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Shteyn

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(54) **PARTITIONING OF MP3 CONTENT FILE FOR EMULATING STREAMING**

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This patent is subject to a terminal disclaimer.

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G06F 15/16 (2006.01)
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H04K 1/00 (2006.01)

(52) **U.S. Cl.** **709/217; 709/231; 709/203; 725/114; 705/50**

(58) **Field of Classification Search** **709/217-219, 709/231-234, 227; 725/90-100, 112; 345/718; 455/418**

See application file for complete search history.

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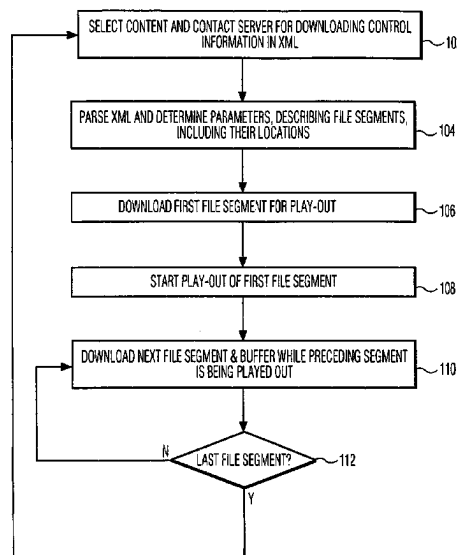
(Continued)

Primary Examiner—Wen-Tai Lin

(57) **ABSTRACT**

An electronic file, e.g., an MP3 file, is partitioned into a sequence of segments at the server side. The first segment is played out upon downloading. While the first segment is being played out, the second is being downloaded and buffered so that it is available when the play out of the first segment is completed. While playing out a current one of the segments, next one(s) of the segments are being downloaded and buffered. This partitioning and sequential play out enables to emulate streaming of a file and to minimize latency while downloading an electronic file.

16 Claims, 2 Drawing Sheets



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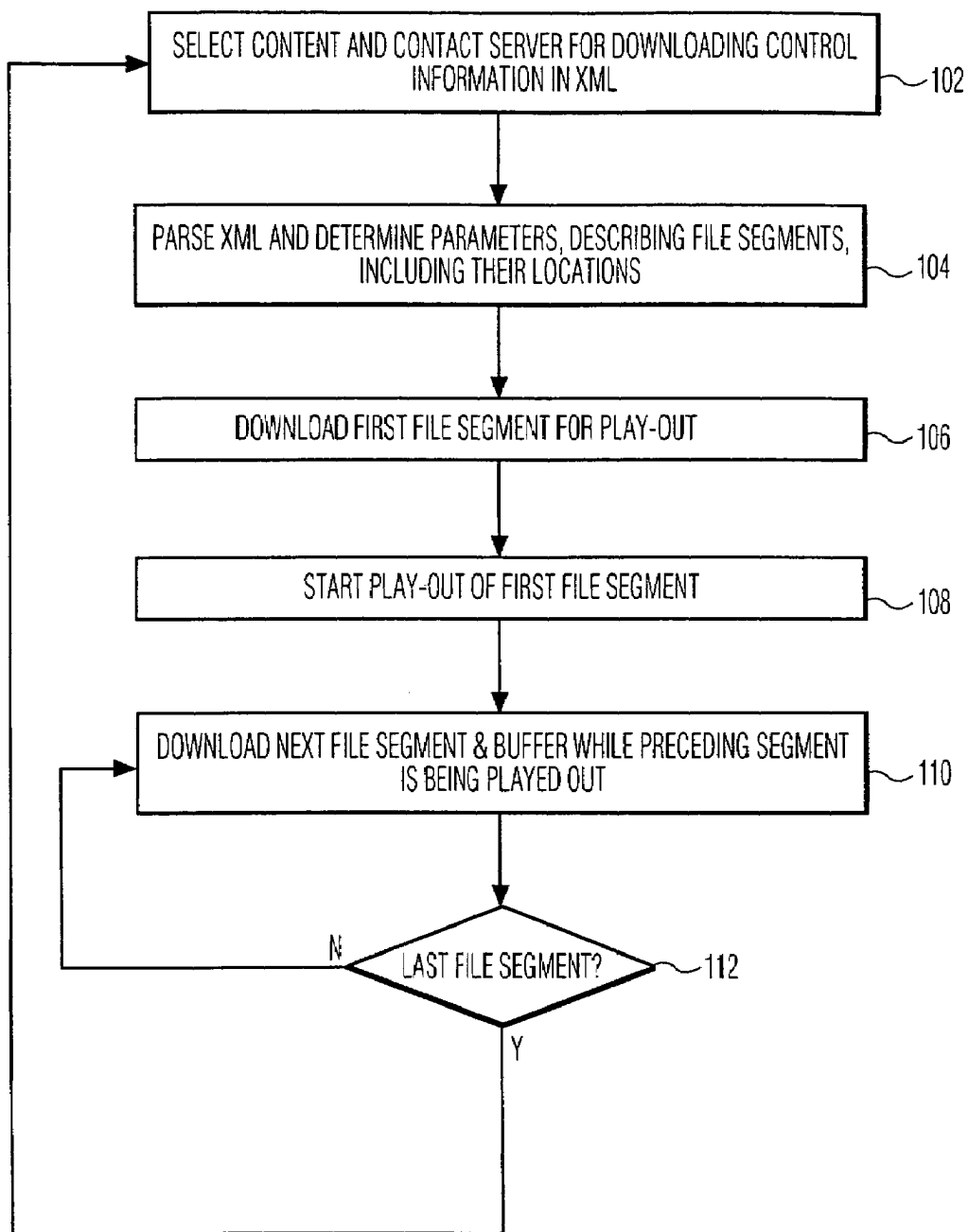


FIG. 1

```
<XML>
  <title>
    The best ever music
  </title>
  <artist>
    V.R. Famous
  </artist>
  <parts>                                     (Preferred format)
    <part1>
      <length> 1024 </length>
      <format> MP3 </format>
      <location> ftp://137.27.52.87 </location>
      <min_bandwidth> 10,000 </min_bandwidth>
    </part1>
                                     (Alternative format)
    </part1_alt>
      <length> 512 </length>
      <format> OTHER </format>
      <location> http:// yevgeniy.net/ ...._ </location>
      <min_bandwidth> 8,000 </min_bandwidth>
    </part_alt1>
  .....
</parts>
</XML>
```

FIG. 2

1

PARTITIONING OF MP3 CONTENT FILE FOR EMULATING STREAMING

FIELD OF THE INVENTION

The invention relates to content and/or control communications between multiple computer systems, or to such communications between computer systems and consumer devices. Specifically, the invention relates to communication constrained by bandwidth or limited by data processing resources available to the receiving system or device, especially if the communications are received by the user in real time. The type of communications can be, e.g., broadcast, multi-cast or point-to-point.

BACKGROUND ART

Consider current major technologies for delivering digital content, such as audio, video, etc. The streaming method for audio, e.g., RealAudio by RealNetworks, consists of playing-out audio at a client device, while constantly sending data from the server to the client. The technology provided by RealNetworks comprises an encoder, a server, a splitter/cache and a player system with two-way intelligence to resolve network congestion, lost packet conditions and negotiate complex internet protocols. More specifically, the known technology comprises an automatic, variable bit-rate encoding and delivery system for audio and video. The system scales to megabit connection rates and dynamically adjust the transmission rate as delivery rate varies due to network congestion. The format and the encoding/decoding methods of the data are proprietary. The server and the client synchronize receiving and playing in a way pre-defined by the particular architecture. The communication stack software is tightly coupled to the interpretation layer (application and user interface (UI)). Manufacturers of such technology promote high level of integration between client and server software, as a complete vertical solution. This approach mostly excludes third parties from developing custom server software (e.g., advertizing, services) and/or client applications (UI, special effects, etc.).

Another known method is downloading of a content file from a remote computer with subsequent play-out on the client. MP3 is a widely known audio data format used within the downloading context. There are other data formats, e.g., MP4 for video data etc. The major advantage of the above mentioned method is its open data standard approach. As long as the right format of the content file is observed during encoding, client and server software/hardware manufacturers are free to develop their own solutions/products.

A major problem with the complete download approach is the inherent latency: there is a delay between the beginning of the download and the start of the play-out. The larger the file and or smaller the communication bandwidth, the longer it takes to transfer the content from the server to the client. This is particularly undesirable in consumer electronics systems, where perceived delay is detrimental to market acceptance of an open architecture.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an open architecture solution for content delivery in a download approach that allows for a low or negligible play-out latency.

To this end the content file is split into multiple parts. Each

2

load time of the first part. The size of the individual part can be determined by the communications bandwidth, e.g., through pinging for a latency-check. The client device/application receives control information about the content. This control information comprises, for example, information relating to the size and memory location of the whole file as well as of its parts at the server. If the client is not capable of processing split data, it proceeds with the traditional approach, i.e., downloads the whole file and then plays it out. In case the client is capable of processing parts of the content, it uses the relevant control information about the parts in order to continue downloading data, while playing. Data play-out, also called "rendering", is computation-intensive, since it requires a plurality of decoding operations. Data download is bandwidth-intensive. Accordingly, simultaneous play-out and downloading do not significantly compete for the same system resources. This separation between downloading and processing can be efficiently used in a multi-process and/or multi-thread environment.

Preferably, the information contains references to the file location as well as references to the locations of the parts. The intended bandwidth information is associated with the parts. The client may make its own decisions regarding how many parts to download before the start of the play out (execution).

The parts can have different data formats. The format of some of the parts can be proprietary. Information about alternative content parts, regarding bandwidth, format, location access options, etc., can be provided. Content parts can physically reside on different servers. Content can be split into parts consistent within the semantics of the content, e.g., end of musical phrase, paragraph, target control device, etc. A third party may insert its own content parts in between the original content parts. The third party parts contain, for example, advertisements, commentary, customization options. The format of parts for play-out may be chosen according to user-related information, e.g., personal preferences, level of access to premium services, quality of the equipment, bandwidth sharing/fluctuation conditions, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in further detail and by way of example with reference to the accompanying drawing wherein:

FIG. 1 is a flow diagram illustrating the various steps in a method according to the invention; and

FIG. 2 gives an example of control code.

Throughout the Figures, same reference labels indicate similar or corresponding features.

PREFERRED EMBODIMENTS

The invention enables emulating the streaming of files while using a download approach. FIG. 1 illustrates a flow diagram 100 with various steps involved in the playing-out of a segmented file at the client.

In step 102, the client contacts the server selects the particular content file and downloads the control information that enables the retrieving and playing out of the segmented file. The control information describes the locations, e.g., URL's, and size of the various file segments, and provides, e.g., UI functionalities at the client. In this example, the control information is coded in XML.

In step 104 the XML code is parsed. Parsing of XML is well known in the art. A person skilled in the art can download XML information including segments from the Internet

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