discloses (the references in parentheses applying to D1):

- A method of making media content available for delivery via a data communications network, the method comprising: (paragraphs [0004-0005])

- receiving, via a communications interface, a request to make media content available for delivery; (paragraph [0020] - "requests to upload")

- obtaining, via the communications interface, a media file having the media content; (paragraph [0019], "content may be streamed from an appropriate content source to CTR" or paragraph [0023], "Content from content source is uploaded through the network to content store")

- determining a plurality of media profiles, based on the request, wherein the plurality of media profiles includes: a first set of media profiles, and a second set of media profiles; (paragraph [0048], "CTR may determine, in any suitable manner and based on input from any appropriate components, the proper format and characteristics for the modified content requested by the requesting client")

- transcoding, with a processing unit, the media file in accordance with the first set of media profiles; (paragraph [0045], "CTR may be able to begin modifying a first content file for delivery to a first client")

- sending, via the communications interface, a notification that the media content is available for delivery using at least the first set of media profiles; (paragraph [0045], implicitly disclosed in "for delivery to a first client" - see also point 1.1 above)

- and transcoding the media file in accordance with the second set of media profiles. (paragraph [0045], "while simultaneously modifying a second content file for delivery to a second client", disclosing two files being transcoded for two clients and paragraph [0035], "application

Petitioner Disney Ex-1004, 0867

server may, in particular embodiments, generate URIs or other identifiers representing the various formats in which an uploaded content file will be made available to users" showing that a single content is made available in different format)

Therefore claim 1 is not new (Article 33(2) PCT).

It is drawn to the attention of the applicant that the same reasoning could be made using D2 (see further citations in the International Search Report).

2.3 Dependent claims 2-8, do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

2.3.1 Claim 2 defines the content as comprising video. This feature is disclosed in D1 (see D1, lines 3-7 of paragraph [0017]).

Therefore claim 2 is not new (Article 33(2) PCT).

2.3.2 Claim 3 defines the reception as the media file with the request. This feature is disclosed in D1 (see D1, lines 5-11 of paragraph [0026]).

Therefore claim 3 is not new (Article 33(2) PCT).

2.3.3 Claim 4 defines the request as having information indicative of the location of the media file (see also point 1.2 above). This feature is not disclosed in D1 but is a well-known alternative to the skilled person whishing to transmit a file (see also D1, paragraph [0028] which discloses URI identifiers to locate the transcoded content).

Therefore the subject-matter of claim 4 is not inventive (Article 33(3) PCT).

2.3.4 Claim 5 defines the sending of notification using part of the request. This feature is not disclosed in D1. However, notifying the sender of a request to upload content that the content has been correctly uploaded is known to the

Petitioner Disney Ex-1004, 0868

skilled person (see for example D4, paragraph [0093] which discloses such acknowledgement and paragraph paragraph [0085] which discloses that the upload request comprises addressing information).

Therefore claim 5 is not inventive (Article 33(3) PCT).

2.3.5 Claim 6 defines the notification information as for example a URL. This feature is not disclosed in D1 but well known in the context of HTTP requests (see also D4 paragraphs [0085] and [0101]).

Therefore claim 6 is not inventive (Article 33(3) PCT).

2.3.6 Claims 7 and 8 do not appear to add any feature to the ones already defined in claim 1.

Therefore claims 7 and 8 are not new (Article 33(2) PCT).

2.4 The subject matter of independent claims 9 (server), 15 (computer readable medium) and dependent claims 10-14 and 16-20 corresponds to the subject matter of claims 1-8 and therefore the same reasoning as given in points 2.2 and 2.3 above for claims 1-8 will apply mutatis mutandis.

Petitioner Disney Ex-1004, 0869

Bitte beachten Sie, dass angeführte Nichtpatentliteratur (wie z. B. wissenschaftliche oder technische Dokumente) je nach geltendem Recht dem Urheberrechtsschutz und/oder anderen Schutzarten für schriftliche Werke unterliegen könnte. Die Vervielfältigung urheberrechtlich geschützter Texte, ihre Verwendung in anderen elektronischen oder gedruckten Publikationen und ihre Weitergabe an Dritte ist ohne ausdrückliche Zustimmung des Rechtsinhabers nicht gestattet.

Veuillez noter que les ouvrages de la littérature non-brevets qui sont cités, par exemple les documents scientifiques ou techniques, etc., peuvent être protégés par des droits d'auteur et/ou toute autre protection des écrits prévue par les législations applicables. Les textes ainsi protégés ne peuvent être reproduits ni utilisés dans d'autres publications électroniques ou imprimées, ni rediffusés sans l'autorisation expresse du titulaire du droit d'auteur.

Please be aware that cited works of non-patent literature such as scientific or technical documents or the like may be subject to copyright protection and/or any other protection of written works as appropriate based on applicable laws. Copyrighted texts may not be copied or used in other electronic or printed publications or re-distributed without the express permission of the copyright holder.

XS CPRTENFRDE

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
McMillan, Scott
Kilpatrick Townsend & Stockton LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
ETATS-UNIS D'AMERIQUE

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)*: 14 May 2014 (14-05-2014)
Applicant's or agent's file reference: 92853-901575	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No.: PCT/US2014/017945	International filing date *(day/month/year)*: 24 February 2014 (24-02-2014)
Applicant: UNICORN MEDIA, INC.	

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	ROTHENBÖCHER, Anita Tel: +31 (0)70 340-9872

Form PCT/ISA/220 (July 2010)

Petitioner Disney Ex-1004, 0871

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
92853-901575		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2014/017945	24 February 2014 (24-02-2014)	8 March 2013 (08-03-2013)
Applicant		
UNICORN MEDIA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] the international application in the language in which it was filed
      [ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 8
      [ ] as suggested by the applicant
      [ ] as selected by this Authority, because the applicant failed to suggest a figure
      [X] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

Petitioner Disney Ex-1004, 0872

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/017945

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/175145 A1 (ERICSSON TELEFON AB L M [SE]; PERKUHN HEIKO [DE]; KAMPMANN MARKUS [DE]) 27 December 2012 (2012-12-27) abstract page 6 - page 29; figures 1-13	1-20
X	US 2011/082924 A1 (GOPALAKRISHNAN KUMAR [US]) 7 April 2011 (2011-04-07) abstract paragraph [0046] - paragraph [0112]; figures 1-12 paragraph [0167] - paragraph [0177]	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 May 2014	14/05/2014

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

1

Form PCT/ISA/210 (second sheet) (April 2005)

Petitioner Disney Ex-1004, 0873

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/017945

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012175145 A1	27-12-2012	CN 103748857 A	23-04-2014
		EP 2724515 A1	30-04-2014
		TW 201322699 A	01-06-2013
		WO 2012175145 A1	27-12-2012
US 2011082924 A1	07-04-2011	EP 2486491 A1	15-08-2012
		US 2011082924 A1	07-04-2011
		US 2011082946 A1	07-04-2011
		WO 2011044287 A1	14-04-2011

Petitioner Disney Ex-1004, 0874

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/017945	24.02.2014	08.03.2013

International Patent Classification (IPC) or both national classification and IPC
INV. H04L29/06

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Manthey, Axel Telephone No. +31 70 340-4512

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	3, 4, 10, 11, 17, 18
	No:	Claims	1, 2, 5-9, 12-16, 19, 20
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

Petitioner Disney Ex-1004, 0876

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Petitioner Disney Ex-1004, 0877

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 The following documents have been cited in the search report:

D1 WO 2012/175145 A1 (ERICSSON TELEFON AB L M [SE]; PERKUHN HEIKO [DE]; KAMPMANN MARKUS [DE]) 27 December 2012 (2012-12-27)

D2 US 2011/082924 A1 (GOPALAKRISHNAN KUMAR [US]) 7 April 2011 (2011-04-07)

2 Novelty and inventive step of the independent claims

2.1 The subject-matter of **claim 1** is not new in the sense of Article 33(2) PCT.

2.2 The document D1 discloses (the references in parentheses applying to this document):

A method of providing media with a data network (Figure 1, mobile communication network 1, Page 5, line 27 ff., media content via live streaming or content on demand), the method comprising:
determining historical data related to streaming media with the data network (Page 19, line 9 ff., receiving of QoE reports, updating of historical data in storage unit based on messages from network entity, since the historical data is based on QoE reports which are received from streaming clients clients (see e.g. page 17, line 23 ff.) reporting the perceived QoE, said historical data is indeed related to streaming media of said clients);
receiving a request having a universal source locator, URL, wherein the URL includes information indicative of a requested media file (e.g. Figures 9 - 11, page 23, line 29 ff., HTTP server receives a request for content, since the server is an HTTP server the request must include an URL, it is furthermore seen as implicitly disclosed in the previous pages, that since the clients are having an active Dynamic Adaptive Streaming HTTP session (DASH) ongoing (see e.g. page 14, line 34 ff.) said clients must have sent a request for media including a URL in order to set up said session);
determining one or more factors related to the request, wherein the one or more factors related to the request include the historical data (Page 16, line 23 ff., historical data is used to e.g. perform prioritization for clients, Page 18, line

Petitioner Disney Ex-1004, 0878

4 ff., Figure 6, controlling entity evaluates rules based on geo information, received QoE reports (=historical data), since this is performed for controlling content delivery to the clients, the evaluation is indeed related to the requests for the content);
determining, with a processor, a chunking strategy based on the one or more factors related to the request (Page 18, line 20 ff., figure 6, step 63, controlling entity adapts the content delivery i.e. bit rate (=chunking strategy));
generating an index file having information for streaming the requested media file via the data network, wherein generating the index file is based, at least in part, on the chunking strategy; and
providing the index file (Page 18, line 29 ff., figure 6, bit rate is adapted and modified manifest file (=index file) is transmitted to clients).

2.3 The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent **claims 8 and 15**, which therefore are also considered not new.

2.4 It is noted that lack of novelty of the subject-matter of **claims 1, 8 and 15** may as well be demonstrated along the disclosure of document D2 (cf. passages cited in the Search Report).

3 Novelty and inventive step of the dependent claims

3.1 Dependent **claims 2 - 7, 9 - 14 and 16 - 20** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, see documents D1 and D2 and the corresponding passages cited in the search report. In particular:

3.2 A method, a server and a computer readable medium (**claims 2, 9 and 16**) wherein the historical data includes Quality of Service (QoS) information regarding a previously-streamed media file is known (see e.g. D1, Page 18 ff., QoS bearers, QoE reports received).

3.3 A method, a server and a computer readable medium (**claims 5, 12 and 19**) wherein the QoS information is based on information obtained from streaming media to a plurality of devices is known (see e.g. D1, Page 18, line 34 ff., plurality of clients, QoS bearers, QoE reports).

3.4 A method, a server and a computer readable medium (**claims 6, 13 and 20**) wherein the chunking strategy includes one or more of:
a size of a chunk for streaming the requested media file,
a length of playback of a chunk for streaming the requested media file, or

Petitioner Disney Ex-1004, 0879

a codec to use for streaming the requested media file is known (see e.g. D1, page 18, line 29 ff, adjustment of bit rates, D2, paragraph [0162] ff., change of rate at which chunks are sent etc.).

3.5 A method and a server (**claims 7 and 14**) wherein generating the index file occurs during playback of the requested media file is known (see e.g. D1, Page 14, line 34 ff., modified manifest during streaming session, D2, paragraph [0168] ff.).

Re Item VII

Certain defects in the international application

4 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2 (b) PCT).

5 Independent claims are not in the two-part form in accordance with Rule 6.3 (b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3 (b) (i) PCT) and with the remaining features being included in the characterizing part (Rule 6.3 (b) (ii) PCT).

6 The relevant background art disclosed in the documents D1 and D2 is not mentioned in the description (Rule 5.1 (a) (ii) PCT).

Re Item VIII

Certain observations on the international application (clarity)

7 The application does not meet the requirements of Article 6 PCT, because **claims 1 - 7** are not clear.

7.1 **Claims 1 - 7** do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. In particular the method steps of *"determining [..]"*, *"receiving [..]"*, *"generating [..]"* and "*providing [..]*" lack information on the entity at which said method steps are carried out and therefore do not enable the skilled person to determine which technical features are necessary to perform the stated function. From the description (e.g. page 22) it appears that said method steps are executed at **a CHIMPS index file generator**.

Petitioner Disney Ex-1004, 0880

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING TRANSMITTAL OF COPY OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (CHAPTER I OF THE PATENT COOPERATION TREATY)
(PCT Rule 44bis.1(c))

To:

MCMILLAN, Scott
Eighth Floor
Two Embarcadero Center
San Francisco, CA 94111
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)*
17 September 2015 (17.09.2015)

Applicant's or agent's file reference
92853-901575

IMPORTANT NOTICE

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/017945	24 February 2014 (24.02.2014)	08 March 2013 (08.03.2013)

Applicant
UNICORN MEDIA, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer
Athina Nickitas-Etienne

e-mail: pt04.pct@wipo.int

Petitioner Disney Ex-1004, 0881

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 92853-901575	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2014/017945	International filing date *(day/month/year)* 24 February 2014 (24.02.2014)	Priority date *(day/month/year)* 08 March 2013 (08.03.2013)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant UNICORN MEDIA, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 08 September 2015 (08.09.2015)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Athina Nickitas-Etienne e-mail: pt04.pct@wipo.int

Form PCT/IB/373 (January 2004)

Petitioner Disney Ex-1004, 0882

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/017945	24.02.2014	08.03.2013

International Patent Classification (IPC) or both national classification and IPC
INV. H04L29/06

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Manthey, Axel Telephone No. +31 70 340-4512

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

   ☐ on paper

   ☐ in electronic form

   b. (time)

   ☐ in the international application as filed

   ☐ together with the international application in electronic form

   ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	3, 4, 10, 11, 17, 18
	No:	Claims	1, 2, 5-9, 12-16, 19, 20
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

Petitioner Disney Ex-1004, 0884

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Petitioner Disney Ex-1004, 0885

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 The following documents have been cited in the search report:

D1 WO 2012/175145 A1 (ERICSSON TELEFON AB L M [SE]; PERKUHN HEIKO [DE]; KAMPMANN MARKUS [DE]) 27 December 2012 (2012-12-27)

D2 US 2011/082924 A1 (GOPALAKRISHNAN KUMAR [US]) 7 April 2011 (2011-04-07)

2 Novelty and inventive step of the independent claims

2.1 The subject-matter of **claim 1** is not new in the sense of Article 33(2) PCT.

2.2 The document D1 discloses (the references in parentheses applying to this document):

A method of providing media with a data network (Figure 1, mobile communication network 1, Page 5, line 27 ff., media content via live streaming or content on demand), the method comprising:
determining historical data related to streaming media with the data network (Page 19, line 9 ff., receiving of QoE reports, updating of historical data in storage unit based on messages from network entity, since the historical data is based on QoE reports which are received from streaming clients clients (see e.g. page 17, line 23 ff.) reporting the perceived QoE, said historical data is indeed related to streaming media of said clients);
receiving a request having a universal source locator, URL, wherein the URL includes information indicative of a requested media file (e.g. Figures 9 - 11, page 23, line 29 ff., HTTP server receives a request for content, since the server is an HTTP server the request must include an URL, it is furthermore seen as implicitly disclosed in the previous pages, that since the clients are having an active Dynamic Adaptive Streaming HTTP session (DASH) ongoing (see e.g. page 14, line 34 ff.) said clients must have sent a request for media including a URL in order to set up said session);
determining one or more factors related to the request, wherein the one or more factors related to the request include the historical data (Page 16, line 23 ff., historical data is used to e.g. perform prioritization for clients, Page 18, line

Petitioner Disney Ex-1004, 0886

4 ff., Figure 6, controlling entity evaluates rules based on geo information, received QoE reports (=historical data), since this is performed for controlling content delivery to the clients, the evaluation is indeed related to the requests for the content);
determining, with a processor, a chunking strategy based on the one or more factors related to the request (Page 18, line 20 ff., figure 6, step 63, controlling entity adapts the content delivery i.e. bit rate (=chunking strategy));
generating an index file having information for streaming the requested media file via the data network, wherein generating the index file is based, at least in part, on the chunking strategy; and
providing the index file (Page 18, line 29 ff., figure 6, bit rate is adapted and modified manifest file (=index file) is transmitted to clients).

2.3 The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent **claims 8 and 15**, which therefore are also considered not new.

2.4 It is noted that lack of novelty of the subject-matter of **claims 1, 8 and 15** may as well be demonstrated along the disclosure of document D2 (cf. passages cited in the Search Report).

3 Novelty and inventive step of the dependent claims

3.1 Dependent **claims 2 - 7, 9 - 14 and 16 - 20** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, see documents D1 and D2 and the corresponding passages cited in the search report. In particular:

3.2 A method, a server and a computer readable medium (**claims 2, 9 and 16**) wherein the historical data includes Quality of Service (QoS) information regarding a previously-streamed media file is known (see e.g. D1, Page 18 ff., QoS bearers, QoE reports received).

3.3 A method, a server and a computer readable medium (**claims 5, 12 and 19**) wherein the QoS information is based on information obtained from streaming media to a plurality of devices is known (see e.g. D1, Page 18, line 34 ff., plurality of clients, QoS bearers, QoE reports).

3.4 A method, a server and a computer readable medium (**claims 6, 13 and 20**) wherein the chunking strategy includes one or more of:
a size of a chunk for streaming the requested media file,
a length of playback of a chunk for streaming the requested media file, or

Petitioner Disney Ex-1004, 0887

a codec to use for streaming the requested media file is known (see e.g. D1, page 18, line 29 ff, adjustment of bit rates, D2, paragraph [0162] ff., change of rate at which chunks are sent etc.).

3.5 A method and a server (**claims 7 and 14**) wherein generating the index file occurs during playback of the requested media file is known (see e.g. D1, Page 14, line 34 ff., modified manifest during streaming session, D2, paragraph [0168] ff.).

Re Item VII

Certain defects in the international application

4 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2 (b) PCT).

5 Independent claims are not in the two-part form in accordance with Rule 6.3 (b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3 (b) (i) PCT) and with the remaining features being included in the characterizing part (Rule 6.3 (b) (ii) PCT).

6 The relevant background art disclosed in the documents D1 and D2 is not mentioned in the description (Rule 5.1 (a) (ii) PCT).

Re Item VIII

Certain observations on the international application (clarity)

7 The application does not meet the requirements of Article 6 PCT, because **claims 1 - 7** are not clear.

7.1 **Claims 1 - 7** do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. In particular the method steps of *"determining [..]"*, *"receiving [..]"*, *"generating [..]"* and "*providing [..]*" lack information on the entity at which said method steps are carried out and therefore do not enable the skilled person to determine which technical features are necessary to perform the stated function. From the description (e.g. page 22) it appears that said method steps are executed at **a CHIMPS index file generator**.

Petitioner Disney Ex-1004, 0888

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
TRANSMITTAL OF COPY OF INTERNATIONAL
PRELIMINARY REPORT ON PATENTABILITY
(CHAPTER I OF THE PATENT COOPERATION
TREATY)
(PCT Rule 44bis.1(c))

To:

MCMILLAN, Scott
Eighth Floor
Two Embarcadero Center
San Francisco, CA 94111
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 09 October 2014 (09.10.2014)	
Applicant's or agent's file reference 92853-858085	**IMPORTANT NOTICE**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2013/023181	25 January 2013 (25.01.2013)	26 March 2012 (26.03.2012)

Applicant
UNICORN MEDIA, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer
Philippe Bécamel

e-mail: pt03.pct@wipo.int

Form PCT/IB/326 (January 2004)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 92853-858085	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2013/023181	International filing date *(day/month/year)* 25 January 2013 (25.01.2013)	Priority date *(day/month/year)* 26 March 2012 (26.03.2012)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant UNICORN MEDIA, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 01 October 2014 (01.10.2014)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Philippe Bécamel e-mail: pt03.pct@wipo.int

Form PCT/IB/373 (January 2004)

Petitioner Disney Ex-1004, 0890

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2013/023181	25.01.2013	26.03.2012

International Patent Classification (IPC) or both national classification and IPC
INV. H04L29/06

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Brichau, Gert Telephone No. +31 70 340-1051

Form PCT/ISA/237 (Cover Sheet) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2013/023181

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4, 6, 10, 12, 15
	No:	Claims	1-3, 5, 7-9, 11, 13, 14
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

Petitioner Disney Ex-1004, 0892

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:
D1: WO2011/009205 (Reza Areef) 27 January 2011
D2: US2012/0047542 (Lewis et al.) 23 February 2012
D3: US2002/0029282 (Buddhikot et al.) 7 March 2002

2 The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.
D1 discloses:
A server for customizing index file generation for streaming a media file via a data network (D1, "media server" of page 15, line 18 to page 17, line 8 and "index XML file" page 24, and page 21, lines 13-21), the server comprising:
a network interface for communicating with the data network; and an index file generator coupled to the network interface and configured to (D1, "index XML file" page 24) :
obtain a request having a universal source locator, URL, wherein the URL includes information indicative of a requested media file (D1, pages 17 and 18, "XML listing 1: Example Request" contains URL "http:// www.company.com/videoid/");
determine a state of a client media player application related to the request (in D1, the server prepares media file depending on what client can treat, based on the client transport format attributes, see page 15, line 18 to page 16, line 9, also based on bandwidth as monitored at client, see pages 25 and 26 and more particularly page 25 last paragraph);
determine a chunking strategy based on the state of the client media player application (in D1, the server prepares media file depending on what client can treat, based on the client transport format attributes, see page 15, line 18 to page 16, line 9, also based on bandwidth as monitored at client, see pages 25 and 26 and more particularly page 25 last paragraph);
generate an index file having information for streaming the requested media file via the data network, wherein generating the index file is based, at least in part, on the chunking strategy; and
send the index file via the network interface (D1, "index XML file" page 24 and page 15, line 18 to page 16, line 9, page 21, lines 13-21 and pages 25 and 26).

Petitioner Disney Ex-1004, 0893

3 The same reasoning as in point 2 above applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 7 and 13, which therefore are also considered not new.

4 Dependent claims 2-6,8-12,14,15 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty (Claims 2,3,5,8,9,11,14) and/or inventive step (Claims 4,6,10,12,15), see for example:
- Claim 2: D1, the server prepares media file depending on what client can treat, based on the client transport format attributes, see page 15, line 18 to page 16, line 9, also based on bandwidth as monitored at client, see pages 25 and 26 and more particularly page 25 last paragraph
- Claim 3: codec D1, page 18 and mp4 (size of chunk)
- Claim 4: not inventive, known to the man skilled in the art, see D2, [0041] anticipates claim 4 because manifest file is updated by dynamic manifest file server while looking at live video footage
- Claim 5: D1, page 29, line 21 to page 30, line 5
- Claim 6: not inventive given disclosure of D3, [0020]-[0022]

Petitioner Disney Ex-1004, 0894

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
McMillan, Scott
Kilpatrick Townsend & Stockton LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
ETATS-UNIS D'AMERIQUE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 8 May 2013 (08-05-2013)
Applicant's or agent's file reference 92853-858085	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2013/023181	International filing date *(day/month/year)* 25 January 2013 (25-01-2013)
Applicant UNICORN MEDIA, INC.	

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

   Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

   In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

   For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	LAMPREIA, Sylvia Tel: +31 (0)70 340-1948

Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
92853-858085		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2013/023181	25/01/2013	26/03/2012
Applicant		
UNICORN MEDIA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] the international application in the language in which it was filed
      [ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 5A
      [X] as suggested by the applicant
      [ ] as selected by this Authority, because the applicant failed to suggest a figure
      [ ] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

Petitioner Disney Ex-1004, 0896

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/023181

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/06
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/009205 A1 (JIGSEE INC [CA]; REZA AREEF [CA]) 27 January 2011 (2011-01-27) page 15, line 18 - page 18, line 25 page 21, line 13 - line 21 page 22, line 21 - page 23, line 2 page 24 - page 26 page 29, line 21 - page 30, line 5	1-15
A	US 2012/047542 A1 (LEWIS JASON [US] ET AL) 23 February 2012 (2012-02-23) paragraph [0041]	1,7,13
A	US 2002/029282 A1 (BUDDHIKOT MILIND M [US] ET AL) 7 March 2002 (2002-03-07) paragraph [0020] - paragraph [0022]	1,7,13

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 May 2013	08/05/2013

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

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/023181

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011009205 A1	27-01-2011	US 2012185530 A1	19-07-2012
		WO 2011009205 A1	27-01-2011
US 2012047542 A1	23-02-2012	NONE	
US 2002029282 A1	07-03-2002	NONE	

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2013/023181	25.01.2013	26.03.2012

International Patent Classification (IPC) or both national classification and IPC
INV. H04L29/06

Applicant
UNICORN MEDIA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Brichau, Gert Telephone No. +31 70 340-1051

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	4, 6, 10, 12, 15
	No:	Claims	1-3, 5, 7-9, 11, 13, 14
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

Petitioner Disney Ex-1004, 0900

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:
D1: WO2011/009205 (Reza Areef) 27 January 2011
D2: US2012/0047542 (Lewis et al.) 23 February 2012
D3: US2002/0029282 (Buddhikot et al.) 7 March 2002

2 The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.
D1 discloses:
A server for customizing index file generation for streaming a media file via a data network (D1, "media server" of page 15, line 18 to page 17, line 8 and "index XML file" page 24, and page 21, lines 13-21), the server comprising: a network interface for communicating with the data network; and an index file generator coupled to the network interface and configured to (D1, "index XML file" page 24) :
obtain a request having a universal source locator, URL, wherein the URL includes information indicative of a requested media file (D1, pages 17 and 18, "XML listing 1: Example Request" contains URL "http:// www.company.com/videoid/");
determine a state of a client media player application related to the request (in D1, the server prepares media file depending on what client can treat, based on the client transport format attributes, see page 15, line 18 to page 16, line 9, also based on bandwidth as monitored at client, see pages 25 and 26 and more particularly page 25 last paragraph);
determine a chunking strategy based on the state of the client media player application (in D1, the server prepares media file depending on what client can treat, based on the client transport format attributes, see page 15, line 18 to page 16, line 9, also based on bandwidth as monitored at client, see pages 25 and 26 and more particularly page 25 last paragraph);
generate an index file having information for streaming the requested media file via the data network, wherein generating the index file is based, at least in part, on the chunking strategy; and
send the index file via the network interface (D1, "index XML file" page 24 and page 15, line 18 to page 16, line 9, page 21, lines 13-21 and pages 25 and 26).

Petitioner Disney Ex-1004, 0901

3 The same reasoning as in point 2 above applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 7 and 13, which therefore are also considered not new.

4 Dependent claims 2-6,8-12,14,15 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty (Claims 2,3,5,8,9,11,14) and/or inventive step (Claims 4,6,10,12,15), see for example:

- Claim 2: D1, the server prepares media file depending on what client can treat, based on the client transport format attributes, see page 15, line 18 to page 16, line 9, also based on bandwidth as monitored at client, see pages 25 and 26 and more particularly page 25 last paragraph
- Claim 3: codec D1, page 18 and mp4 (size of chunk)
- Claim 4: not inventive, known to the man skilled in the art, see D2, [0041] anticipates claim 4 because manifest file is updated by dynamic manifest file server while looking at live video footage
- Claim 5: D1, page 29, line 21 to page 30, line 5
- Claim 6: not inventive given disclosure of D3, [0020]-[0022]

Petitioner Disney Ex-1004, 0902

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 January 2011 (27.01.2011)

PCT

(10) International Publication Number
WO 2011/009205 A1

(51) International Patent Classification:
H04N 7/173 (2011.01)

(21) International Application Number:
PCT/CA2010/001129

(22) International Filing Date:
22 July 2010 (22.07.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/227,683 22 July 2009 (22.07.2009) US

(71) Applicant *(for all designated States except US)*: **JIGSEE INC.** [CA/CA]; 1166 Bay Street, Suite 2105, Toronto, Ontario M5S 2X8 (CA).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **REZA, Areef** [CA/CA]; 12 Ealing Street, Ottawa, Ontario K2W 1E4 (CA).

(74) Agent: **HILL & SCHUMACHER**; 264 Avenue Road, Toronto, Ontario M4V 2G7 (CA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: METHOD OF STREAMING MEDIA TO HETEROGENEOUS CLIENT DEVICES

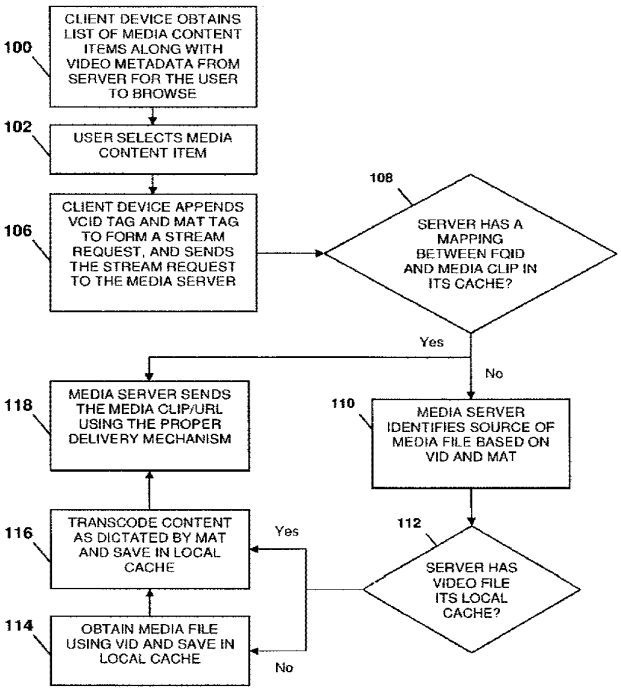


Figure 2

(57) Abstract: A method of dynamically preparing a media clip for delivery from a server to a client is provided. Media attributes comprising media playback formats compatible with the client are provided to the server. A request is made by the client to provide a media content item at a specified starting time, and the server identifies a source where a media content file related to the selected media content item is located. The server obtains the media file from the source, and obtains a transcoded media segment file having a playback format compatible with the client media attributes. The transcoded media segment file may further be prepared in a transport format that is compatible with transport format media attributes of the client device, and a location of the prepared transcoded media segment file may be communicated to the client for the client to access the media segment.

WO 2011/009205 A1

Petitioner Disney Ex-1004, 0903

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Petitioner Disney Ex-1004, 0904

METHOD OF STREAMING MEDIA TO HETEROGENEOUS CLIENT DEVICES

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to U.S. Provisional Application No. 61/227683, titled "Method and Apparatus for Seamless Video Streaming to Mobile Devices" and filed on July 22nd, 2009, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to digital media streaming, and more particularly, the present invention relates to a system and method for streaming digital media to heterogeneous client devices.

BACKGROUND OF THE INVENTION

Video streaming from a server to a client entity presently faces many engineering challenges. For example, network connected devices come in different screen sizes and CPU power; media optimized for one device (say, a PC) may not be viewable on other devices (say, a cell phone). Not all device supports the same streaming technology (e.g., RTSP streaming) or the same codec (e.g., some supports mp4, some may not).

When watching a video content on the PC, it is typically not possible or not straight forward to find the same video to watch on a mobile phone. Furthermore, it is even more challenging to watch from the middle of a video content on a phone where the first half was already viewed on a PC.

Petitioner Disney Ex-1004, 0905

Traditionally when a video streaming starts from a video server, the server, content, delivery mechanism, etc. remain the same for the duration of the session. This imposes a restriction when multiple devices request access to the same stream within the same streaming session.

Accordingly, it would be advantageous to provide a system for video streaming from a server that addresses the above-mentioned challenges.

SUMMARY OF THE INVENTION

In a first aspect, there is provided a method of dynamically preparing a media clip for delivery from a server to a client, the client comprising a client device and a media application for providing media playback on the client device, the method comprising the steps of receiving media attributes from the client, the media attributes comprising one or more playback formats compatible with the client; receiving from the client a request to provide a media segment comprising a selected segment of a selected media content item, the request defining a starting offset of the media segment; identifying a source where a media content file relating to the selected media content item is stored; obtaining the media content file from the source; and obtaining a transcoded media segment file comprising a transcoded segment of the media content file, wherein the transcoded media segment file comprises a playback format selected from the media attributes. The step of obtaining a transcoded media segment file comprises generating a transcoded file comprising the selected segment of the media file. The method may be repeated for one or more additional clients.

Petitioner Disney Ex-1004, 0906

At least one of the media attributes is preferably selected from the group consisting of frame rate, resolution, aspect ratio, encoding rate, audio codec, and video codec. The media attributes may further comprise a preferred playback format, and wherein the playback format selected from the media attributes is the preferred playback format.

The media attributes may further comprise a content format; wherein the step of identifying a source comprises identifying one or more sources (which may comprise a single source) where media files related to the selected media content item are stored; and wherein the step of obtaining the media content file from the source comprises selecting a media file from the media files, wherein the selected media file comprises a content format selected from the media attributes. The media attributes may further comprise a preferred content format, and wherein the content format selected from the media attributes is the preferred content format. At least one of the media attributes is preferably selected from the group consisting of content language, content edition, content subtitles, and content censorship.

The step of identifying a source where a media file relating to the media content item is stored preferably comprises the step of identifying the selected media content item from a list of available media content items; wherein the list further comprises at least one source of at least one media file related to the selected media content item.

The source may comprise a cached copy of the media file, and one or more of the media content file and the transcoded media segment file may be cached. The cached copy of the media file may comprises a segment substantially matching the selected segment, and wherein the media file

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comprises a playback format selected from the media attributes, wherein the transcoded media segment file is obtained from the cached copy of the media file.

Prior to receiving the request to provide a segment of a selected media content item, media content availability information may provided to the client, wherein the media content availability information relates to at least a portion of the list of available media content items.

The media attributes preferably further comprise one or more transport formats compatible with the client, the method further comprising the steps of selecting a transport format from the media attributes; preparing the transcoded media segment file for delivery according to the transport format; and communicating a location of the prepared transcoded media segment file to the client. The media attributes may further comprise a preferred transport format, and wherein the transport format selected from the media attributes is the preferred transport format. At least one of the media attributes is preferably selected from the group consisting of hypertext transfer protocol, real time streaming protocol, file transfer protocol, and adaptive hypertext transfer protocol streaming.

The request may be provided after the client is disconnected while streaming a previously generated prepared transcoded media segment, wherein the starting offset is an offset during the previously generated prepared transcoded media segment when the streaming of the previously generated prepared transcoded media segment was disconnected. The previously generated prepared transcoded media segment may have been prepared by the server. Alternatively, the previously generated prepared

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transcoded media segment may have been prepared by a different server, and wherein the currently prepared transcoded media segment is generated using a different transport format than a transport format employed when streaming the previously generated prepared transcoded media segment, and wherein the different transport format is selected from the media attributes.

The request may be provided after a previous client is disconnected while streaming a previously generated prepared transcoded media segment, and wherein the starting offset is an offset during the previously generated prepared transcoded media segment when the streaming of the previously generated prepared transcoded media segment was disconnected.
The current client may comprise media attributes that are different from media attributes of the previous client.

The request may comprise metadata associated with semantic content of the selected media content item. The selected media content item is preferably related to any one of a video segment, an audio and video segment, and an image. Statistical information relating to the requests for the delivery of the media content item is preferably recorded.

In another aspect, there is provided a method of dynamically receiving a media clip on a client, the client comprising a client device and a media application for providing media playback on the client device, the method comprising the steps of communicating client media attributes from the client to a server, the media attributes comprising a playback format and a transport format compatible with the client; receiving from the server a list of available media content items; allowing a user to select a media content item from the list; allowing the user to identify a media segment of the media content item

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by selecting a starting offset; communicating with the server to request dynamic preparation of the media segment; receiving from the server a location of a prepared transcoded media segment file comprising a transcoded media segment file prepared in a format for delivery to the client, wherein the transcoded media segment file comprises a transcoded segment of a media file related to the media content item, and wherein the transcoded media segment file comprises a playback format selected from the media attributes, and wherein the prepared transcoded media segment file comprises a transport format selected from the media attributes; and obtaining the transcoded media segment file from the location for playback on the client device. The method preferably comprises the step of playing the transcoded media segment file on the client device.

At least one of the media attributes may comprise a playback format attribute selected from the group of consisting of frame rate, resolution, aspect ratio, encoding rate, audio codec, and video codec. At least one of the media attributes is preferably a transfer protocol attribute selected from the group consisting of hypertext transfer protocol, real time streaming protocol, file transfer protocol, and adaptive hypertext transfer protocol streaming.

The media attributes may further comprise a preferred playback format, and wherein the playback format selected from the media attributes is the preferred playback format. Preferably, the media attributes further comprise a preferred transport format, and wherein the transport format selected from the media attributes is the preferred transport format.

The media attributes may further comprise a content format, and wherein the media file related to the media content item comprises a content

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format selected from the media attributes. Preferably, the media attributes further comprise a preferred content format, and wherein the content format selected from the media attributes is the preferred content format.

At least one of the media attributes is preferably a content format attribute selected from the group consisting of content language, content edition, content subtitles, and content censorship.

The client device may be selected from the list comprising a cell phone, a smartphone, a tablet, a portable media player, and a computer.

The playing of the transcoded media segment file on the client device may be interrupted, in which case the method may further comprising the steps of recording an offset in the selected media segment file when the interruption occurred; re-establishing communication with the server; and obtaining the transcoded media segment file from the location for playback on the client device.

Alternatively, if the playing of the transcoded media segment file on the client device is interrupted, the method may further comprise the steps of recording an offset in the transcoded media segment file when the interruption occurred; and establishing communication with another server, wherein the media content item is available from the another server; communicating the client media attributes to the another server; identifying a new media segment of the media content item by selecting a starting offset corresponding to the offset in the transcoded media segment file when the interruption occurred; communicating with the another server to request dynamic preparation of the new media segment; receiving from the another server a location of a new prepared transcoded media segment file comprising a new transcoded media

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segment file prepared in a format for delivery to the client, wherein the new transcoded media segment file comprises a transcoded segment of the media file related to the media content item, and wherein the new transcoded media segment file comprises a playback format selected from the media attributes, and wherein the new prepared transcoded media segment file comprises a transport format selected from the media attributes; and obtaining the new transcoded media segment file from the location for playback on the client device. The transport format of the new prepared transcoded media segment file may be different from a transport format of the prepared transcoded media segment file that was prepared prior to the interruption.

Prior to the step of receiving from the server the first list of available media content items, the following steps may be performed: communicating with the server to access a user account associated with the user; receiving a second list of media content items comprising media content items previously viewed by the user; wherein the step of allowing the user to select a media content item from the first list further comprises the step of allowing the user to select a media content item from the second list.

If the previously viewed media content item was stopped during playback by the user during a previous viewing session, and wherein an offset at which playback of the media content item was stopped is recorded in the user account; then the step of allowing the user to identify a media segment of the previously viewed media content item by selecting a starting offset may comprise the step of allowing the user to select the offset at which playback of the media content item was stopped. The client may be different than a client used during the previous viewing session.

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Prior to the step of receiving from the server the first list of available media content items, the following steps may be performed: communicating with the server to access a user account associated with the user; receiving an additional list of media content items from another user; wherein the step of allowing the user to select a media content item from the first list further comprises the step of allowing the user to select a media content item from the additional list.

The method may further comprise the steps of communicating with the server to access a user account associated with the user; and allowing the user to share the media content item with an additional user.

The media content item is preferably related to any one of a video segment, an audio and video segment, and an image, and the client device is preferably selected from the list comprising a cell phone, a smartphone, a tablet, a portable media player, and a computer. The client may further comprise a user interface in communication with the server, the user interface displaying the list to the user.

A further understanding of the functional and advantageous aspects of the present invention can be realized by reference to the following detailed description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will now be described, by way of example only, with reference to the drawings, in which:

Figure 1 is a diagram of a system for streaming video content from one or more media servers to one or more clients;

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Figure 2 is a flow chart diagram illustrating an example method for obtaining a video server from a media server;

Figure 3 is a flow chart diagram illustrating a video transmission that is interrupted; and

Figure 4 is a flow chart diagram illustrating a hand-off of a video transmission between more than one client.

DETAILED DESCRIPTION OF THE INVENTION

Without limitation, the majority of the systems described herein are directed to systems and methods for transmitting digital media. As required, embodiments of the present invention are disclosed herein. However, the disclosed embodiments are merely exemplary, and it should be understood that the invention may be embodied in many various and alternative forms.

The Figures are not to scale and some features may be exaggerated or minimized to show details of particular elements while related elements may have been eliminated to prevent obscuring novel aspects. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention. For purposes of teaching and not limitation, the illustrated embodiments are directed to systems and methods for transmitting digital video clips.

As used herein, the term "about", when used in conjunction with ranges of dimensions or other physical properties or characteristics is meant to cover slight variations that may exist in the upper and lower limits of the ranges of dimensions as to not exclude embodiments where on average most of the

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dimensions are satisfied but where statistically dimensions may exist outside this region. For example, in embodiments of the present invention configurations of video streaming systems are given but it will be understood that these are not meant to be limiting.

As used herein, the terms "comprises", "comprising", "includes" and "including" are to be construed as being inclusive and open ended, and not exclusive. Specifically, when used in this specification including claims, the terms "comprises", "comprising", "includes" and "including" and variations thereof mean the specified features, steps or components are included. These terms are not to be interpreted to exclude the presence of other features, steps or components.

As used herein, the coordinating conjunction "and/or" is meant to be a selection between a logical disjunction and a logical conjunction of the adjacent words, phrases, or clauses. Specifically, the phrase "X and/or Y" is meant to be interpreted as "one or both of X and Y" wherein X and Y are any word, phrase, or clause.

As used herein, the acronym "RTSP" refers to Real Time Streaming Protocol which is a transfer protocol designed for transmission of media; the acronym "HTTP" refers to "Hypertext Transfer Protocol" which is a transfer protocol designed for the transmission of web pages; and the acronym "FTP" refers to File Transfer Protocol which is a transfer protocol designed for the transmission of digital files.

As used herein, the term "transcoding" refers to the conversion of digital media from one digital encoding to another. If the second encoding is lossy, signal content will be lost in the conversion operation. As an example,

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one encoding of digital video may be H.264 and another encoding may be WMV.

Referring to Figure 1, an exemplary and non-limiting system 10 is shown for illustrating selected embodiments in which media content is provided to a client 5. The system includes a media server 16, which provides media content to a client comprising a client application 14 that is executed on client device 12 such as a phone, tablet, personal computer, portable media player, or other computing and/or media presentation device. The client device is operated by user 6, and the client application 14 includes a user interface for interacting with user 6. Client application 14 includes computer readable instructions stored on computer readable memory and may be referred to as a "media application."

Media server 16 accesses media to that is to be streamed and client application 14 is capable of decoding and playing media content (such as a media content stream) on the client device 12. Media server 16 may access media stored in a content management system including media store 20 and media database 22. Further, the media server 16 is connected to a network 24 (preferably the internet), which may connect to additional servers such as a web server 26, an Amazon™ media 28, and a RTSP server 30. The media server 16 has a media transcoder 18 which may be a separate machine from the media server 16, or it may be a program running on the media server 16. The media transcoder 18 may be a device connected over a network.

While the present system is directed to a method of streaming video, the system may be applied to any media content such as audio and images. In Figure 1, a cell phone 12 is shown as running the client application 14,

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though other digital devices may serve as the client device 14 such as a smartphone, portable media player, desktop computer, or a tablet computer.

According to selected embodiments, a method of providing media to a client 5 employs a hierarchical system for categorizing or metadata tagging media. At the highest level for example, a media metadata tag may specify a movie title, at an intermediate level, a media tag may specify a viewing language, and at the lowest level, a media tag may specify a specific file representing digital media content. These examples of tag levels are meant to be exemplary and those skilled in the art would appreciate that a hierarchical tagging system may employ different media tags. For example, language may be the highest level in the hierarchy. As disclosed below, such categorization or metadata tagging of media content supports a method in which media content compatible with a client's media attributes can be dynamically provided.

By way of example, a media content item may be defined by a metadata such as a global video identifier (VID) that identifies a video by its semantic content, as opposed to by its digital encoding or formatting. There may be many copies of a video with the same VID, each with a different audio content, screen size, encoding parameters, subtitles, etc. For example, it is possible to have a video dubbed in a different language than the original, the two sharing the same VID. In other words VID is not a sufficient identifier to identify a video in its original source form. One example of a VID is a title of a movie, which is generic and can be applied to describe multiple media files of the same movie, but having different properties such as the presence or absence of subtitles, or the censorship status of the media item.

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Considering now the client 5, the capability of the client receiving and playback of media playback and transport formats may be described and provided to the server 16. Such capability, or compatibility, of the client 5 may be referred to as media attributes (MAT). Non-limiting examples of media playback format attributes include the following: frames per second, spoken language, optimized screen size, encoding rate (audio, video), codec used, and many other attributes. Non-limiting examples of media transport format attributes include the following: RTSP, HTTP, adaptive HTTP streaming, FTP, and BitTorrent.

It is to be understood that media attributes may describe the capabilities or compatibility of a client, and that the media attributes may comprise more than one compatible media playback format attribute and/or media transport attribute. For example, a client 5 may be capable of playback of multiple encoding formats, or accepting multiple transport formats. In a preferred embodiment, the client media attributes comprise preferred media attributes, where the preferred media attributes may be selected by a media server for providing media content in a preferred playback or content format.

The media attributes of the client preferable further comprise preferred content format of media to be provided to, and played back, on the device. Content format media attributes may include, for example, a preferred language, and a preference for the display of subtitles. By providing content format media attributes to a server, a specific media file compatible with the client content media attributes may be selected when a media content item is specified. For example, if a specific movie title is selected as a media content item, the server, armed with the knowledge of the client media content format

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attributes, may select an appropriate version (i.e. specific media file) to generate and provide to the client.

It is also to be understood that a specific media file, which may relate to a media content item, may be described in terms of specific media attributes, such as the encoding format of the media file. Accordingly, in one embodiment, a specific media file may be identified the media content item and the media attributes of the file, for example, by a 2-tuple such as {VID, MAT}.

A segment of a specific media file may be identified by the starting time of the media segment, and optionally the ending time of the media segment. In one exemplary embodiment, a video clip identifier (VCID) may be used to identify a subset of a media file, where the VCID comprises a VID, a millisecond offset (Off), a millisecond length (Len), and a MAT. The offset denotes the starting point of the clip; the length indicates the running time of the clip from its start. Accordingly, in this exemplary embodiment, a 3-tuple {VID, Off, Len} may be termed as a Video Clip Identifier or a VCID. The 4-tuple {VID, Off, Len, MAT} may be termed as a Fully Qualified VCID, or FQID.

As described above, media content from a media server 16 may be prepared and delivered to a client in a dynamic fashion. A client may send a request to a server (e.g. media server 16) in which a media content item is selected for delivery. For example, a video clip may be selected by sending its VCID to the server. The media server 16 responds by providing a media file matching the request, where the media file is formatted and transported according to the media attributes of the client, which have been provided to the server.

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The media file is preferably dynamically transcoded according the media playback attributes of the client, and transported according to the media transport attributes of the client. For example, if the current delivery mechanism chosen is RTSP, the media server 16 automatically skips to the Offset of the clip and automatically stops the session when it reaches the Length of the clip. If the current delivery mechanism is HTTP, FTP or BitTorrent for example, the media server 16 creates an appropriate video file dynamically with appropriate headers such that the video starts at Offset and ends at the Length. This is described in more detail below.

Referring to Figure 2, a flow chart is provided that illustrates a preferred method of providing a media file from a server 16 to client 5. In step 100, the client obtains, from the server, a list of media content items that are available for delivery. Such media content items may preferably be described by VCID tags that uniquely identifies a video clip, where the server maintains a list comprising the VCID tags and one or more sources where a media file relating to the VCID tag may be obtained. In selected embodiments, such VCID tags can be obtained from an online site, or via email, or similar sources.

In step 102, the user selects a media content item a client 5 to request for delivery from the server 16. The client may display user interpretable information such as the title of a movie, which may be cross-referenced with a VCID or other metadata record that specifically identifies the video content item in a format that can be understood by the server.

In step 106, the client 5 provides the request for the media content item to the media server 16. The address of such a media server can either be

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preconfigured at the client, or can be found from a designated website, or from a discovery service. In one embodiment, the client contacts a proxy server (not shown in Figure 1) which functions as a load balancer. The load balancer can redirect this request to any number of media servers 16. In a preferred embodiment, the client employs a set of preconfigured DNS addresses for communicating with the proxy server. If the first preconfigured DNS address does not lead to a successful connection, the client 16 uses the next preconfigured DNS address.

The client 5 preferably issues a request to media server 16 by providing passing the VCID along with the client MAT. As described above the MAT identifies media attributes of the client, which may include playback format attributes, transport format attributes, and media content attributes, and may contain more than one alternative for each attribute.

XML listing 1, as shown below, provides an example of how such a request may be provided to media server 16 as an XML fragment. In the example below, 240x320 pixels is the preferred resolution; 64 is the preferred video bit-rate; 3gp and mp4 are the preferred video containers; h.263 and h.264 the two preferred video codecs; aac, amr-nb, amr-wb, mp3 are the preferred audio codecs; 32 is the preferred audio bit-rate; between 10 and 30 frames per second is the preferred frame-rate range; English is the preferred language; RTSP or HTTP is the preferred delivery protocol; and 60 seconds is the preferred clip size (explained later) when HTTP is the delivery protocol.

XML Listing 1: Example Request

```
<request>
```


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```
<vcid>
    <vid>http://www.company.com/videoid/
        34546KBK234.xml</vid>
    <off unit="sec">140</off>
    <len unit="sec">3600</len>
</vcid>
<mat>
    <screen>240x320</screen>
    <container>3gp,mp4</container>
    <videocodec>h.263, h.264</ videocodec>
    <videobitrate>64</videobitrate>
    <acodec>aac, amr-nb, amr-wb, mp3</acodec>
    <audiobitrate>32</audiobitrate>
    <framerate>10-30</framerate>
    <lang>en</lang>
    <delivery>rtsp</delivery>
    <delivery splitsec=60>http</delivery>
</mat>
</request>
```

In step 108, the media server 16 receives the request sent in step 106, and identifies whether a media segment file having media playback attributes common with the client media attributes is resident in its local cache. Such a case may occur when the server 16 has already responded to the request in the past (for example, the FQID = {VCID, MAT} combination is in its local

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