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ISSUE CLASSIFICATION	
341	Class
50	Subclass

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APPLICATION NO.	CONT/PRIOR	CLASS	SUBCLASS	ART UNIT	EXAMINER
09/742294		341	50	~~2185~~ 2819	L. MAI

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TITLE
Distributed on-demand media transcoding system and method

PTO-2040
12/99

ISSUING CLASSIFICATION

ORIGINAL CLASS	ORIGINAL SUBCLASS	CROSS REFERENCE(S) CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
341	50	341	51	52	57	62	63	75
INTERNATIONAL CLASSIFICATION		348	470	192	469	434	466	384
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		370	355	278	282	477		
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5-23-02 Formal Drawings (8 shts) set 12-22-00

TERMINAL DISCLAIMER	DRAWINGS			CLAIMS ALLOWED	
	Sheets Drwg.	Figs. Drwg.	Print Fig.	Total Claims	Print Claim for O.G.
	8	8	2	47	1

		NOTICE OF ALLOWANCE MAILED
☐ The term of this patent subsequent to _____ (date) has been disclaimed.	Lam T. Mai (Assistant Examiner) 3/21/02 (Date)	3/26/02
☐ The term of this patent shall not extend beyond the expiration date of U.S Patent. No. _____	Michael J. Tokar Michael Tokar Supervisory Patent Examiner Technology Center 2800 (Primary Examiner) 3/25/02 (Date)	ISSUE FEE (W) Amount Due: 940 Date Paid: 4-25-02
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SERIAL NUMBER	FILING DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
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** CONTINUING DATA **********

N/A

** FOREIGN APPLICATIONS **********

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Foreign Priority claimed	35 USC 119 (a-d) conditions met	Verified and Acknowledged	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☒ no	☐ yes ☒ no ☐ Met after Allowance	Examiner's Signature / Initials	CA	8	47	12

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TITLE

Distributed on-demand media transcoding system and method

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR § 1.53(b))

Attorney Docket No.	*1968.0020000*
First Inventor	*Angela C. W. LAI*
Title	*Distributed On-Demand Media Transcoding System and Method*
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
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Washington, DC 20231

1. ☐ Fee Transmittal Form (*e.g.*, PTO/SB/17)
(Submit an original, and a duplicate for fee processing)

2. ☐ Applicant claims small entity status.
See 37 CFR 1.27.

3. ☒ Specification [Total Pages 56]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross Reference to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to sequence listing, a table, or a computer program listing appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings *(if filed)*
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 8]

5. Oath or Declaration [Total Pages 4]
   a. ☒ Newly executed (original or copy)
   b. ☐ Copy from a prior application (37 CFR 1.63(d))
   (for continuation/divisional with Box 17 completed)
      i. ☐ DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR §§ 1.63(d)(2) and 1.33(b).

6. ☐ Application Data Sheet. See 37 CFR 1.76.

7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)*

8. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
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ACCOMPANYING APPLICATION PARTS

9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney
(when there is an assignee)
11. ☐ English Translation Document *(if applicable)*
12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
15. ☐ Certified Copy of Priority Document(s)
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16. ☐ Request and Certification u under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. ☒ Other: Authorization under 37 C.F.R. § 1.136(a)(3)

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Prior application information: *Examiner* _____ *Group/Art Unit:* _____

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18. CORRESPONDENCE ADDRESS

☐ *Customer Number or Bar Code Label* *(Insert Customer No. or Attach bar code label here)* *or* ☒ *Correspondence address below*

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NAME (Print/Type)	Michael V. Messinger	*Registration No. (Attorney/Agent)*	37,575
SIGNATURE		*Date*	12/22/00

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR § 1.53(b))

Attorney Docket No.	*1968.0020000*
First Inventor	*Angela C. W. LAI*
Title	*Distributed On-Demand Media Transcoding System and Method*
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CITY	Washington	*STATE*	DC	*ZIP CODE*	20005-3934
COUNTRY	USA	*TELEPHONE*	(202) 371-2600	*FAX*	(202) 371-2540

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Distributed On-Demand Media Transcoding System and Method

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Background of the Invention

Field of the Invention

The present invention relates to a system and method for transcoding information. More specifically, the present invention relates to a system and method for transcoding media content.

Related Art

The rapid publication of media content has been sought throughout human history. Publishers strive to deliver media content faster to larger audiences. As used herein, the term "media content" refers to any information, including audio, video, data, ideas, images, story, sound, text, or other content, that is perceived by one or more human senses.

The digital representation of media content combined with computing and networking technologies now provide a powerful way to publish. According to this new mode of publishing, networking technology permits the delivery of digitized media content over a network to end user computers. Communication protocols define how the digitized media content is exchanged over the network. A media player runs on the end user computer to allow the user to play or otherwise experience the media content.

Digital representations of media content come in different types. These types are generally defined according to a series of publishing variables which can include, but are not limited to, the file format, bit rate, communication protocol(s), physical medium, compression algorithm, and/or digital rights management information associated with the media content. The type of digitized media content which is used will depend upon a number of factors, such as, the computing and/or networking technology used in the process of publishing and the nature of the content itself.

For example, many types of digitized media content are defined according to a file format. Common file formats include QUICK TIME, MPEG, AVI, MP3, REAL, WINDOWS MEDIA, H.263 video coding, and PALM-compatible formats. A format can define media content as a file or in a data stream. See, for example, the graphics file formats and other formats described by J. D. Murray and W. vanRyper, *The Encyclopedia of Graphics File Formats*, Second Edition (O'Reilly & Associates, Inc.: Sebastopol, CA), 1996, which is incorporated in its entirety herein by reference.

Digitized media content types can also be categorized according to the type of encoding or compression technique that is used to reduce the physical size of the media content, or according to the type of physical medium that supports the storage of the media content. Different kinds of physical medium are used in publishing media content, such as magnetic or optical storage devices, memory devices, and wireless mediums.

Digitized media content types may also be categorized by the type of communication protocol or protocols used to transmit the media content. In packet-switched networks such as the Internet, many layers of protocols are used. Such protocols can include network and transport protocols and application protocols. Network and transport protocols are in part responsible for delivering packets of digital data. Examples of network and transport protocols are Internet Protocol (IP), Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Real-Time Transport Protocol (RTP). Application protocols are

higher level protocols that run on top of the network and transport protocols. Among other things, application protocols provide services that support digital media publishing. Examples of application protocols used in World Wide Web technology are HyperText Transport Protocol (HTTP) and Real-Time Streaming Protocol (RTSP).

The emergence of a fast-growing number of media players has created a widening gap between the richness of the various types of media content and the diverse capabilities of the client devices to handle the content. As a result, the technology selection process for the end user has become quite complicated. For example, the user often cannot be certain that a given media player will be able to play the type of media content in which he or she is interested. Also, the user may be required to frequently download new media playing software in order to access desired content.

Furthermore, because users employ a wide variety of client media players, content providers are required to publish original media content in a number of source types in order to deliver the content to a large number of users. Content providers with archived media content also face a burden of having to publish archived media content into new or updated source types.

Transcoders convert certain types of media content (source type) to another type of media content (destination type). This conversion is known as "transcoding." Transcoding can involve a number of different conversion operations. The particular conversion operations used depend upon what publishing variables are being converted. For example, transcoding can involve a conversion operation from one encoded data format to another encoded data format (such as, converting CCITT Group 3 encoded data to RLE-encoded data.) See, Murray and vanRyper, p. 1095.

Conventional multi-type transcoding services are provided off-line, before the content provider publishes media content, adding an undesirable and unavoidable delay to the publishing process. Although arrangements for the real-time transcoding of media content are known, (e.g., transcoding and delivery of

live media events over the Internet), these arrangements are limited in that they only allow for media content to be transcoded into a single destination type, and do not permit for the delivery of media content in multiple destination types.

Also, because off-line multi-format transcoding services are expensive, content providers can only afford to have their media content transcoded into a limited number of destination types. Users with media players incapable of accommodating the destination type of the transcoded files simply cannot access the content. Accordingly, conventional media production is limited to a "push" process in which content providers are forced to speculate about which media player users will employ to play their media files.

As a further result of this rapid development in media publishing technology, new internet and wireless device manufacturers must also invest heavily in the transcoding of media content so that a variety of content can be experienced on new media playing devices as new destination types. Thus, new internet and wireless device manufacturers experience the same setbacks and disadvantages from conventional transcoding schemes as described above.

Summary of the Invention

The present invention is directed to a system and method for the on-demand transcoding of media content into from a plurality of source types to a plurality of destination types. In one embodiment, a method is provided for transcoding media content from a source type to a destination type, comprising the steps of receiving a transcoding request for the media content, fetching the media content, selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types based on the source type and the destination type, sending the media content to the selected transcoder, transcoding the media content from the source type to the destination type, thereby generating a transcoded media file, and transmitting the transcoded media content.

In embodiments of the present invention, the media content may comprise either a file of digital information or a stream of digital data. In embodiments of the present invention, the media content is fetched, sent and transcoded as a stream of digital data, the transcoded media file is transmitted as a stream of digital data, and the fetching, sending, transcoding and transmitting are all performed in a pipelined fashion.

In embodiments of the present invention, the transcoding request is received over the Internet and the transcoded media content is transmitted over the Internet.

In embodiments of the present invention, the media content type is defined according to at least one publishing variable, wherein the publishing variable may be the file format of the media content, the bit-rate of the media content, the compression algorithm according to which the media content is stored, the communication protocol according to which the media content is transferred, or the physical medium on which the media content is stored, and the step of transcoding the media content comprises converting the publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

A media transcoding system in accordance with the present invention transcodes media content from a source type to a destination type. The media transcoding system includes a network interface, a resource manager, a transmitting server, a streaming server, and a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types. The network interface is adapted to receive a transcoding request for the media content. The resource manager is adapted to respond to the transcoding request and, in response to the transcoding request, to command the transcoding server to fetch the media content, to select one of the plurality of transcoders based on the source type and the destination type, to command the selected transcoder to transcode the media content from the source type to the destination type, thereby

generating transcoded media content, and to command the streaming server to transmit the transcoded media content.

In embodiments of the present invention, the media content may comprise a file of digital information or a stream of digital data.

In embodiments of the present invention, the transmitting server is adapted to fetch the media content as a data stream, the selected transcoder is adapted to transcode the media content as a data stream, and the streaming server is adapted to transmit the transcoded media content as a data stream. The resource manager manages the operation of the transmitting server, the selected transcoder, and the streaming server so that the fetching, transcoding and transmitting occur in a pipelined fashion.

In embodiments of the present invention, the network interface is adapted to receive the transcoding request over the Internet and the streaming server is adapted to transmit the transcoded media content over the Internet.

In embodiments of the present invention, the media content type is defined according to at least one publishing variable, wherein the publishing variable may be the file format of the media content, the bit-rate of the media content, the compression algorithm according to which the media content is stored, the communication protocol according to which the media content is transferred, or the physical medium on which the media content is stored, and the selected transcoder is adapted to convert the publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

The invention is advantageous in that it permits the transcoding of media content on demand from a single source type to a variety of destination types in a manner that is transparent to the content provider and the user.

The invention is also advantageous in that it permits the transcoding of media content stored in files on demand from a single source type to a variety of destination types in a manner that is transparent to the content provider and the user.

Another advantage of the invention is that it permits the transcoding of live (i.e., streaming) media content on demand from a single source type to a variety of destination types in a manner that is transparent to the content provider and the user.

Another benefit of the invention is that it permits a user to play various types of media content regardless of the media player employed by the user.

Yet another benefit of the invention is that it obviates the need for a user to download a newer media player or upgrade an existing media player in order to access desired media content.

A further advantage of the invention is that it permits a content provider to provide original media content in a single source type to a large number of users using diverse media players that accept different media content types.

A further benefit of the invention is that it expedites the publishing process for media content providers by allowing them to publish media content without first employing off-line encoding services. The invention thus minimizes the time-to-market for the publication of media content.

Another benefit of the invention is that it creates a lower barrier of entry to media publication by permitting content providers to out-source necessary transcoding tasks and to avoid investment in transcoding servers and other equipment necessary for transcoding.

Yet another benefit of the invention is that it permits content providers to deliver media content to users with media players incapable of accommodating the source type of the original media content.

A further advantage of the invention is that it defers the transcoding of media content until the content is demanded by a user for a specific media player. Accordingly, content providers can avoid an unnecessary investment in the transcoding of original media content to types not requested by users.

Additional features and advantages of the invention will be set forth in the description that follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of

the invention will be realized and attained by the system and method particularly pointed out in the written description and claims hereof as well as the appended drawings.

Brief Description of the Figures

The accompanying drawings, which are incorporated herein and form a part of the specification, illustrate the present invention and, together with the description, further serve to explain the principles of the invention and to enable a person skilled in the pertinent art to make and use the invention.

In the drawings:

FIG. 1 is a block diagram of a media transcoding system according to one embodiment of the present invention.

FIG. 2 is a block diagram of an example media transcoding engine according to one embodiment of the present invention.

FIG. 3 is a flowchart that describes a routine for publishing media content according to an embodiment of the present invention.

FIG. 4 is a flowchart that describes a routine for publishing media content according to an embodiment of the present invention.

FIGs. 5A-5B are a flowchart that describes a routine for accessing media content according to an embodiment of the present invention.

FIG. 6 depicts an exemplary transcoder that may be used in accordance with embodiments of the present invention.

FIG. 7 is a table showing exemplary transcoding source types and destination types for various publishing variables according to an embodiment of the present invention.

The present invention will now be described with reference to the accompanying drawings. In the drawings, like reference numbers indicate identical or functionally similar elements. Additionally, the left-most digit(s) of a reference number identifies the drawing in which the reference number first appears.

Detailed Description of the Preferred Embodiments

Table of Contents

A. Overview of the Invention

The present invention is directed to a system and method for the on-demand transcoding of media information from a variety of source types into a

variety of destination types. According to the present invention, in a system comprising a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, a method is provided for transcoding media content from a source type to a destination type. The method includes receiving a transcoding request for the media content, fetching the media content, and sending the media content to a selected one of the plurality of transcoders. The transcoder is selected based on the source type and the destination type. The transcoder transcodes the media content from the source type to the destination type, thereby generating transcoded media content. The transcoded media content is then transmitted.

A media transcoding system in accordance with the present invention transcodes media content from a source type to a destination type. The transcoding system includes a network interface, a resource manager, a transmitting server, a streaming server, and a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types. The network interface receives a transcoding request for media content. The resource manager commands the transmitting server to fetch the media content. The resource manager further selects one of the plurality of transcoders based on the source type and destination type, and commands the selected transcoder to transcode the media content from the source type to the destination type to generate transcoded media content. The resource manager also commands the streaming server to transmit the transcoded media content.

The invention will now be further described with reference to FIGs. 1-7.

B. Operating Environment

FIG. 1 is a block diagram representing an example operating environment 100 of the transcoding system of the present invention. It should be understood that the example operating environment 100 is shown for illustrative purposes only and does not limit the invention. Other implementations of the operating

environment described herein will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein, and the invention is directed to such other implementations.

Referring to FIG. 1, example operating environment 100 includes a viewer client 102, a content provider client 104, a media transcoding engine 106, and a network 108. Only one viewer client 102 and content provider client 104 is shown for clarity. In general, any number of these components can be included in the transcoding system of the present invention.

The viewer client 102, the content provider client 104 and the media transcoding engine 106 are all connected via a network 108. The network 108 connects all the components of the present invention, and can be any type of computer network or combination of networks including, but not limited to, circuit switched and/or packet switched networks, as well as wireless networks. In one example, the network 108 includes the Internet.

Any conventional communication protocol can be used to support communication between the components of the transcoding system 100. For example, a Transmission Control Protocol/Internet Protocol (TCP/IP) suite can be used to establish links and transport data and Real-Time Streaming Protocol (RTSP) can be used to stream data between components of the transcoding system 100. A World Wide Web-based application layer and browser (and Web server) can also be used to further facilitate communication between the components shown in FIG. 1. However, these examples are illustrative. The present invention is not intended to be limited to a specific communication protocol or application, and other proprietary or non-proprietary network communication protocols and applications can be used.

The viewer client 102 is used by a user, or viewer, to request and receive media content via the network 108, and to play received media content. In embodiments, the viewer client 102 is a personal computer that includes a Web browser and one or more media players running under the computer operating system. Alternately, the viewer client 102 can be a WEBTV, a WINDOWS CE

device, a Personal Digital Assistant (PDA), a PALM handheld device, a console appliance with network access capability, an MP3 appliance, or any other client device and/or program capable of requesting, receiving and playing media content. However, the invention is not limited to these examples, and one skilled in the art will appreciate that a wide variety of client devices and programs can be used to request, receive and play media content via the network 108. The invention is directed to such other client devices and programs.

The viewer client 102 is capable of receiving and playing various types of media content. For example, the viewer client may receive and play media content in various well-known encoded formats including, but not limited to, MPEG, AVI, MP3, REAL, WINDOWS MEDIA, QUICK TIME, H.263 video coding, and PALM-compatible formats.

The content provider client 104 is used by the content provider to publish and/or transmit media content over the network 108. In embodiments, the content provider client 104 includes a client workstation and media input device and/or program. For example, the content provider client 104 may comprise a personal computer with an attached media input device. The content provider client 104 can provide media content using a variety of media input devices and programs. For example, media content can be provided using cameras (8mm, Hi-8, or any video digitizing device), line-in/microphone (either attached to any of the camera devices, or stand-alone audio input devices), digital cameras, devices that upload slide shows with voice-over illustrations, files previously encoded in a client-chosen format, or files available via a network accessible mount point (such as, but not limited to, Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), or remote servers). These examples are not limiting, and one skilled in the art will appreciate that a wide variety of client devices and programs can be used to publish and/or transmit media content via the network 108, and that the invention is directed to such client devices and programs.

The content provider client 104 is capable of publishing and/or transmitting various types of media content. For example, the content provider client 104 can

provide multimedia files in various well-known encoded formats including, but not limited to, MPEG, AVI, MP3, REAL, WINDOWS MEDIA, QUICK TIME, H.263 video coding, and PALM-compatible formats.

The media transcoding engine 106 acts as an intermediate between the content provider client 104 and the viewer client 102. As will be described in more detail below, the media transcoding engine 106 receives requests for media content from the viewer client 102 and obtains the requested media content from the content provider client 104. The media transcoding engine 106 then transcodes the media content received from the content provider client 104 from a source type to a destination type that can be accommodated by the viewer client 102 and delivers the transcoded media content to the viewer client 102. The media transcoding engine 106 performs the transcoding and delivery of the requested media content on-demand in a manner that is transparent to the content provider as well as the viewer of the media content.

In accordance with the present invention, because the media transcoding engine 106 can transcode media content into a variety of destination types, the content provider can provide media content using a single media input device and still deliver the content to viewers using a variety of different media players, each of which requires a different destination type. Additionally, the present invention permits users to access a variety of media content published in different source types no matter what media player they are using. The media transcoding engine 106 of FIG. 1 will now be described in more detail.

C. Media Transcoding Engine of the Present Invention

FIG. 2 is a block diagram of the media transcoding engine 106 according to an embodiment of the present invention. The media transcoding engine 106 is comprised of a number of components including a viewer Web server interface 202, a content provider Web server interface 204, a task manager 206, a resource manager 208, a database 210, a transcoded cache 212, a master archive 214, a

machine farm 216, and, within the machine farm 216, transcoder servers 218, transmitter servers 220, and streaming servers 222. The components of the media transcoding engine 106 are each operably connected to each other by an internal computer network represented, in part, by the arrows connecting the components in FIG. 2. The computer network can include one or more computer buses for connecting components co-existing on the same server, as well as any other type of communication infrastructure for connecting remote components including, but not limited to, circuit switched and/or packet switched networks, as well as wireless networks. In embodiments, the network connecting the components within the media transcoding engine 106 includes a local area network (LAN).

Each of the components of the media transcoding engine 106 will now be described.

The content provider Web server interface 204 is a network interface between the media transcoding engine 106 and the content provider client 104 that permits a content provider to publish media content. The content provider Web server interface 204 receives and processes a request to publish media content from the content provider client 104. In embodiments, the content provider Web server interface 204 also receives the media content itself from the content provider client 104 for archival purposes within the media transcoding engine 106. Alternately, the content provider Web server interface 204 receives location and access information from the content provider client 104, which permits the media transcoding engine 106 to locate and fetch the media content at a later time for transcoding and/or delivery of the media content to a viewer.

In embodiments, the content provider can download a software tool or "plug-in" from the content provider Web server interface 204 that facilitates the delivery of media content from the content provider client 104 to the content provider Web server interface 204. The tool provides a configurable interface that resides on the content provider client 104 and permits the content provider to upload various types of media content to the content provider Web server interface 204.

After it receives the media content, or, alternately, the necessary location and access information for fetching the media content, the content provider Web server interface 204 returns address and source information to the content provider client 104. The address information points viewers who request the content provider's media content to the media transcoding engine 106 and the source information provides information concerning the source of the requested media content. As shown in FIG. 2, in embodiments of the present invention, the address and source information comprise a URL (Uniform Resource Locator) that points the viewer client to the media transcoding engine 106 and provides information to the media transcoding engine 106 about the source of the requested media content. Content providers can post the URL as a link on their Web-site, thereby allowing viewers who visit their Web-site to click on the URL in order to access the media content via the media transcoding engine 106.

The viewer Web server interface 202 is a network interface between the media transcoding engine 106 and the viewer client 102 that permits media content to be requested by and delivered to a viewer. The viewer Web server interface 202 receives and processes a request to access media content from the viewer client 102, thereby initiating the transcoding and delivery of the requested media content to the viewer client 102. Because transcoded media content is streamed to the viewer client 102 by a streaming server and/or proxy server as will be discussed in more detail herein, the viewer Web server interface 202 sends a reply to the viewer client 102 redirecting the viewer client 102 to the appropriate server from which to receive the requested media content.

The media transcoding engine 106 is adapted to deliver requested media content to the viewer client 102 in an optimal destination type. The optimal destination type for the viewer client 102 may be determined in a number of ways.

In embodiments, the viewer can download a software tool or "plug-in" from the viewer Web server interface 202 that facilitates the delivery of media content from the media transcoding engine 106 to the viewer client 102. The tool is a program that runs on the viewer client 102 and assists in determining the

optimal destination type for the viewer client 102 to receive and play media content. In embodiments, the optimal destination type may be determined either by automatic tests run on the viewer client 102, or by requiring the viewer to provide system and preference information explicitly. The optimal destination type may then be stored by the software tool as a "cookie" on the viewer client 102 for future reference by the media transcoding engine 106.\

Alternatively, the optimal destination type may be stored in a database within the media transcoding engine 106, and a "cookie" may be stored on the viewer client 102 that simply identifies the user. Then, when the media transcoding engine 106 is required to transcode media content for delivery the viewer client 102, it may read the cookie and map the identification of the user to the database to obtain the optimal destination type.

In further embodiments, the optimal configuration can be made adjustable for more sophisticated users, or may be updated periodically in case of network condition changes between the viewer client 102 and the network 108 (e.g., change of Internet Service Provider, or change of connection speed).

As described above, the content provider Web server interface 204 and the viewer Web server interface 202 each comprise network interfaces. In embodiments, the content provider Web server interface 204 and the viewer Web server interface 202 each comprise a Web server. In alternate embodiments, the content provider Web server interface 204 and the viewer Web server interface 202 each comprise a load-balancer that redirects requests to other physical Web servers (in other words, they are virtual Web servers).

The task manager 206 is a component of the media transcoding engine 106 that processes requests for media content received from the viewer Web server interface 202. The task manager determines whether the media transcoding engine 106 has all the information necessary to deliver the requested media content, gathers any missing information, and determines what tasks need to be executed to deliver the requested media content. The task manager then interacts with the resource manager 208 to execute the required tasks.

The resource manager 208 is a program that determines what resources are available within the media transcoding engine 106 to carry out the tasks necessary to deliver the requested media content (e.g., fetching and transcoding the requested media content), allocates the necessary tasks to the appropriate resources, and then manages the tasks to completion. In a sense, the resource manager 208 works like a traditional load balancer. However, whereas a traditional load balancer operates by managing a virtual machine consisting of a set of machines that perform separate and identical tasks, the resource manager distributes tasks that are often different and interdependent. The process by which the resource manager 208 distributes tasks and allocates resources will be described in more detail below.

Although FIG. 2 shows only one resource manager 208, it will be understood by one of ordinary skill in the relevant art(s) that alternate embodiments of the media transcoding engine 106 can include more than one resource manager for allocating tasks and resources within the media transcoding engine 106.

In embodiments, the task manager 206 and the resource manager 208 may be implemented as software running on one or more general purpose server(s) within the media transcoding engine 106.

The machine farm 216 includes a plurality of individual servers for performing the transcoding and delivery of requested media content within the media transcoding engine 106. The machine farm 216 includes transmitter servers 220 that fetch the source data for the requested media content, transcoder servers 218 that transcode the source data to the appropriate destination type, and streaming servers 222 that stream the transcoded media content to the viewer client 102 or to a proxy server for delivery to the viewer client 102.

The transmitter servers 220 run transmitter software that permits them to fetch the requested media content from a source location and transmit it to one of the transcoder servers 218, streaming servers 222, or a proxy server (not shown).

The transcoder servers 218 run transcoder software that permit them to transcode from a variety of known source types to a variety of known destination types. In embodiments, the machine farm 216 is implemented utilizing a plug-in architecture that permits new transcoding services to be added incrementally, thereby ensuring that the media transcoding engine 106 can accommodate new media types.

In alternate embodiments of the present invention, a single server may perform both the transmitter and transcoder functions. In further alternate embodiments, the transmitting of requested media content may be carried out by software external to the media transcoding engine 106. For example, the transmitting of requested media content may be executed by software residing on the content provider client 104.

In embodiments, each streaming server within the machine farm 216 is a type-specific streaming server dedicated to the delivery of media content of a single type. For example, a streaming server within the machine farm 216 may be dedicated to delivering transcoded media content in REAL format, WINDOWS MEDIA format, QUICK TIME format, etc. The streaming servers 222 within the machine farm may run off-the-shelf industry-standard streaming server programs, streaming server programs that are implemented according to a public standard, or proprietary streaming server programs.

In addition to streaming media content to the viewer client 102, the streaming servers 222 keep usage statistics pertaining to the media content being delivered as well as the destination types in which the media content is being delivered. The streaming servers 222 provide the usage statistics to the resource manager 208, thereby permitting the resource manager 208 to perform cache management functions within the media transcoding engine 106. For example, such usage statistics permit the resource manager 208 to cache the most frequently requested transcoded media content in the most frequently requested destination types. The caching of transcoded media content will be further described in regard to the transcoded cache 212, below.

In alternate embodiments, the tracking of usage statistics is carried out by an optional proxy server (not shown) that channels streaming media content from the streaming servers 222 to the viewer client 102. Such an implementation may be desired where the streaming servers 222 are not capable of tracking usage statistics.

As shown in FIG. 2, each server within the machine farm 216 includes a slave monitor that serves as an interface between the server and the resource manager 208. The slave monitor operates to receive tasks from the resource manager 208, to initialize the tasks within the server, and to report the status of initialized tasks, including the reporting of the failure or completion of an assigned task. By reporting the status of each task within a server, the slave monitor thereby permits the resource manager 208 to manage the execution of all the tasks within the media transcoding engine 106.

In an alternate embodiment, the slave monitor only initiates tasks received from the resource manager 208, and the tasks themselves report directly to the resource manager 208 rather than to the slave monitor.

The database 210 is used by the resource manager 208 to assist in managing tasks and resources within the media transcoding engine 106. The database 210 stores information concerning the status of each active and pending task as well as information concerning the status of each resource within the machine farm 216, thereby aiding the resource manager 208 in determining which resources are currently available to the resource manager 208 for executing necessary tasks.

The database 210 is also used by the task manager 206 to keep track of published media content archived within the media transcoding engine 106. The database 210 maintains source information about such published media content including the identity, source location, and source type of the media content, when available.

The database 210 can be implemented using any type of database structure known in the art for storing data, including, but not limited to, relational

databases, object-oriented databases, flat-file databases or inverted-list databases. In embodiments, the database 210 can be stored on one or more general purpose servers, file servers, or network attached storage appliances internal to the media transcoding engine 106.

The master archive 214 is an archive within the media transcoding engine 106 that stores the original media content published by the content provider and received by the content provider Web server interface 204 from the content provider client 104. Also, where the media transcoding engine 106 is required to fetch original media content from a location outside the media transcoding engine 106, the media transcoding engine 106 can cache a copy of the original media content in the master archive 214. By caching a copy of the original media content in the master archive 214, the media transcoding engine 106 avoids having to fetch the original media content from outside the internal network of the engine when a subsequent request for the same media content is received.

The transcoded cache 212 is a cache within media transcoding engine 106. The transcoded cache 212 is used by the media transcoding engine 106 to store a copy of requested media content after it has been transcoded. When subsequent requests are received for the same media content in the same destination type, the media transcoding engine 106 delivers the content from the transcoded cache, thereby avoiding the expensive CPU overhead of repeatedly transcoding the same media content.

The resource manager 208 keeps track of what is cached within the master archive 214 and the transcoded cache 212 and manages the utilization of each cache using intelligent algorithms. In embodiments, the intelligent algorithm used by the resource manager 208 to manage the utilization of each cache is based on usage statistics received from the streaming servers 222 and/or optional proxy servers (not shown), as discussed above, regarding the frequency with which media content is requested in various destination types. For example, in embodiments, the resource manager 208 uses a Least-Recently-Used algorithm to determine whether a certain copy of media content should be retained within

a cache or discarded. According to a Least-Recently-Used algorithm, a copy of media content is discarded if it has not met a predetermined threshold for a number of accesses in a given time. This example is not limiting and one skilled in the relevant art(s) will appreciate that any number of intelligent algorithms known in the art may be used to manage the utilization of the master archive 214 and the transcoded cache 212. Such intelligent algorithms are within the scope and spirit of the present invention.

In embodiments, the master archive 214 and/or the transcoded cache 212 are implemented as one or more network attached storage appliances coupled to the internal network within the media transcoding engine 106. However, the invention is not so limited, and any suitable storage device may be used to implement the master archive 214 and/or the transcoded cache 212, including but not limited to, general-purpose servers running caching software, file servers, one or more disk arrays, or a storage area network (SAN).

The methods by which media content is published and accessed according to embodiments of the present invention will now be described.

D. Publishing of Media Content According to Embodiments of the Present Invention

In embodiments of the present invention, media content may be published either as an encoded file or delivered as a continuous stream of data, as in the case of a live audio or video feed.

FIG. 3 depicts a flowchart 300 of a method by which media content is published according to embodiments of the present invention wherein the media content is an encoded media file. The invention, however, is not limited to the description provided by the flowchart 300. Rather, it will be apparent to persons skilled in the art from the teachings herein that other functional flows are within the scope and spirit of the present invention.

In step 302, the content provider sends a request to publish content from the content provider client 104 to the content provider Web server interface 204. In embodiments, the request comprises an HTTP request.

In step 304, the content provider Web Server interface 204 sends a prompt to the content provider client 104 asking for the media content itself or the necessary location and access information to fetch the media content. As discussed above, according to embodiments of the present invention, the content provider can either archive media content within the media transcoding engine 106, or can store media content in an alternate location outside of the media transcoding engine 106, such as on the content provider's own server.

As shown in step 306, where the content provider wishes to store the encoded media file in an archive within the media transcoding engine 106, the content provider delivers the media file to the content provider Web server interface 204 via the content provider client 104. At step 308, after the content provider Web server interface 204 receives the encoded media file, it transmits the file to the master archive 214 for archival within the media transcoding engine 106. From the master archive 214, the encoded file is available to the resource manager 208 and other components of the media transcoding engine 106. At step 310, the identity and location of the archived file is reported by the content provider Web-Server interface 204 to the task manager 206, which stores the information within the database 210 for future reference. In embodiments, the source type of the archived file is also stored within the database 210 for future reference.

As shown in step 312, where the content provider wishes to store the encoded media file in an alternate location outside of the media transcoding engine 106, the content provider provides the location and access information necessary to fetch the encoded media file to the content provider Web server interface 204 via the content provider client 104.

At step 316, after receiving either the encoded media file or the location and access information necessary to fetch the encoded media file, the content

provider Web server interface 204 provides the content provider client 104 with address and source information. The address information points viewers who request the content provider's media content to the media transcoding engine 106 and the source information provides information concerning the source of the requested media content. Where the encoded media file is stored in an alternate location outside of the media transcoding engine 106, the source information includes the location and access information provided by the content provider in earlier step 312.

In embodiments, the address and source information comprises a URL (Uniform Resource Locator) that points the viewer client 102 to the media transcoding engine 106 and provides information to the media transcoding engine 106 about the source of the requested media content. Content providers can post the URL as a link on their web-site, thereby allowing viewers who visit their web-site to click on the URL in order to access the media content via the media transcoding engine 106.

After step 316, the flowchart 300 ends.

FIG. 4 depicts a flowchart 400 of a method by which media content is published according to embodiments of the present invention wherein the media content is delivered as a continuous stream of data, as in the case of a live audio or video feed. The invention, however, is not limited to the description provided by the flowchart 400. Rather, it will be apparent to persons skilled in the art from the teachings herein that other functional flows are within the scope and spirit of the present invention.

In step 402, the content provider sends a request to publish streaming media content from the content provider client 104 to the content provider Web server interface 204. In embodiments, the request comprises an HTTP request.

In step 404, the content provider Web Server interface 204 sends a prompt to the content provider client 104 asking for the streaming media content.

As shown in step 406, the content provider continuously streams the media content to the content provider Web server interface 204 via the content provider client 104.

At step 410, after receiving the streaming media content, the content provider Web server interface 204 provides the content provider client 104 with address and source information. The address information points viewers who request the content provider's media content to the media transcoding engine 106 and the source information provides information concerning the source of the requested media content. In embodiments, the address and source information comprises a URL (Uniform Resource Locator) that points the viewer client 102 to the media transcoding engine 106 and provides information to the media transcoding engine 106 about the source of the requested media content. Content providers can post the URL as a link on their web-site, thereby allowing viewers who visit their web-site to click on the URL in order to access the media content via the media transcoding engine 106.

After step 410, the flowchart 400 ends.

Methods by which published media content is accessed by a viewer according to embodiments of the present invention will now be described.

E. Accessing Media Content According to Embodiments of the Present Invention

As described herein, embodiments of the present invention perform the transcoding of media content on demand, in response to a viewer's request to access media content. Additionally, embodiments of the present invention essentially perform the transcoding of media content in "real-time" after the publication of the media content, as part of the media content delivery process. In particular embodiments of the present invention, the delay between the submission of a request to view media content to the media transcoding engine 106 and the delivery of the media content to the viewer client 102 will be approximately thirty seconds or less. However, the invention is not limited to a

specific delivery time and can encompass a variety of delivery times greater than or less than thirty seconds.

FIG. 5 depicts a flowchart 500 of a method by which media content is accessed by a viewer according to embodiments of the present invention. The invention, however, is not limited to the description provided by the flowchart 500. Rather, it will be apparent to persons skilled in the art from the teachings herein that other functional flows are within the scope and the spirit of the present invention.

In step 502, the viewer sends a request to access media content via the viewer client 102 to the viewer Web server interface 202 within the media transcoding engine 106. In embodiments, the request is an HTTP request generated by the viewer client 102 when the viewer clicks on a URL on the content provider's web-site. As discussed above, the URL link, which may be provided by the media transcoding engine 106 to the content provider during the media content publishing process, contains address information and source information that points the viewer client 102 to the media transcoding engine 106 and provides information to the media transcoding engine 106 about the source of the requested media content.

After the viewer Web server interface 202 receives the request, it forwards it to the task manager 206.

In step 504, the task manager 206 parses the request to determine if the necessary request information is included in order to service the request. In embodiments of the invention where the request comprises an HTTP request, the task manager 206 parses the header of the HTTP request to determine if the necessary information is included in order to service the request. In embodiments, the necessary information includes at least a source location, a source type, a destination location, and a destination type. The source type and destination type are each defined by at least one publishing variable. In embodiments, publishing variables for media content can include, but are not limited to, the file format, bit rate, communication protocol(s), physical medium, compression algorithm, digital

rights management information, or any combination thereof. In one embodiment, the information required for servicing the request includes at least a source location, a source format, a source bit-rate, a destination location, a destination format, and a destination bit rate.

If the task manager 206 determines that the request information is not complete, the task manager 206 will fetch the necessary information as shown in steps 506 and 508. For example, if the source type or source location is not included in the request and the requested media content is stored within the media transcoding engine 106, the task manager 206 can consult the database 210 to find the necessary source information. Alternately, if the media content is stored externally with respect to the media transcoding engine 106, the task manager 206 can perform a network request to fetch the necessary information from the content provider's web-site. For example, the task manager 206 can perform an HTTP request, an RTSP request, or a request using any other standard network application protocol. Additionally, if the destination type is not available, the task manager 206 can fetch the needed information by querying the viewer client 102. As discussed above, in embodiments, the optimal destination type for the destination location may be stored as a "cookie" on the viewer client 102, which may be accessed by the task manager 206.

At step 510, once the task manager 206 has the necessary information to service the request, it then determines what tasks need to be executed in order to deliver the requested media content. The tasks include all the steps necessary to deliver the requested media content, and may include fetching the requested media content, transcoding the requested media content from the source type into the destination type, and streaming the transcoded media content to the viewer client 102. Once the task manager 206 has determined what tasks need to be executed, it then interfaces with the resource manager 208 and instructs the resource manager 208 to execute the required tasks.

The resource manager 208 receives the instruction to execute the required tasks from the task manager 206 and, at step 512, assigns each task to one or

more machines within the machine farm 216. The resource manager 208 is programmed to achieve an efficient execution of tasks by the available resources. In embodiments, the allocation of resources to a given task by the resource manager 208 is determined based on a variety of factors including, but not limited to, which machines support the necessary utilities for performing the required task, which machines have available resources (for example, available CPU), and which machines can coordinate with each other to carry out the task when coordination is required for execution. The resource manager 208 can also be programmed to distribute tasks based on a variety of other criteria including the avoidance of network congestion. For example, the resource manager 208 may be programmed to assign decompression and compression tasks to the same machine in order to avoid the network congestion that may result from transmitting uncompressed data from one machine to another within the internal network of the media transcoding engine 106.

In accordance with the present invention, the resource manager 208 oversees tasks after they are assigned to make sure that they are properly executed. The resource manager 208 oversees the execution of assigned tasks by maintaining a list of all assigned tasks in the database 210 and periodically communicating with the slave monitor of each machine running a given task in order to determine the status of the task.

In embodiments, the resource manager 208 periodically polls the slave monitor of the machine to which the task has been assigned to determine the status of the task. In alternate embodiments, the slave monitor itself sends periodic status messages to the resource manager 208, informing it of the status of an assigned task. The resource manager 208 stores information that it receives from the slave monitors about the status of each task and each machine in the database in order to assist in its function of assigning and monitoring necessary tasks.

In an alternate embodiment of the present invention, the slave monitors only initiate tasks received from the resource manager 208, and the tasks

themselves report directly to the resource manager 208 rather than to the slave monitors.

The resource manager 208 monitors each assigned task in accordance with a fault tolerance routine that permits the resource manager 208 to determine when a task has failed and to execute the necessary steps for correcting the problem and ensuring the delivery of the requested media content. For example, if a machine to which a task has been assigned does not respond to a status query for a predetermined period of time, the resource manager 208 can be programmed to reassign the task to a different machine and re-boot the machine that is not responding. Additionally, where the failure of a task also results in the failure of a chain of distributed dependent tasks, the resource manager 208 can be programmed to shut down all the dependent tasks and re-assign the entire set of tasks in order to ensure the delivery of the requested media content. These examples are not limiting, and other fault tolerance schemes will be apparent to one of ordinary skill in the relevant art based on the teachings contained herein, and the invention is directed to such other fault tolerance schemes.

In a further embodiment of the present invention, individual tasks are each assigned a priority. The resource manager 208 monitors new tasks and when the priority of an existing task is lower than that of a new task that needs to be assigned, the resource manager 208 will instruct the existing task to kill itself to accommodate the new higher-priority task. Alternately, the slave monitor can kill the existing task. An example of a low priority task includes the transcoding of media content for a viewer after the viewer has stopped viewing the requested content.

At step 514, after all the tasks have been assigned, the task manager 206 constructs a reply to the initial request to access media content received from the viewer client 102. The reply serves to redirect the viewer client 102 to a streaming server or proxy server from which the requested media content will ultimately be received by the viewer client 102. In embodiments, the reply comprises an HTTP reply.

At steps 516-526, the machines within the machine farm 216 perform the steps necessary to deliver the requested media content in accordance with the assigned tasks received from the resource manager 208. In embodiments of the present invention, the delivery of media content is a pipelined process in which the fetching, transcoding and streaming of different portions of the same media content stream may occur simultaneously. The resource manager 208 arranges for the pipelining of these steps through resource allocation within the media transcoding engine 106. The pipelining of these steps results in a faster delivery time for requested media by the media transcoding engine 106.

As shown at step 516, if the requested media content already resides in the transcoded cache 212 transcoded into the appropriate destination type (e.g., the appropriate destination format and bit-rate or other appropriate publishing variables), then the delivery of content is achieved by the streaming servers 222 at step 524, which stream the transcoded media content to the viewer client 102 as described below.

If, however, the requested media content does not reside in the transcoded cache 212 transcoded into the appropriate destination type, then one of the transmitter servers 220 within the machine farm 216 begins fetching the requested media content as a data stream from the source location as shown at step 518. As discussed above in regard to FIGs. 3 and 4, in embodiments of the invention, the requested media content can initially either reside within the master archive 214 within the media transcoding engine 106, in an archive external to the media transcoding engine 106, or be received as a streaming feed directly from the content provider client 104.

Where the requested media content resides within the master archive 214, one of the transmitter servers 220 fetches the requested media content over the internal network of the media transcoding engine 106.

Where the requested media content resides in an archive outside of the media transcoding engine 106, one of the transmitter servers 220 uses the access information provided during the publishing process to fetch the requested media

content. In embodiments, after the transmitter server uses the access information to fetch the requested media content, the requested media content may be temporarily cached in the master archive 214, permitting expedited access to the media content when subsequent requests for the same media content are received by the media transcoding engine 106.

Where the requested media content is a streaming feed directly from the content provider client 104, one of the transmitter servers 220 fetches the streaming data from the content provider Web server interface 204. Because embodiments of the present invention do not fetch and transcode the streaming data until it is actually requested by a viewer, unnecessary transcoding of media content is thereby avoided.

As shown in step 520, after the transmitter server begins fetching the requested media content, if the source type is the same as the destination type (e.g., the source format and bit rate is the same as the destination format and bit-rate), then no transcoding is necessary and the media content is transmitted to the streaming servers 222 as soon it is fetched. The streaming servers 222 then stream the content to the viewer client 102 at step 524, as described below. However, if the source type is not the same as the destination type, then one of the transcoding servers 218 within the machine farm 216 will transcode the media content from the source type to the destination type as shown in step 522. In accordance with the discussion in regard to step 512, above, the resource manager 208 assigns the transcoding task to a transcoder server that runs the necessary transcoder software for performing the appropriate conversion of publishing variables. In embodiments, the transcoding is carried out using one of a variety of well-known methods and for converting media content of one type to another, including conventional codec routines for transcoding media content. Further description of transcoding operation and examples are provided below.

In embodiments, after the transcoding is complete, a copy of the transcoded media content is temporarily stored in the transcoded cache 212, permitting expedited delivery of the media content when subsequent requests for

the same media content transcoded into the same destination type are received by the media transcoding engine 106.

In step 524, one of the streaming servers 222 streams the media content in the appropriate destination type to the viewer client 102 as soon as it is received from either a transcoder, a transmitter or the transcoded cache 212. In embodiments, the transcoded media content is streamed to the viewer client 102 via an optional proxy server, as discussed above in regard to FIG. 2. In further embodiments, either the streaming server or the optional proxy server keep usage statistics pertaining to the media content being delivered as well as the destination types in which the media content is being delivered that are used by the resource manager 208 for cache management purposes.

In embodiments, the protocol used for streaming media to the viewer client and for streaming data between the transmitter servers 220, transcoder servers 218 and the streaming servers 222 is a standard protocol for streaming media, such as RTSP. Alternately, a proprietary protocol defined over standard network protocols like TCP/UDP can be used. In further embodiments, different protocols may be used to accommodate different network infrastructure needs. For example, protocols may be implemented that dynamically change according to network traffic conditions. However, these examples are illustrative. The present invention is not intended to be limited to a specific communication protocol or application, and other proprietary or non-proprietary network communication protocols and applications can be used.

At step 526, the viewer client 102 receives the streaming media content from either the streaming server or the proxy server. At this point, the viewer client 102 plays the media content in accordance with the destination type associated with the media player resident on the viewer client 102. In alternate embodiments of the present invention, the media content may be received and stored as a downloaded file on the viewer client 102 for playing at a later time, or for transfer to an alternate media playing device.

After step 526, the flowchart 500 ends.

F. Further Transcoder Operation and Media Content Examples

As described above, media transcoding engine 106 includes one or more transcoders 218. Transcoders 218 convert certain types of media content (referred to herein as a source type) to another type of media content (referred to herein as a destination type). Transcoding can involve a number of different conversion operations. The particular conversion operations used depend upon the media content and associated publishing variables being converted. Publishing variables as used herein refers to different characteristics of media content.

According to the present invention, media content is digital data being published over a network. In this case, publication refers to digital data which has been formatted for delivery over a network and for viewing by a destination media player. Publishing variables for media content can include, but are not limited to, the file format, bit rate, communication protocol(s), physical medium, compression algorithm, and/or digital rights management information.

The digital data can be any type of file format including but not limited to container formats, bitmap formats, video formats, audio formats, vector formats, metafile formats, scene formats, animation formats, multimedia formats, hybrid formats, hypertext and hypermedia formats, three-dimensional data (3D) formats, virtual reality modeling language (VRML) formats, font formats (bitmap fonts, stroke fonts, spline-based outline fonts), page description language (PDL) formats, and any other type of graphics file format or other file format. Table 1 lists examples of such file formats that can be used in embodiments of the present invention:

Table 1
Example File Formats

Format	Type
ADOBE ILLUSTRATOR	Metafile
ADOBE PHOTOSHOP	Bitmap

Table 1 Example File Formats	
ATARI ST GRAPHICS FORMATS	Bitmap and Animation
AUTOCAD DXF	Vector
AUTODESK 3D STUDIO	Scene Description
BDF	Bitmap
BRL-CAD	Other
BUFR	Other
CALS RASTER	Bitmap
CGM	Metafile
CMU FORMATS	Multimedia
DKB	Scene Description
DORE RASTER FILE FORMAT	Bitmap
DPX	Bitmap
DR. HALO	Bitmap
DVM MOVIE	Animation
ENCAPSULATED POSTSCRIPT	Metafile (page description language)
FACESAVER	Bitmap
FAX FORMATS	Bitmap
FITS	Other
FLI	Animation
GEM RASTER	Bitmap
GEM VDI	Metafile
GIF	Bitmap
GRASP	Animation
GRIB	Other
HARVARD GRAPHICS	Metafile
HIERARCHICAL DATA FORMAT	Metafile

Table 1 Example File Formats	
IFF	Bitmap
IGES	Other
INSET PIX	Bitmap
INTEL DVI	Multimedia
JPEG FILE INTERCHANGE FORMAT	Bitmap
KODAK PHOTO CD	Bitmap
KODAK YCC	Bitmap
LOTUS DIF	Vector
LOTUS PIC	Vector
LUMENA PAINT	Bitmap
MACINTOSH PAINT	Bitmap
MACINTOSH PICT	Metafile
MICROSOFT PAINT	Bitmap
MICROSOFT RIFF	Multimedia
MICROSOFT RTF	Metafile
MICROSOFT SYLK	Vector
MICROSOFT WINDOWS BITMAP	Bitmap
MICROSOFT WINDOWS METAFILE	Metafile
MIFF	Bitmap
MPEG	Other
MTV	Scene Description
NAPLPS	Metafile
NFF	Scene Description
OFF	Scene Description

Table 1 Example File Formats	
OS/2 BITMAP	Bitmap
P3D	Scene Description
PBM., PGM., PNM., and PPM.	Bitmap
PCX	Bitmap
PDS	Other
PICTOR PC PAINT	Bitmap
PIXAR RIB	Scene Description
PLOT-10	Vector
PNG	Bitmap
POV	Vector
PRESENTATION MANAGER METAFILE	Metafile
PRT	Scene Description
QRT	Scene Description
QUICK TIME	Other
RADIANCE	Scene Description
RAYSHADE	Scene Description
RIX	Bitmap
RTRACE	Scene Description
SAF	Bitmap and other
SENSE8 NFF	Scene Description
SGI IMAGE FILE FORMAT	Bitmap
SGI INVENTOR	Scene Description
SGI YAODL	Scene Description
SGO	Vector
SPIFF	Bitmap

Table 1 Example File Formats	
SUN ICON	Bitmap
SUN RASTER	Bitmap
TDDD	Vector and Animation
TGA	Bitmap
TIFF	Bitmap
TTDDD	Vector and Animation
URAY	Scene Description
UTAH RLE	Bitmap
VICAR2	Bitmap
VIFF	Bitmap
VIS-5D	Vector
VIVID AND BOB	Scene Description
WAVEFRONT OBJ	Vector
WAVEFRONT RLA	Bitmap
WORDPERFECT GRAPHICS METAFILE	Metafile
XBM	Bitmap
XPM	Bitmap
XWD	Bitmap
ZBR	Metafile

See, Murray and vanRyper, pp. 12-26. These examples are illustrative and not intended to necessarily limit the present invention. Other file formats (now known or developed in the future) can be used as would be apparent to a person skilled in the art given this description.

Even within the same file format, digital data can be compressed according to different compression algorithms. In a QUICK TIME formatted file, for

example, video can be compressed in accordance with H.263, CINEPAK, JPEG, QT ANIMATION, or QT VIDEO standards. As a further example, in a WINDOWS MEDIA ASF formatted file, audio can be compressed in accordance with the MICROSOFT AUDIO FORMAT, ACELP, VOXWARE, or MP3 standards. Compression algorithm choices can be made based on optimization according to bit-rate choices, or according to the nature of the content. For example, video files in which little motion occurs ("talking heads") and video files in which there is a substantial amount of motion ("high-motion" video) may each be more efficiently compressed using different compression algorithms.

Within any one compression algorithm, there can be further variations. For example, files compressed according to the JPEG standard can be either YUB-based or RGB-based.

In addition to the publishing variables set forth above, there are also publishing variables unique to video data and audio data.

Publishing variables for video data include the width and height of the video image in pixels as well as the frame rate of the video. Depending on the bit-rate requirements and the nature of the data, different settings may be necessary in order to ensure the best picture quality. For example, some video may be better viewed at 15 frames per second at 160 x 120 pixels, while some others may be better viewed at 5 frames per second at 320 x 240 pixels, even at the same bit-rate. Where the bit-rate is 56K bps, picture quality becomes very limited, and it is almost never optimal to deliver video in 640 x 480 pixel resolution. Yet another publishing variable for video data is the number of bits per component.

Publishing variables for audio data include the number of samples per second, the number of channels (e.g., mono, stereo, 5-channel) and the sample size (8-bit, 16-bit, etc.). Different settings may be necessary to ensure audio quality in light of a particular content type and bit-rate.

Publishing variables may also include the size of data packets being sent and the choice of transmission protocol (e.g., TCP vs. UDP).

FIG. 6 shows an example transcoder 218 that transcodes on demand source type media content 610 to destination type media content 650. Source type media content 610 is digital data delivered over a network in one or more packets. The digital data that forms source type media content 610 is defined by one or more publishing variables. The publishing variables as shown in FIG. 6 include one or more of the following variables: source file format, source bit rate, source physical medium, source communication protocol, source encoding, or any combination thereof. Destination type media content 650 is digital data delivered over a network in one or more packets to an end user that demands the media content. The digital data that forms destination type media content 650 is also defined by one or more publishing variables. The publishing variables as shown in FIG. 6 include one or more of the following variables: destination file format, destination bit rate, destination physical medium, destination communication protocol, destination encoding, or any combination thereof.

FIG. 7 shows a table of an example implementation where one or more transcoders 218 transcodes on demand from a source type media content 710 to a first destination type 750. FIG. 7 also shows an example implementation where one or more transcoders 218 transcodes on demand from a source type media content 710 to a second destination type 760. The source type media content 710 includes digital data published according to the following source publishing variables: namely, the physical medium is a local disk, the communication protocol includes a file I/O, the file format is MP3 using MP3 encoding at a bit rate of 128 kilobits per second (kbps). The first destination type media content 750 includes digital data transcoded for publication according to the following destination publishing variables: namely, the physical medium is a packet-switched network (the Internet), the communication protocol includes WINDOWS MEDIA STREAMING MMS protocol, the file format is WINDOWS MEDIA FILE, using MP3 encoding at a bit rate of 56 kbps. The second destination type media content 760 includes digital data transcoded for publication according to the following destination publishing variables: namely, the physical medium is a Wireless

Network, the communication protocol includes HTTP, the file format is MP3 including MP3 encoding at a bit rate of 12 kbps.

Other examples are shown in the following tables:

Tables 2-5: Example Transcoder Operations

Table 2

Publishing Variables	Source Type	Destination Type
physical medium	Disk	Network
communication protocol(s)	File I/O	RTSP
container format	MPEG1	QUICK TIME
encoding	MPEG1	SORENSON (video) QDESIGN (audio)
bit rate	1.5 Mbps	300 kbps

Table 3

Publishing Variables	Source Type	Destination Type
physical medium	Wired Network	Wireless Network
communication protocol(s)	HTTP	MMS
container format	MPEG1	WINDOWS MEDIA
encoding	MPEG1	MPEG4 (video) MSAUDIO (audio)
bit rate	1.5 Mbps	100 kbps

Table 4

Publishing Variables	Source Type	Destination Type
physical medium	Wired Network	Wired Network
communication protocol(s)	HTTP	RTSP
container format	QUICK TIME	REAL
encoding	H.263	REAL PROPRIETARY G2 Video/Audio

bit rate	56 kbps	56 kbps

Table 5

Publishing Variables	Source Type	Destination Type
physical medium	Disk	Wireless Network
communication protocol(s)	File I/O	HTTP
container format	MPEG1	MP3
encoding	MPEG1	audio only - MP3
bit rate	1.5 Mbps	16 kbps

These examples are illustrative and not intended to limit the present invention. Other types of on demand transcoding operations that are known now or developed in the future can be used as would be apparent to a person skilled in the art given this description.

G. Alternate Embodiments of the Present Invention

Example embodiments of the methods and systems of the present invention have been described herein. As noted elsewhere, these example embodiments have been described for illustrative purposes only, and are not limiting. Alternate embodiments, differing slightly or substantially from those described herein, will be apparent to persons skilled in the relevant art based on the teachings contained herein. For example, one skilled in the relevant art will appreciate that the transcoding system and method of the present invention is not limited to the transcoding and delivery of media content alone, but also encompasses the transcoding and delivery of information of all types, including, but not limited to compressed files, electronic documents, HTML pages, XML documents, and any other information that can be stored in a plurality of formats and delivered electronically. Other alternate embodiments include, but are not limited to, hardware, software, and software/hardware implementations of the methods,

systems, and components of the invention. Such alternate embodiments fall within the scope and spirit of the present invention.

H. Conclusion

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. It will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined in the appended claims. Accordingly, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What Is Claimed Is:

1. A method for transcoding media content from a source type to a destination type, comprising the steps of:

(a) receiving a transcoding request for the media content;

(b) fetching the media content in response to said transcoding request;

(c) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on the source type and the destination type;

(d) sending the media content to said selected transcoder;

(e) transcoding the media content from the source type to the destination type, thereby generating transcoded media content; and

(f) transmitting said transcoded media content.

2. The method of claim 1, wherein the media content comprises a file of digital information.

3. The method of claim 1, wherein the media content comprises a stream of digital data.

4. The method of claim 1, wherein the media content is fetched, sent and transcoded as a stream of digital data and said transcoded media file is transmitted as a stream of digital data, and wherein steps (b), (d), (e) and (f) are performed in a pipelined fashion.

5. The method of claim 1, wherein said transcoding request is received over the Internet and wherein said transcoded media content is transmitted over the Internet.

6. The method of claim 1, wherein the media content type is defined according to at least one publishing variable, wherein said at least one publishing variable is:

(1) the file format of the media content;

(2) the bit-rate of the media content;

(3) the compression algorithm according to which the media content is stored;

(4) the communication protocol according to which the media content is transferred; or

(5) the physical medium on which the media content is stored; and

wherein said step (e) comprises converting said at least one publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

7. The method of claim 1, further comprising the steps of:

(g) storing said transcoded media content in a transcoded cache; and

(h) responding to subsequent transcoding requests for the media content by fetching said transcoded media content from said transcoded cache, and transmitting said transcoded media content.

8. The method of claim 7, further comprising the step of:

(i) determining whether to keep said transcoded media content in said transcoded cache based on an intelligent algorithm.

9. The method of claim 8, wherein said intelligent algorithm is a Least Recently Used algorithm.

10. The method of claim 1, further comprising the step of publishing the media content, wherein said publishing step further comprises the steps of:

(1) receiving the media content;

(2) archiving the media content in a master archive;

wherein said publishing step precedes step (a), and wherein said step (b) comprises fetching said archived media content from said master archive in response to said transcoding request.

11. The method of claim 1, further comprising the step of publishing the media content, wherein said publishing step further comprises the step of:

(1) receiving location and access information for the media content;

wherein said publishing step precedes step (a), and wherein said step (b) comprises fetching the media content in response to said transcoding request using said location and access information.

12. The method of claim 1, further comprising the step of publishing the media content, wherein said publishing step further comprises the step of:

(1) receiving the media content as a stream of digital data;

wherein said publishing step precedes step (a), and wherein said step (b) comprises fetching said stream of digital data in response to said transcoding request.

13. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a network interface;

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, and wherein said resource manager is adapted to

respond to said transcoding request and, in response to said transcoding request, to command said transmitting server to fetch the media content, to select one of said plurality of transcoders based on the source type and the destination type, to command said selected transcoder to transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

14. The media transcoding system of claim 13, wherein the media content comprises a file of digital information.

15. The media transcoding system of claim 13, wherein the media content comprises a stream of digital data.

16. The media transcoding system of claim 13, wherein said transmitting server is adapted to fetch the media content as a data stream, said selected transcoder is adapted to transcode the media content as a data stream, and said streaming server is adapted to transmit said transcoded media content as a data stream, and wherein said resource manager manages the operation of said transmitting server, said selected transcoder, and said streaming server so that said fetching, transcoding and transmitting occur in a pipelined fashion.

17. The media transcoding system of claim 13, wherein said network interface comprises a Web server interface.

18. The media transcoding system of claim 13, wherein said network interface is adapted to receive said transcoding request over the Internet and wherein said streaming server is adapted to transmit said transcoded media content over the Internet.

19. The media transcoding system of claim 13, wherein the media content type is defined according to a least one publishing variable, wherein said at least one publishing variable is:

(1) the file format of the media content;

(2) the bit-rate of the media content;

(3) the compression algorithm according to which the media content is stored;

(4) the communication protocol according to which the media content is transferred; or

(5) the physical medium on which the media content is stored; and

wherein said selected transcoder is adapted to convert said at least one publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

20. The media transcoding system of claim 13, further comprising:

a transcoded cache;

wherein said transcoded cache is adapted to store said transcoded media content and wherein said resource manager is adapted to command said transmitter server to fetch said transcoded media content from said transcoded cache and to command said streaming server to transmit said transcoded media content when said network interface receives a subsequent transcoding request for the media content.

21. The media transcoding system of claim 20, wherein said resource manager is adapted to determine whether to keep said transcoded media file in said transcoded cache based on an intelligent algorithm.

22. The media transcoding system of claim 21, wherein said intelligent algorithm is a Least Recently Used algorithm.

23. The media transcoding system of claim 13, further comprising:

a master archive; and

a content provider network interface;

wherein said content provider network interface is adapted to receive the media content and to archive the media content in said master archive, and wherein said transmitter server is adapted to fetch said archived media content from said master archive.

24. The media transcoding system of claim 13, further comprising:

a content provider network interface;

wherein said content provider network interface is adapted to receive location and access information for the media content, and wherein said transmitter server is adapted to fetch the media content using said location and access information.

25. The media transcoding system of claim 13, further comprising:

a content provider network interface;

wherein said content provider network interface is adapted to receive the media content as a stream of digital data, and wherein said transmitter server is adapted to fetch said stream of digital media content.

26. The media transcoding system of claim 13, wherein said transmitting server, said streaming server, and each of said plurality of transcoders each further comprise a slave monitor, wherein each of said slave monitors is adapted to receive a command from said resource manager and to initiate a task in response to said command.

27. The media transcoding system of claim 26, wherein each of said slave monitors is further adapted to report a status of said task to said resource manager.

28. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a network interface;

a resource manager;

a streaming server; and

a plurality of transcoding servers for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to select one of said plurality of transcoders based on the source type and the destination type, to command said transcoding server to fetch and transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

29. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a plurality of transcoding means for transcoding from a plurality of source types to a plurality of destination types;

transmitting means;

streaming means;

means for receiving a transcoding request;

means for responding to said transcoding request, wherein said means for responding to said transcoding request include resource management means for commanding said transmitting means to fetch the media content, for selecting one of said plurality of transcoding means based on the source type and the destination type, for commanding said selected transcoding means to transcode the media content from the source type to the destination type,

thereby generating transcoded media content, and for commanding said streaming means to transmit said transcoded media content.

30. The media transcoding system of claim 29, wherein the media content comprises a file of digital information.

31. The media transcoding system of claim 29, wherein the media content comprises a stream of digital data.

32. The media transcoding system of claim 29, wherein said transmitting means is adapted to fetch the media content as a data stream, said selected transcoding means is adapted to transcode the media content as a data stream, and said streaming means is adapted to transmit said transcoded media content as a data stream, and wherein said resource management means manages the operation of said transmitting means, said selected transcoding means, and said streaming means so that said fetching, transcoding and transmitting occur in a pipelined fashion.

33. The media transcoding system of claim 29, wherein said means for receiving said transcoding request is adapted to receive said transcoding request over the Internet and wherein said streaming means is adapted to transmit said transcoded media content over the Internet.

34. The media transcoding system of claim 29, wherein the media content type is defined according to a least one publishing variable, wherein said at least one publishing variable is:

(1) the file format of the media content;

(2) the bit-rate of the media content;

(3) the compression algorithm according to which the media content is stored;

(4) the communication protocol according to which the media content is transferred; or

(5) the physical medium on which the media content is stored; and

wherein said selected transcoding means is adapted to convert said at least one publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

35. A method for transcoding media content, comprising the steps of:

(a) receiving a transcoding request for the media content, wherein said transcoding request includes a source type, a source location, a destination type, and a destination location;

(b) fetching the media content from said source location in response to said transcoding request;

(c) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on said source type and said destination type;

(d) sending the media content to said selected transcoder;

(e) transcoding the media content from said source type to said destination type, thereby generating transcoded media content; and

(f) transmitting said transcoded media content to said destination location.

36. The method of claim 35, further comprising the step of parsing said transcoding request to determine said source type, said source location, said destination type, and said destination location.

37. The method of claim 36, further comprising the step of fetching at least one of said source type, said source location, said destination type, or said destination location when it is determined in said parsing step that said transcoding request is incomplete.

38. A method for transcoding media content from a source type to a destination type, comprising the steps of:

(a) fetching the media content;

(b) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on the source type and the destination type;

(c) sending the media content to said selected transcoder;

(d) transcoding the media content from the source type to the destination type, thereby generating transcoded media content; and

(e) transmitting said transcoded media content.

39. A media transcoding system for transcoding media content, comprising:

a network interface;

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, wherein said transcoding request includes a source type, a source location, a destination type, and a destination location and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to command said transmitting server to fetch the media content from said source location, to select one of said plurality of transcoders based on said source type and said destination type, to command said selected transcoder to transcode the media content from said source type to said destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content to said destination location.

40. The media transcoding system of claim 39, further comprising:

a task manager;

wherein said task manager is adapted to parse said transcoding request to determine said source type, said source location, said destination type, and said destination location.

41. The media transcoding system of claim 40, wherein said task manager is further adapted to fetch at least one of said source type, said source location, said destination type, or said destination location when it is determined that said transcoding request is incomplete.

42. The media transcoding system of claim 39, wherein said network interface is a Web server interface.

43. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to to command said transmitting server to fetch the media content, to select one of said plurality of transcoders based on the source type and the destination type, to command said selected transcoder to transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

44. A method for transcoding media content from a source type to a first destination type and a second destination type, comprising the steps of:

(a) fetching the media content;

(b) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said first transcoder is selected based on the source type and the first destination type;

(c) sending the media content to said first transcoder;

(d) transcoding the media content from the source type to the first destination type, thereby generating first transcoded media content;

(e) transmitting said first transcoded media content;

(f) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the source type and the second destination type;

(g) sending the media content to said second transcoder;

(h) transcoding the media content from the source type to the second destination type, thereby generating second transcoded media content;

(i) transmitting said second transcoded media content.

45. A method for transcoding a first media content from a first source type to a destination type and transcoding a second media content from a second source type to the destination type, comprising the steps of:

(a) fetching the first and second media content;

(b) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said first transcoder is selected based on the first source type and the destination type;

(c) sending the first media content to said first transcoder;

(d) transcoding the first media content from the first source type to the destination type, thereby generating first transcoded media content;

(e) transmitting said first transcoded media content;

(f) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the second source type and the destination type;

(g) sending the second media content to said second transcoder;

(h) transcoding the second media content from the second source type to the destination type, thereby generating second transcoded media content;

(i) transmitting said second transcoded media content.

46. A media transcoding system for transcoding media content from a source type to a first destination type and a second destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to to command said first transmitting server to fetch the media content, to select a first transcoder from said plurality of transcoders based on the source type and the first destination type, to command said first transcoder to transcode the media content from the source type to the first destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the media content, to select a second transcoder from said plurality of transcoders based on the source type and the second destination type, to command said second transcoder to transcode the media content from the source type to the second destination type, thereby generating second

transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

47. A media transcoding system for transcoding a first media content from a first source type to a destination type and for transcoding a second media content from a second source type to the destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to to command said first transmitting server to fetch the first media content, to select a first transcoder from said plurality of transcoders based on the first source type and the destination type, to command said first transcoder to transcode the media content from the first source type to the destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the second media content, to select a second transcoder from said plurality of transcoders based on the second source type and the destination type, to command said second transcoder to transcode the second media content from the second source type to the destination type, thereby generating second transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

Distributed On-Demand Media Transcoding System and Method

Abstract

A system and method for the on-demand transcoding of media content from a source type to a destination type is provided, wherein the system includes a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, and wherein the system receives a transcoding request for media content, fetches the media content in response to the transcoding request, sends the media content to one of the plurality of transcoders based on the source type and destination type, transcodes the media content from the source type to the destination type, thereby generating transcoded media content, and transmits the transcoded media content. The system fetches, sends, and transcodes the media content and transmits the transcoded media content in a pipelined fashion. The system also provides for the publication of media content as a file or stream of digital data, for the archiving of media content, and the caching of transcoded media content to improve system efficiency.

Declaration for Patent Application

Docket Number: 1968.0020000

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter that is claimed and for which a patent is sought on the invention entitled **Distributed On-Demand Media Transcoding System and Method**, the specification of which is attached hereto unless the following box is checked:

☐ was filed on _____;
as United States Application Number or PCT International Application Number _____; and
was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to patentability as defined in 37 C.F.R. § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application, which designated at least one country other than the United States listed below, and have also identified below any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Claimed
_____ (Application No.)	_____ (Country)	_____ (Day/Month/Year Filed)	☐ Yes ☐ No
_____ (Application No.)	_____ (Country)	_____ (Day/Month/Year Filed)	☐ Yes ☐ No

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

_____ (Application No.) _____ (Filing Date)

_____ (Application No.) _____ (Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or under § 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information that is material to patentability as defined in 37 C.F.R. § 1.56 that became available between the filing date of the prior application and the national or PCT international filing date of this application

_____ (Application No.)	_____ (Filing Date)	_____ (Status - patented, pending, abandoned)
_____ (Application No.)	_____ (Filing Date)	_____ (Status - patented, pending, abandoned)

Appl. No. (To Be Assigned)
Docket No. 1968.0020000

Send Correspondence to:

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934

Direct Telephone Calls to:

(202) 371-2600

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

Full name of sole or first inventor	Angela C. W. LAI
Signature of sole or first inventor ✔	Date ✔
Residence	Mountain View, CA
Citizenship	Hong Kong
Post Office Address	1190 Morton Court
	Mountain View, CA 94040
Full name of second inventor	James Peter HODDIE
Signature of second inventor ✔	Date ✔
Residence	Menlo Park, CA
Citizenship	USA
Post Office Address	579 Ninth Avenue
	Menlo Park, CA 94025
Full name of third inventor	Howard E. CHARTOCK
Signature of third inventor ✔	Date ✔
Residence	Palo Alto, CA
Citizenship	USA
Post Office Address	P.O. Box 519

	Los Altos, CA 94023
Full name of fourth inventor	Christopher V. PIRAZZI
Signature of fourth inventor ✔	Date ✔
Residence	Redwood City, CA
Citizenship	USA
Post Office Address	442 Lakeview Way
	Redwood City, CA 94062
Full name of fifth inventor	Giovanni M. AGNOLI
Signature of fifth inventor ✔	Date ✔
Residence	San Francisco, CA
Citizenship	USA
Post Office Address	3345 21st Street
	San Francisco, CA 94110
Full name of sixth inventor	Harry A. CHOMSKY
Signature of sixth inventor ✔	Date ✔
Residence	Oakland, CA
Citizenship	USA
Post Office Address	641 65th Street #A
	Oakland, CA 94609
Full name of seventh inventor	Steve H. CHEN
Signature of seventh inventor ✔	Date ✔
Residence	Santa Clara, CA
Citizenship	USA
Post Office Address	815 Bond Place

Santa Clara, CA 95051
Full name of eighth inventor Hitoshi HOKAMURA
Signature of eighth inventor ✔ Date ✔
Residence Sunnyvale, CA
Citizenship USA
Post Office Address 362 Dennis Avenue
Sunnyvale, CA 94086

P:\USERS\AHOLMES\ucf\1968\1968.0020000.declaration
SKGF Rev. 9/2/98 mac

(Supply similar information and signature for subsequent joint inventors, if any)

PRINT OF DRAWINGS
AS ORIGINALLY FII

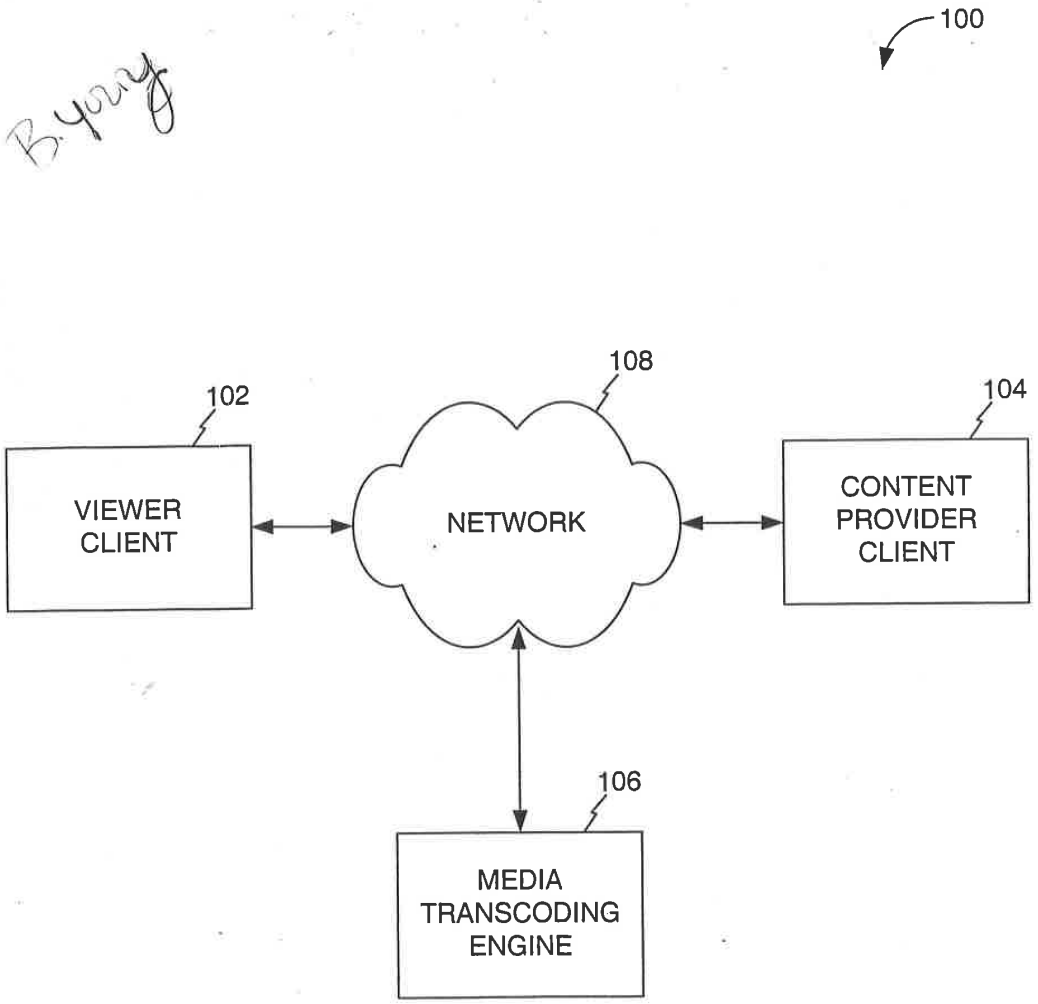

FIG. 1

0003-23.vsd/1

PRINT OF DRAWINGS
AS ORIGINALLY FIL

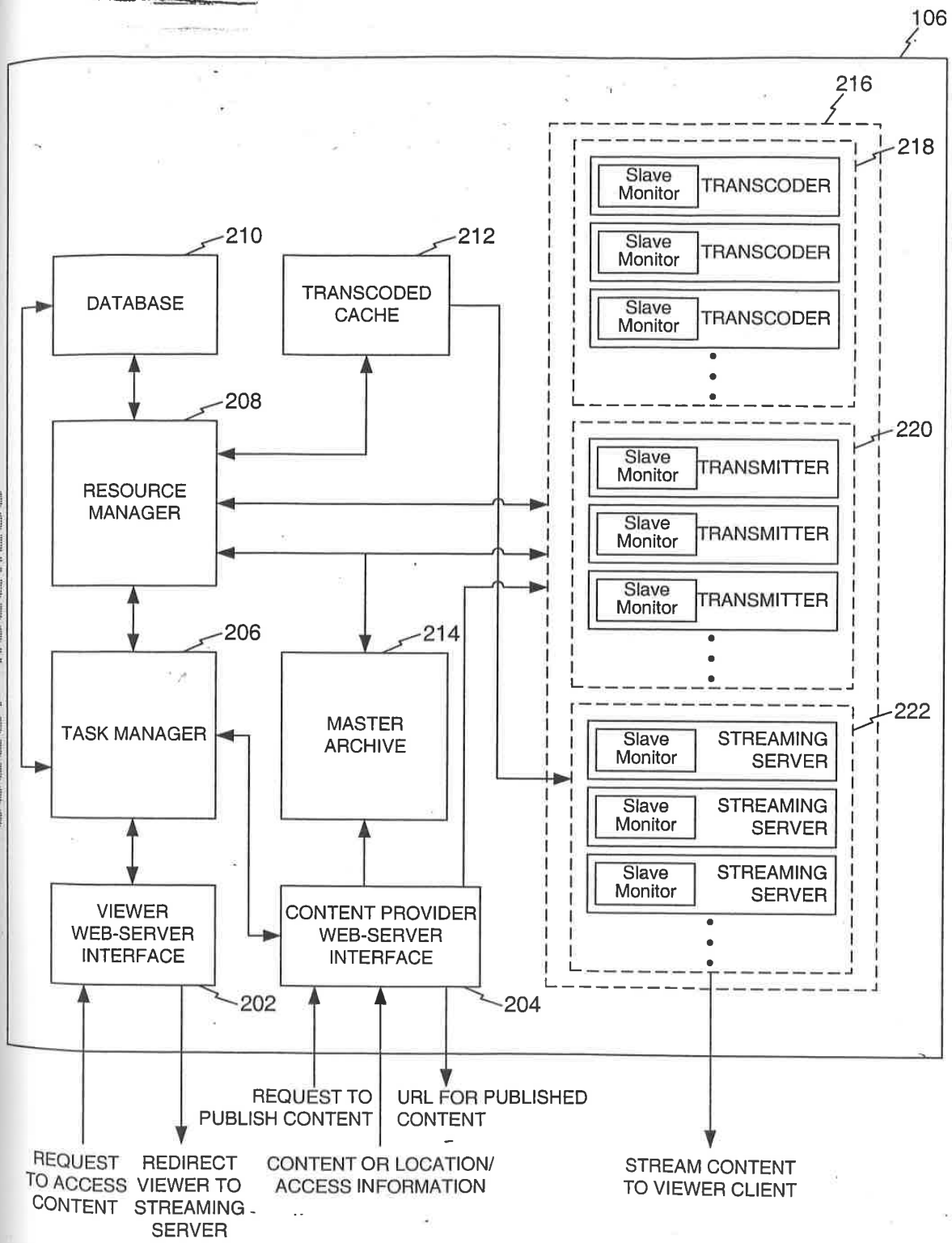

FIG. 2

0003-23.vsd/2

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AS ORIGINALLY FIL

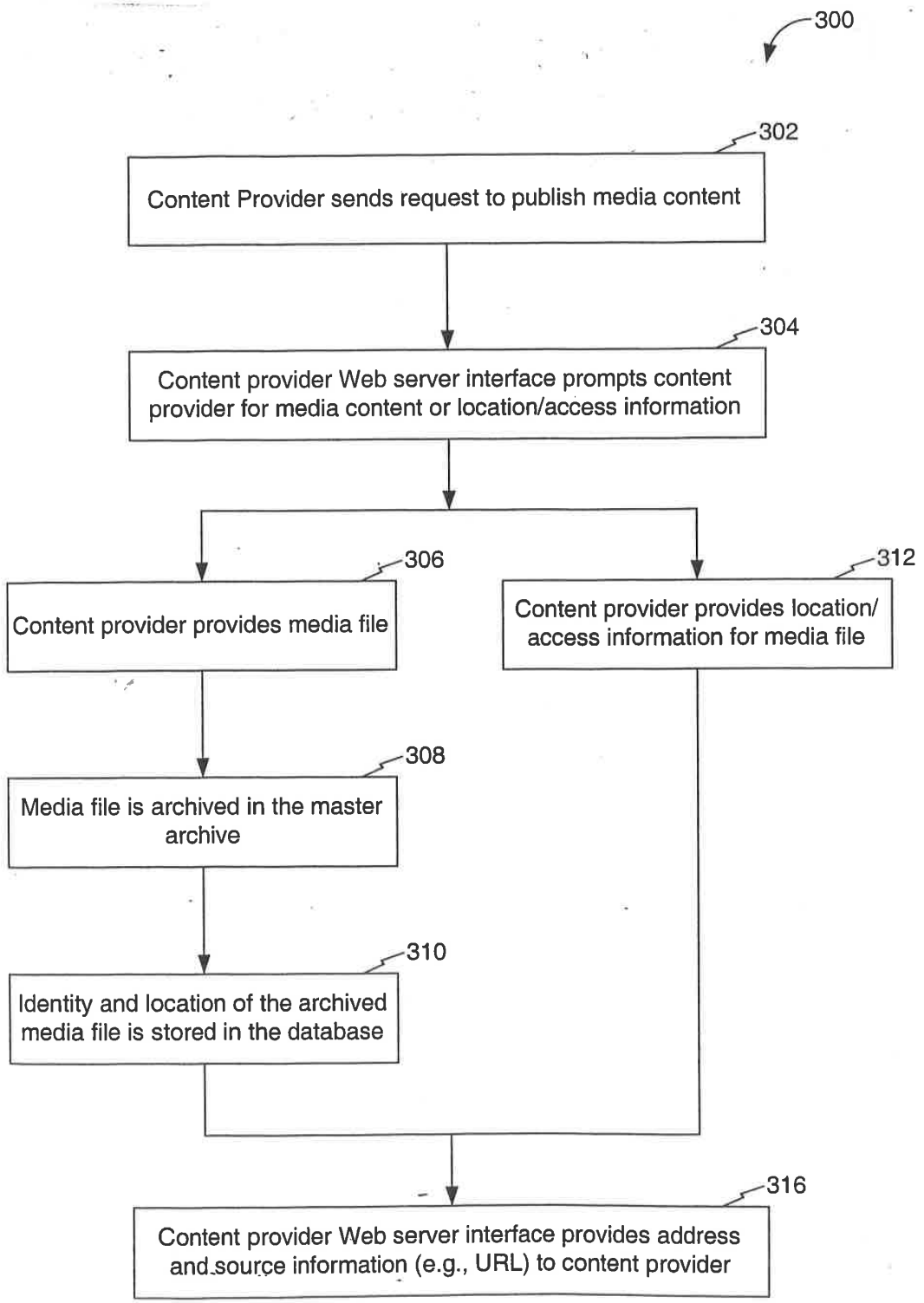

FIG. 3

0003-23.vsd/3

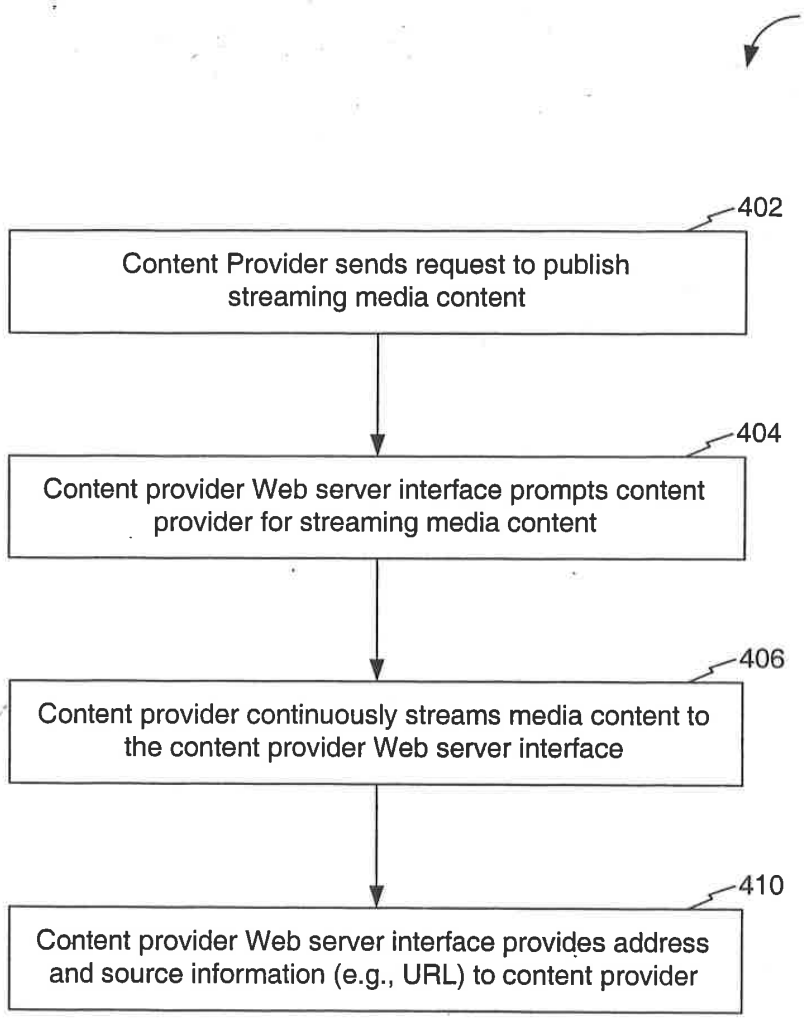

FIG. 4

0003-23.vsd/4

PRINT OF DRAWINGS
AS ORIGINALLY FIL

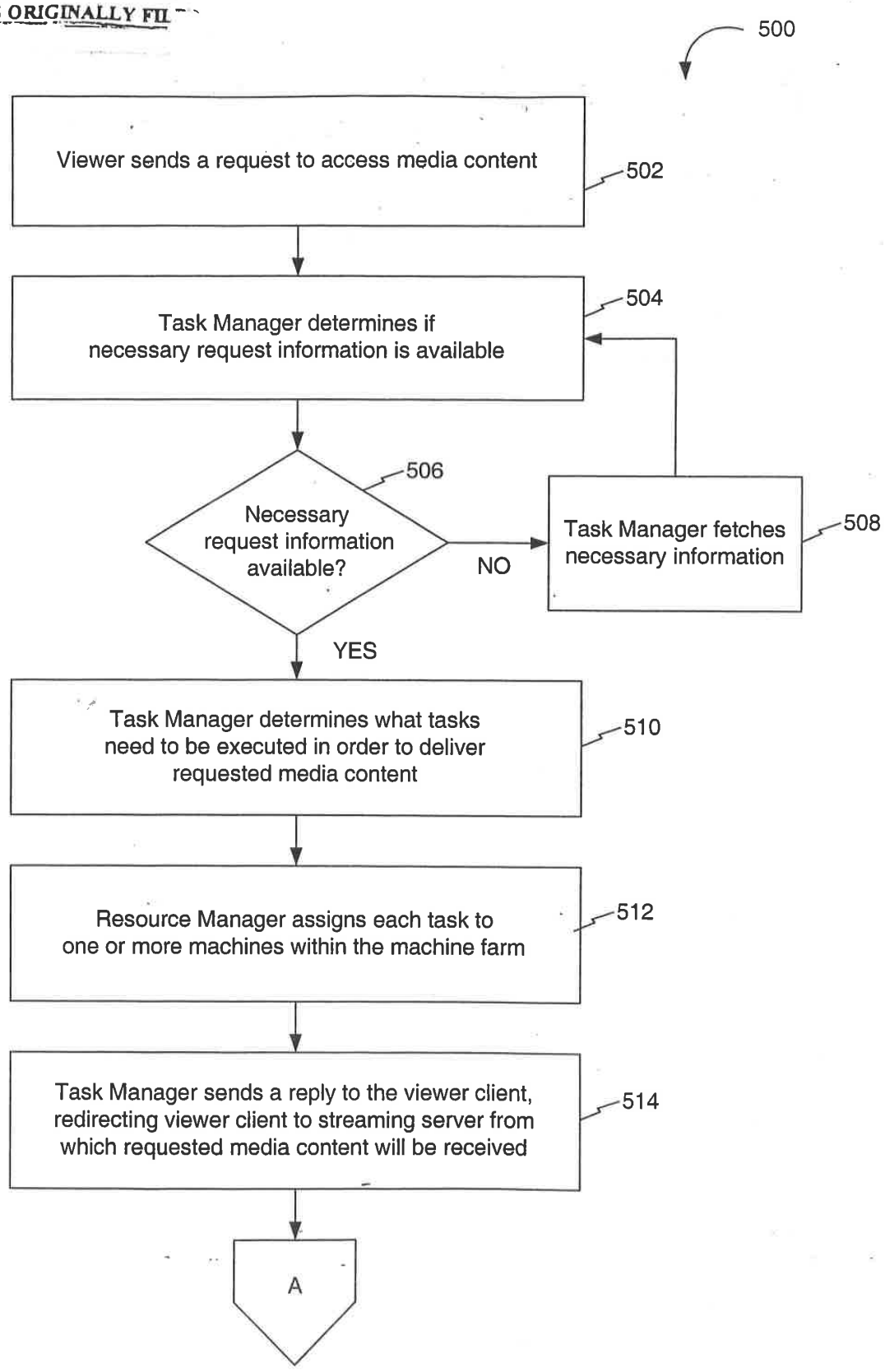

FIG. 5A

0003-23.vsd/5

PRINT OF DRAWINGS
AS ORIGINALLY FIL

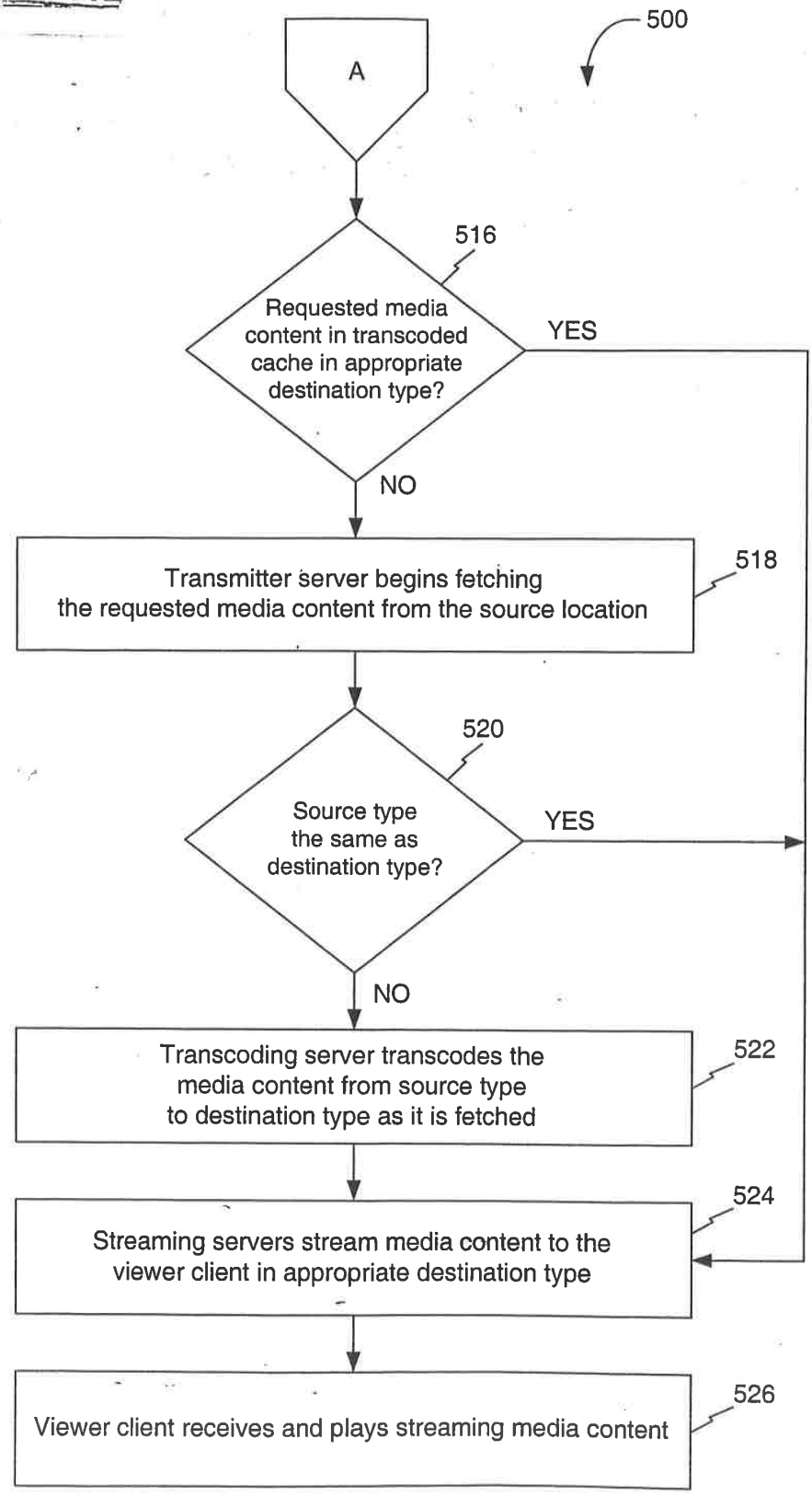

FIG. 5B

0003-23.vsd/6

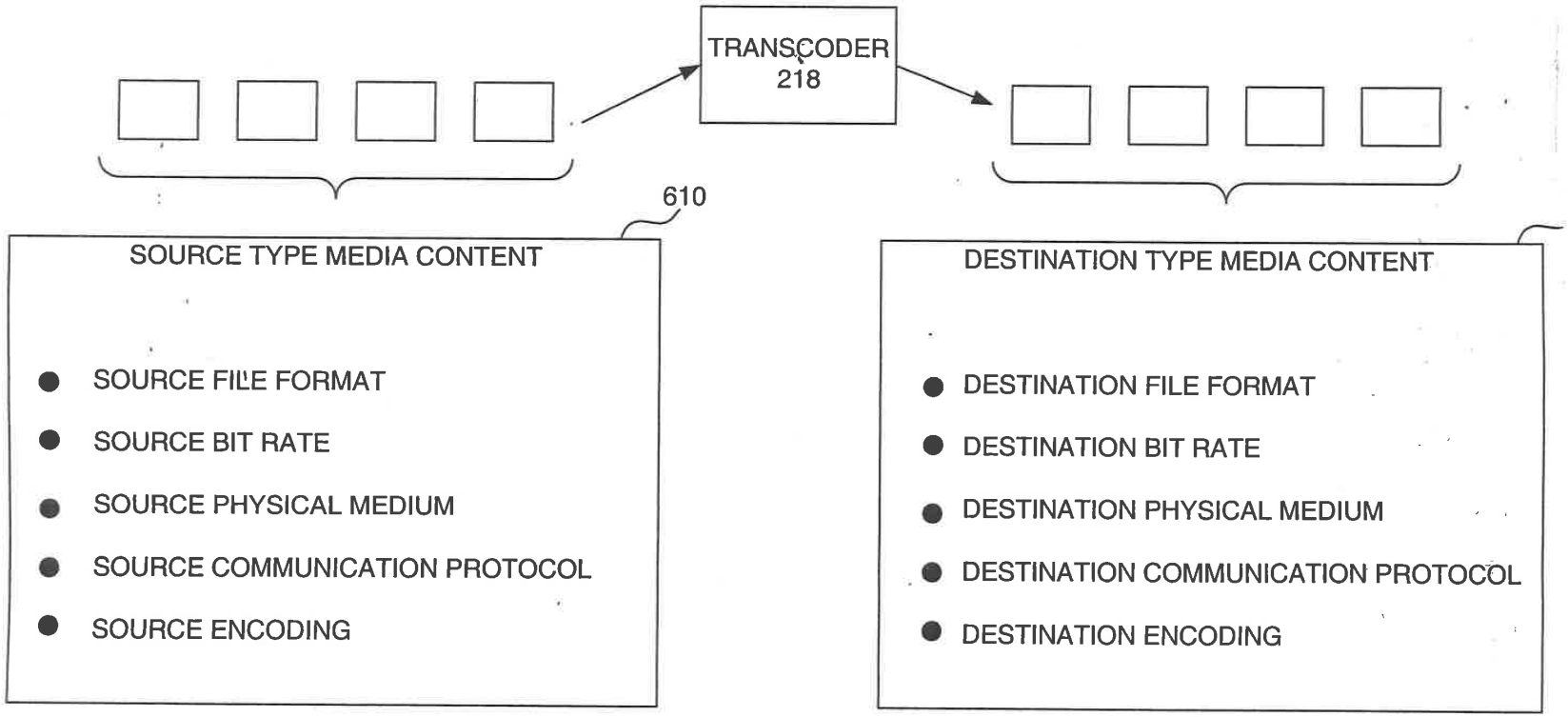

FIG. 6

0003-23.vsd/7

PUBLISHING VARIABLES	SOURCE TYPE 710	DESTINATION TYPE 750	DESTINATION TYPE 760
PHYSICAL MEDIUM	LOCAL DISK	INTERNET	WIRELESS NETWORK
COMMUNICATION PROTOCOL	FILE I/O	WINDOWS MEDIA STREAMING MMS PROTOCOL	HTTP
CONTAINER FORMAT	MP3	WINDOWS MEDIA	MP3
ENCODING BIT RATE	128 kpbs	56 kbps	12 kbps

FIG. 7

6407680

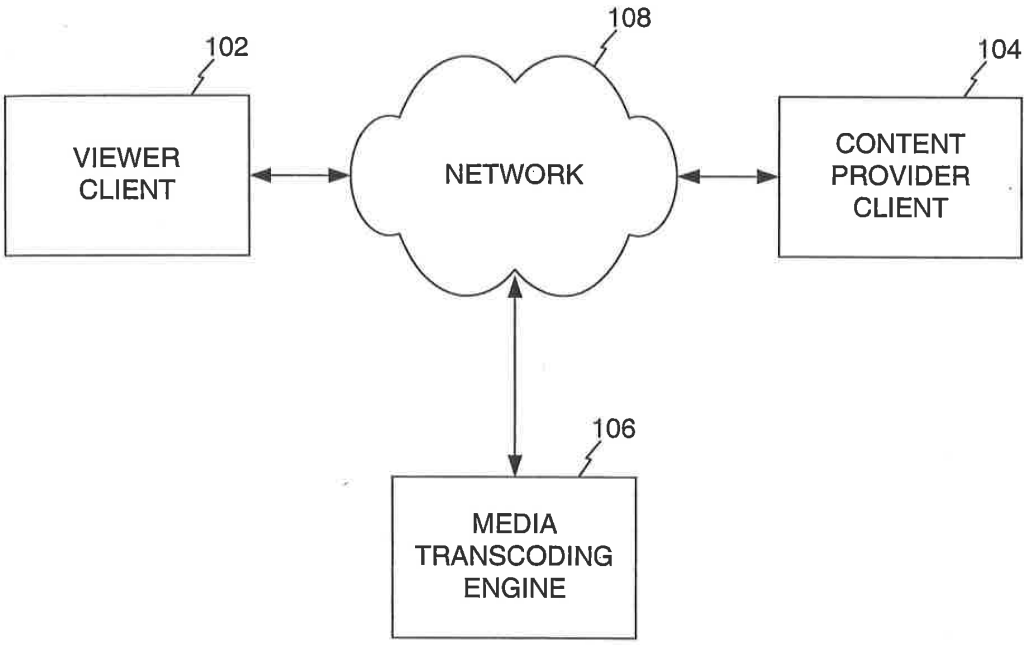

FIG. 1

0003-23.vsd/1

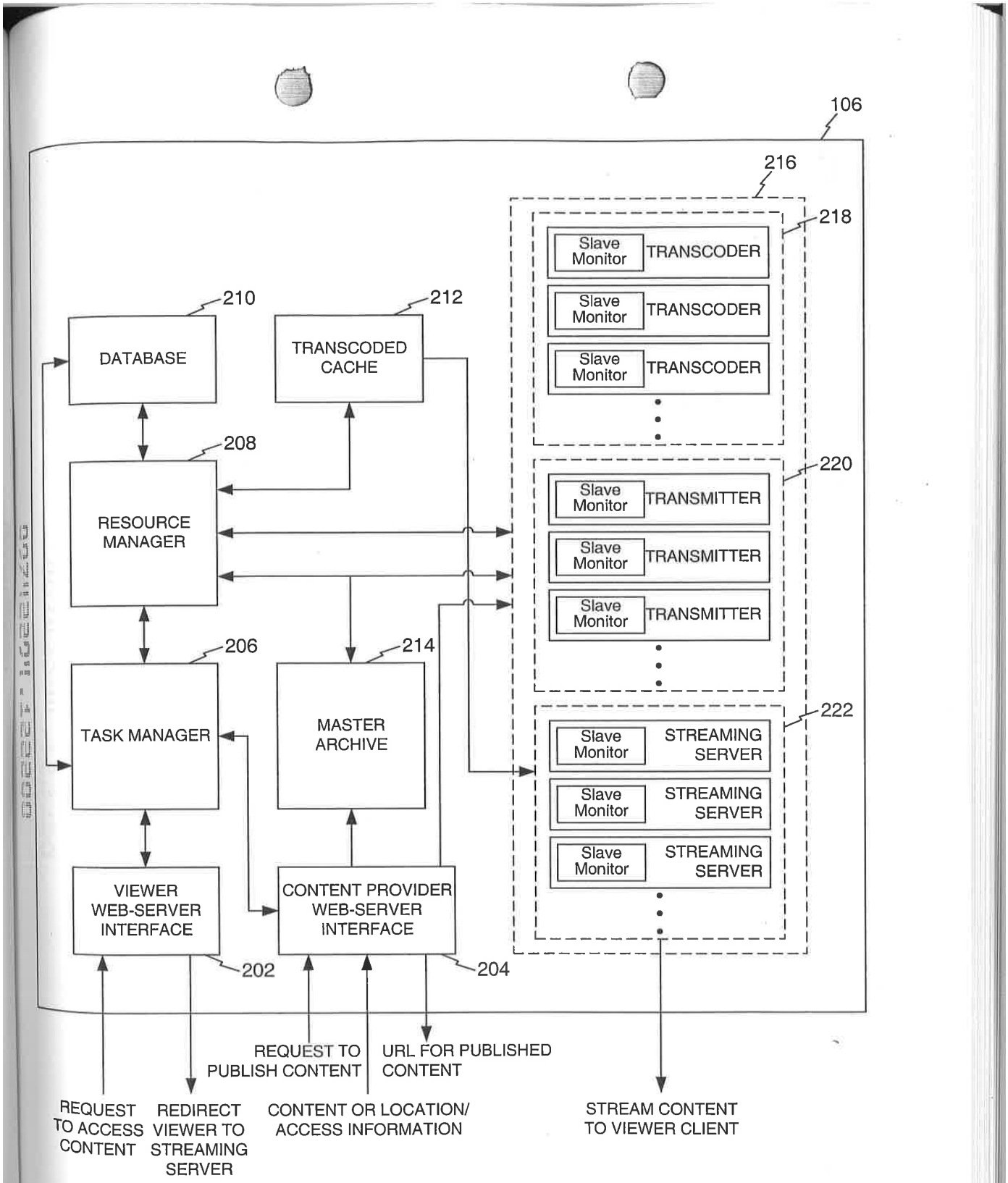

FIG. 2

0003-23.vsd/2

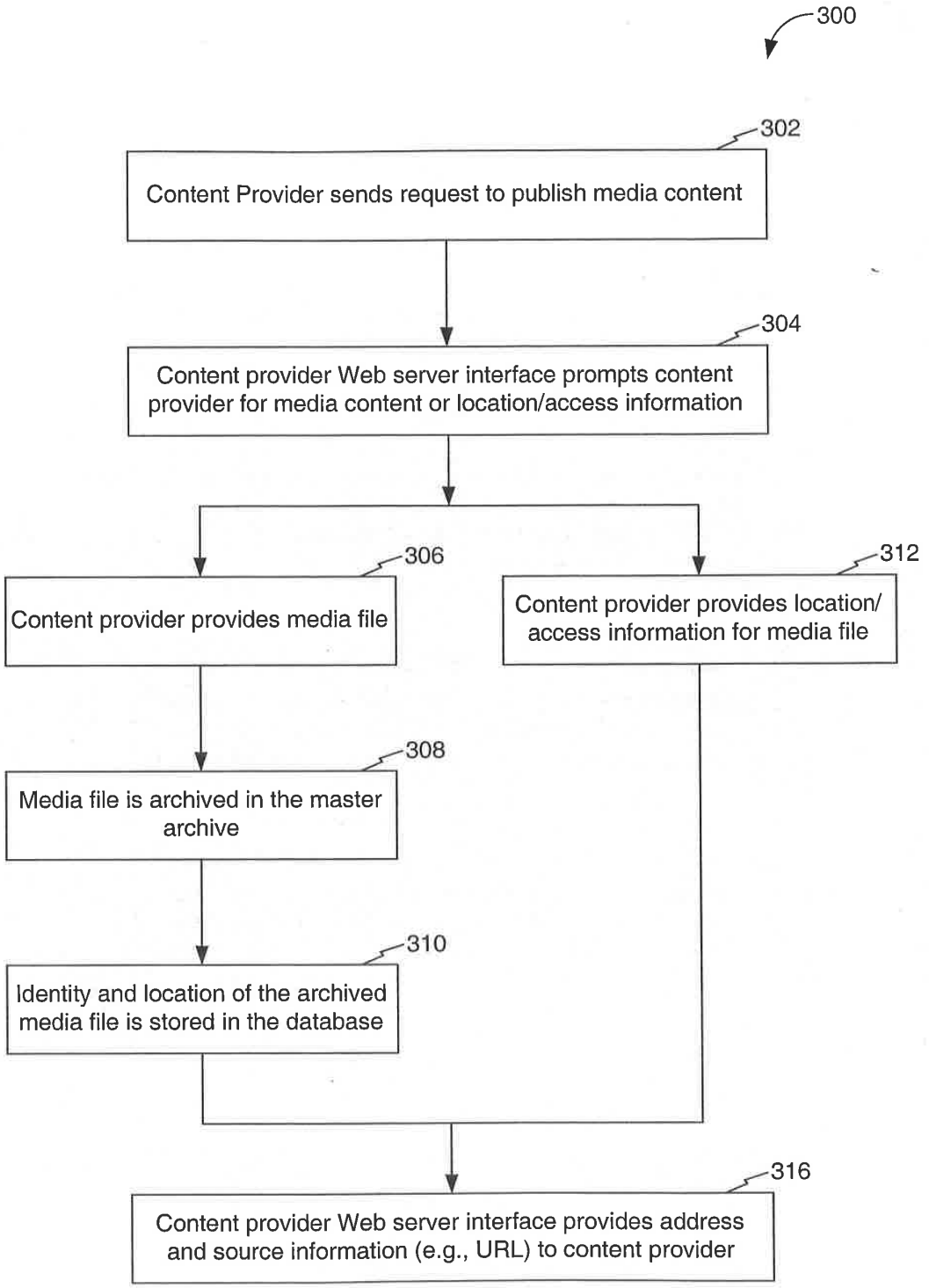

FIG. 3

0003-23.vsd/3

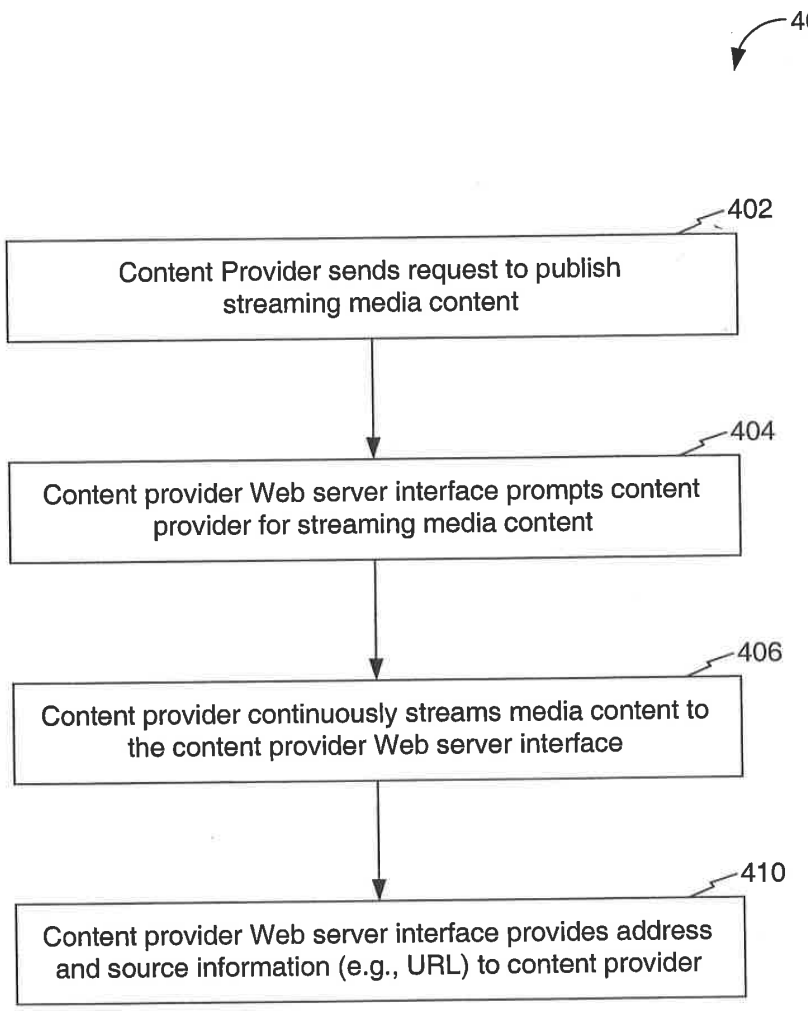

FIG. 4

0003-23.vsd/4

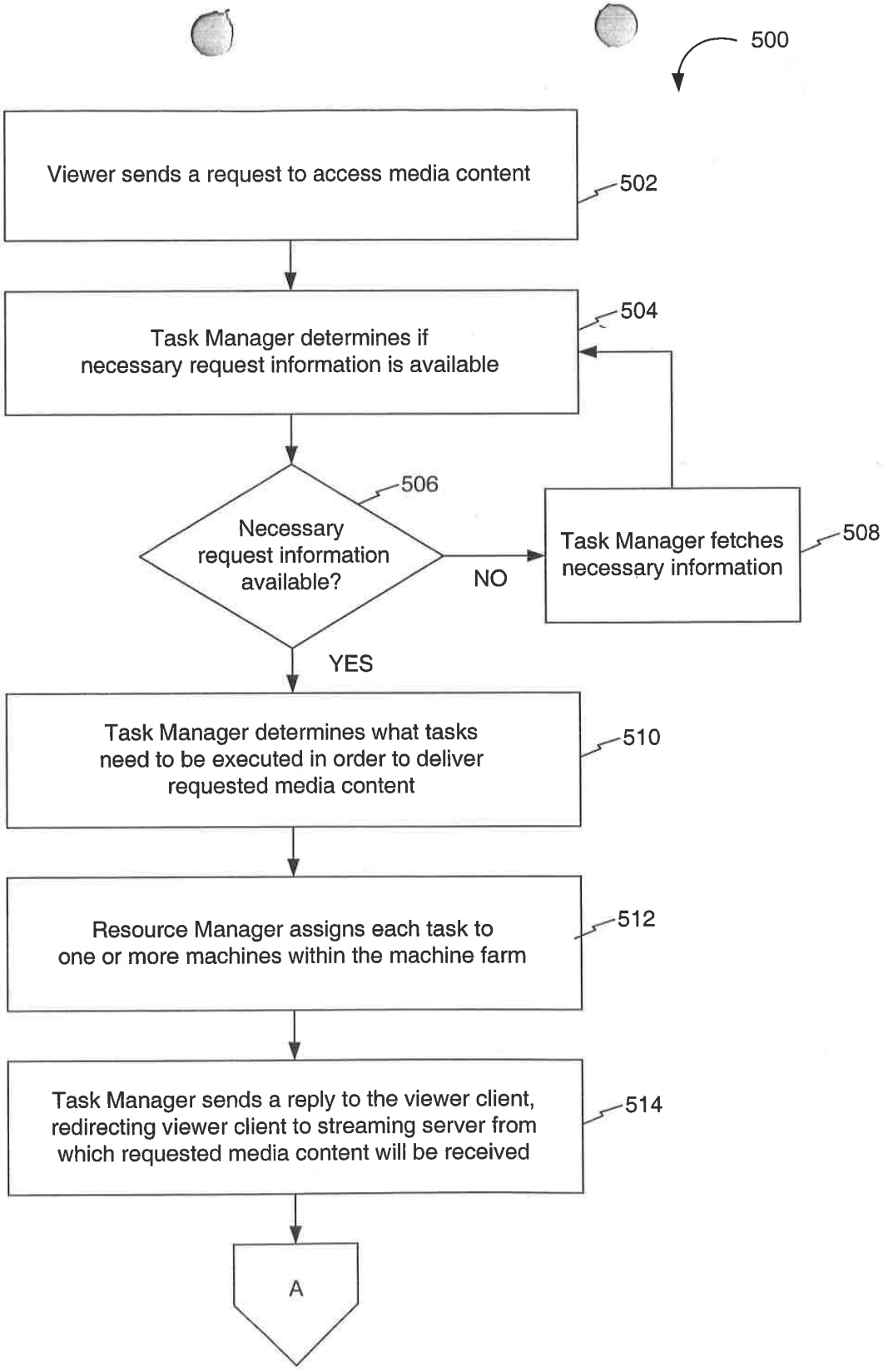

FIG. 5A

0003-23.vsd/5

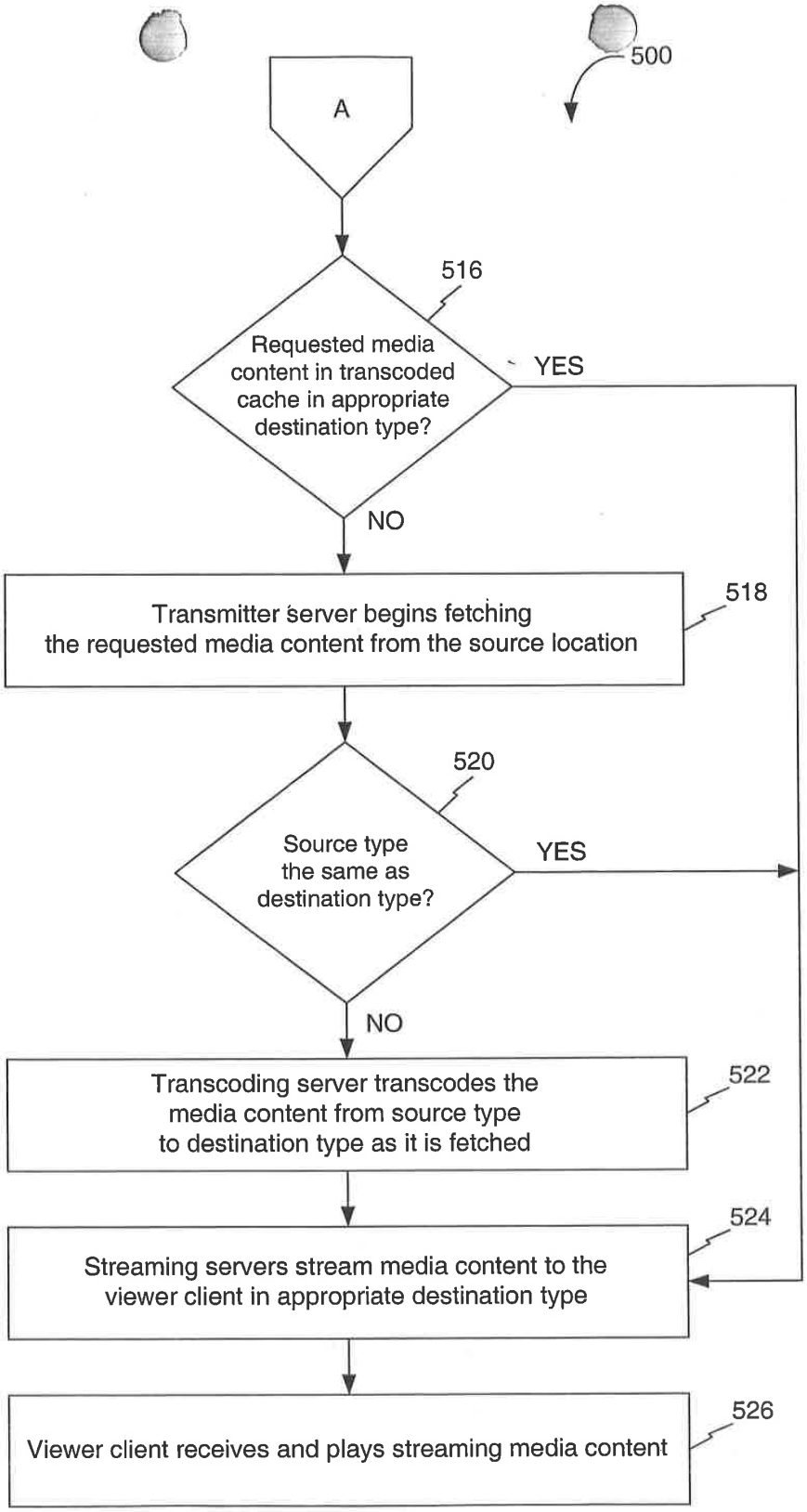

FIG. 5B

0003-23.vsd/6

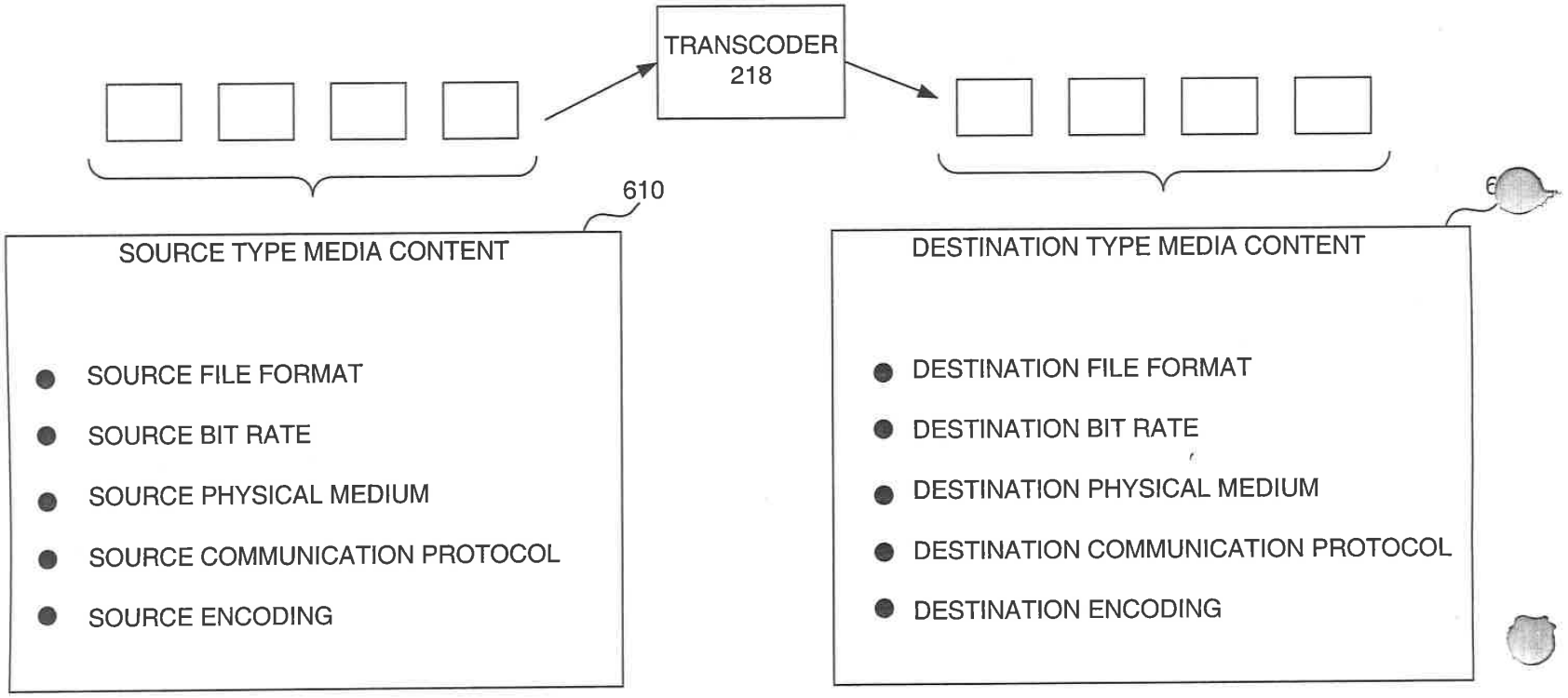

FIG. 6

0003-23.vsd/7

PUBLISHING VARIABLES	SOURCE TYPE 710	DESTINATION TYPE 750	DESTINATION TYPE 760
PHYSICAL MEDIUM	LOCAL DISK	INTERNET	WIRELESS NETWORK
COMMUNICATION PROTOCOL	FILE I/O	WINDOWS MEDIA STREAMING MMS PROTOCOL	HTTP
CONTAINER FORMAT	MP3	WINDOWS MEDIA	MP3
ENCODING BIT RATE	128 kpbs	56 kbps	12 kbps

FIG. 7

0003-23.vsd/8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	
Lai *et al.*	Art Unit: To Be Assigned
Appl. No. To Be Assigned	Examiner: To Be Assigned
Filed: December 22, 2000	Atty. Docket: 1968.0020000
For: **Distributed On-Demand Media Transcoding System and Method**	

Authorization To Treat A Reply As Incorporating An Extension Of Time Under 37 C.F.R. § 1.136(a)(3)

Commissioner for Patents
Washington, D.C. 20231

Sir:

The U.S. Patent and Trademark Office is hereby authorized to treat any concurrent or future reply that requires a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. The U.S. Patent and Trademark Office is hereby authorized to charge all required extension of time fees to our Deposit Account No. 19-0036, if such fees are not otherwise provided for in such reply. A duplicate copy of this authorization is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Michael V. Messinger
Attorney for Applicants
Registration No. 37,575

Date: 12/22/00

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

P:\USERS\AHOLMES\tcf\1968\0020000eotauth

DUPLICATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Lai *et al.*
Appl. No. To Be Assigned
Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**

Art Unit: To Be Assigned
Examiner: To Be Assigned
Atty. Docket: 1968.0020000

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Commissioner for Patents
Washington, D.C. 20231

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Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Michael V. Messinger
Attorney for Applicants
Registration No. 37,575

Date: 12/22/00

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

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United States Patent & Trademark Office

Office of Initial Patent Examination

Application papers not suitable for publication

SN 09/742294 Mail Date 12/22/00

- ☐ Non-English Specification
- ☑ Specification contains drawing(s) on page(s)_____ or table(s) p 32-36, 39, 40
- ☐ Landscape orientation of text ☐ Specification ☐ Claims ☐ Abstract
- ☐ Handwritten ☐ Specification ☐ Claims ☐ Abstract
- ☐ More than one column ☐ Specification ☐ Claims ☐ Abstract
- ☐ Improper line spacing ☐ Specification ☐ Claims ☐ Abstract
- ☐ Claims not on separate page(s)
- ☐ Abstract not on separate page(s)
- ☐ Improper paper size -- Must be either A4 (21 cm x 29.7 cm) or 8-1/2"x 11"
  - ☐ Specification page(s)_____ ☐ Abstract
  - ☐ Drawing page(s)_____ ☐ Claim(s)
- ☐ Improper margins
  - ☐ Specification page(s)_____ ☐ Abstract
  - ☐ Drawing page(s)_____ ☐ Claim(s)
- ☐ Not reproducible

  Reason
  - ☐ Paper too thin
  - ☐ Glossy pages
  - ☐ Non-white background

  Section
  - ☐ Specification page(s)_____
  - ☐ Drawing page(s)_____
  - ☐ Abstract
  - ☐ Claim(s)
- ☐ Drawing objection(s)
  - ☐ Missing lead lines, drawing(s)_____
  - ☐ Line quality is too light, drawing(s)_____
  - ☐ More than 1 drawing and not numbered correctly
  - ☐ Non-English text, drawing(s)_____
  - ☐ Excessive text, drawing(s)_____
  - ☐ Photographs capable of illustration, drawing(s)_____

4 2

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
09/742,294	12/22/2000	Angela C. W. Lai	1968.0020000

CONFIRMATION NO. 8151

FORMALITIES LETTER

OC000000005800601

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Attorneys at Law
Suite 600
1100 New York Avenue, N. W.
Washington, DC 20005-3934

Date Mailed: 02/26/2001

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given TWO MONTHS from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  Applicant must submit $ **710** *to complete the basic filing fee and/or file a small entity statement claiming such status (37 CFR 1.27).*
- Total additional claim fee(s) for this application is $1206.
  - **$486** for **27** total claims over 20.
  - **$720** for **9** independent claims over 3 .
- The oath or declaration is unsigned.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of $130 for a non-small entity, must be submitted with the missing items identified in this letter.
- **The balance due by applicant is $ 2046.**

A copy of this notice MUST be returned with the reply.

Customer Service Center
Initial Patent Examination Division (703) 308-1202
PART 3 - OFFICE COPY

H-3

Sector 43

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
ATTORNEYS AT LAW
1100 NEW YORK AVENUE, N.W. • WASHINGTON, D.C. 20005-3934
PHONE: (202) 371-2600 • FACSIMILE: (202) 371-2540 • www.skgf.com

ROBERT GREENE STERNE
EDWARD J. KESSLER
JORGE A. GOLDSTEIN
SAMUEL L. FOX***
DAVID K.S. CORNWELL
ROBERT W. ESMOND
TRACY-GENE G. DURKIN
MICHELE A. CIMBALA
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ROBERT E. SOKOHL
ERIC K. STEFFE
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STEVEN R. LUDWIG

JOHN M. COVERT*
LINDA E. ALCORN
ROBERT C. MILLONIG
MICHAEL V. MESSINGER
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TIMOTHY J. SHEA, JR.
DONALD R. MCPHAIL
PATRICK E. GARRETT
STEPHEN G. WHITESIDE
JEFFREY T. HELVEY*
HEIDI L. KRAUS
JEFFREY R. KURIN
RAYMOND MILLIEN

PATRICK D. O'BRIEN
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DONALD R. BANOWIT
PETER A. JACKMAN
MOLLY A. MCCALL
TERESA U. MEDLER
JEFFREY S. WEAVER
KRISTIN K. VIDOVICH
KENDRICK P. PATTERSON
DONALD J. FEATHERSTONE

GRANT E. REED
VINCENT L. CAPUANO
JOHN A. HARROUN*
ALBERT J. FASULO III*
W. BRIAN EDGE*
ELDORA ELLISON FLOYD*
W. RUSSELL SWINDELL
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VIRGIL L. BEASTON*
RYAN J. STAMPER*

KAREN R. MARKOWICZ**
SUZANNE E. ZISKA**
ANDREA J. KAMAGE**
NANCY J. LEITH**
ELIZABETH J. HAANES**
MARK P. TERRY**

*BAR OTHER THAN D.C.
**REGISTERED PATENT AGENT
***SENIOR COUNSEL

April 26, 2001

WRITER'S DIRECT NUMBER:
(202) 371-2667
INTERNET ADDRESS:
MIKEM@SKGF.COM

Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utility Patent Application
Appl. No. 09/742,294; Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**
Inventors: Lai *et al.*
Our Ref: 1968.0020000/MVM/TCF

Sir:

Transmitted herewith for appropriate action are the following documents:

1. PTO Fee Transmittal Form PTO/SB/17;
2. Copy of the Notice to File Missing Parts;
3. Copy of executed Declaration;
4. Executed Certificate Under 37 C.F.R. §3.73(b) with a copy of the Assignment attached;
5. Executed Power of Attorney from Assignee;
6. Original executed Statement Claiming Small Entity Status-Small Business concern;
7. One (1) return postcard; and
8. Our check no. 31094 for $1023.00 to cover $355.00 basic filing fee; $65.00 government surcharge-late filing fee; and $603.00 for additional claim fees.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

for Michael V. Messinger
Attorney for Applicants
Registration No. 37,575

Reg No. 33,876

MVM/TCF:ayh
Enclosures

P:\USERS\TFIALA\Generic Media\1968.0020000\1968\0020000covltrnfmp
SKGF Rev. 4/27/00 mac

PTO/SB/17 (11-00)
Approved for use through 10/31/2002. OMB 0651-0032
d Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Pa. Reduction Act of 1995, no persons are required to respond to a c of information unless it displays a valid OMB control number.

FEE TRANSMITTAL for FY 2001

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($)1023.00

Complete if Known	
Application Number	09/742,294
Filing Date	December 22, 2000
First Named Inventor	Lal et al.
Examiner Name	To Be Assigned
Group Art Unit	2185
Attorney Docket No.	1968.0020000

METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any overpayment to:

Deposit Account Number	19-0036
Deposit Account Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.

☐ Charge Any Additional Fee Required Under 37 CFR §§ 1.16 and 1.17

☐ Applicant claims small entity status See 37 CFR 1.27

2. ☒ Payment Enclosed:

☒ Check ☐ Credit card ☐ Money Order ☒ Other*

*Charge any deficiencies or credit any overpayments in the fees or fee calculations of Parts 1, 2 and 3 below to Deposit Account No. 19-0036.

FEE CALCULATION

1. BASIC FILING FEE

Large Fee Code	Large Entity Fee ($)	Small Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	355.00
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 355.00

2. EXTRA CLAIM FEES

		Extra	Fee from below	Fee Paid
Total Claims 47	- 20** =	27	X 9	= $243.00
Indep. Claims 12	- 3** =	9	X 40	= $360.00
Multiple Dependent				=

Large Fee Code	Large Entity Fee ($)	Small Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim
108	80	209	40	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 603.00

** or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Fee Code	Large Entity Fee ($)	Small Fee Code	Small Entity Fee ($)	Fee Description	Fee paid
105	130	205	65	Surcharge - late filing fee or oath	$65.00
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for *ex parte* reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	390	216	195	Extension for reply within second month	
117	890	217	445	Extension for reply within third month	
118	1,390	218	695	Extension for reply within fourth month	
128	1,890	228	945	Extension for reply within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,240	241	620	Petition to revive - unintentional	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	130	123	130	Petitions related to provisional applications	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	481	40	Recording each patent assignment per property (times number of properties)	
146	710	246	355	Filing a submission after final rejection (37 CFR 1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR 1.129(b))	
179	710	279	355	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	
Other fee (specify) :					
Other fee (specify) :					

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 65.00

SUBMITTED BY

Complete (*if applicable*)

Name (*Print/Type*)	Michael V. Messinger	Telephone	202-371-2600
Signature	Donald Messinger Reg. no. 33,876	Date	4/26/01.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

SKGF Rev. 11/13/00 mnac

0020000feetrans

Combined Declaration and Power of Attorney for Patent Application

Docket Number: 1968.0020000

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter that is claimed and for which a patent is sought on the invention entitled Distributing On-Demand Media Transcoding System and Method, the specification of which is attached hereto unless the following box is checked:

☒ was filed on December 22, 2000;
as United States Application Number or PCT International Application Number 09/742,294; and
was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to patentability as defined in 37 C.F.R. § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application, which designated at least one country other than the United States listed below, and have also identified below any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Claimed
_____ (Application No.)	_____ (Country)	_____ (Day/Month/Year Filed)	☐ Yes ☐ No
_____ (Application No.)	_____ (Country)	_____ (Day/Month/Year Filed)	☐ Yes ☐ No

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

_____ (Application No.)	_____ (Filing Date)
_____ (Application No.)	_____ (Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or under § 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information that is material to patentability as defined in 37 C.F.R. § 1.56 that became available between the filing date of the prior application and the national or PCT international filing date of this application.

_____ (Application No.)	_____ (Filing Date)	_____ (Status - patented, pending, abandoned)
_____ (Application No.)	_____ (Filing Date)	_____ (Status - patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Robert G. Sterne, Esq., Reg. No. 28,912; Edward J. Kessler, Esq., Reg. No. 25,688; Jorge A. Goldstein, Esq., Reg. No. 29,021; David K.S. Cornwell, Esq., Reg. No. 31,944; Robert W. Esmond, Esq., Reg. No. 32,893; Tracy-Gene G. Durkin, Esq., Reg. No. 32,831; Michele A. Cimbala, Esq., Reg. No. 33,851; Michael B. Ray, Esq., Reg. No. 33,997; Robert E. Sokohl, Esq., Reg. No. 36,013; Eric K. Steffe, Esq., Reg.No. 36,688; Michael Q. Lee, Esq., Reg. No. 35,239; Steven R. Ludwig, Esq., Reg. No. 36,203; John M. Covert, Esq., Reg. No. 38,759; and Linda E. Alcorn, Esq., Reg. No. 39,588.

Send Correspondence to:

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934

Direct Telephone Calls to:

(202) 371-2600

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

Full name of sole or first inventor	Angela C. W. LAI
Signature of sole or first inventor	Date 3/21/2001
Residence Mountain View, CA	
Citizenship Hong Kong	
Mailing Address 1190 Morton Court, Mountain View, CA 94040	

Full name of second inventor	James Peter HODDIE
Signature of second inventor	Date 3/21/1
Residence Menlo Park, CA	
Citizenship U.S.A.	
Mailing Address 579 Ninth Avenue, Menlo Park, CA 94025	

Full name of third inventor	Howard E. CHARTOCK
Signature of third inventor	Date 3/23/2001
Residence Palo Alto, CA	
Citizenship U.S.A.	
Mailing Address P.O. Box 519, Los Altos, Ca 94023	
Full name of fourth inventor	Christopher V. PIRAZZI
Signature of fourth inventor x	Date 3/22/2001
Residence Redwood City, CA	
Citizenship U.S.A.	
Mailing Address 442 Lakeview Way, Redwood, CA 94062	
Full name of fifth inventor	Giovanni M. AGNOLI
Signature of fifth inventor x	Date 3/22/01
Residence San Francisco, CA	
Citizenship U.S.A.	
Mailing Address 3345 21st Street, Oakland, CA 94110	
Full name of sixth inventor	Harry A. CHOMSKY
Signature of sixth inventor	Date 3/23/2001
Residence Oakland, CA	
Citizenship U.S.A.	
Mailing Address 641 65th Street #A, Oakland, CA 94609	

Full name of seventh inventor	Steve H. CHEN
Signature of seventh inventor	Date 4/16/01
Residence Santa Clara, CA	
Citizenship U.S.A.	
Mailing Address 815 Bond Place, Santa Clara, CA 95051	
Full name of eighth inventor	Hitoshi HOKAMURA
Signature of eighth inventor	Date 3/26/01
Residence Sunnyvale, CA	
Citizenship Japan	
Mailing Address 362 Dennis Avenue, Sunnyvale, CA 94086	

P:\USERS\AHOLMES\taf\1968\1968.0020000.declaration

(Supply similar information and signature for subsequent joint inventors, if any)

Certificate Under 37 C.F.R. § 3.73(b)

Applicant/Patent Owner: Angela C. W. LAI, James Peter HODDIE, Howard E. CHARTOCK, Christopher V. PIRAZZI, Giovanni M. AGNOLI, Harry A. CHOMSKY, Steve H. CHEN and Hitoshi HOKAMURA

Application No./Patent No.: 09/742,294 Filed/Issue Date: December 22, 2000

Entitled: **Distributed On-Demand Media Transcoding System and Method**

Generic Media, Inc., a corporation,
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency,etc.)

states that it is:

1. [X] the assignee of the entire right, title, and interest, or

2. [ ] an assignee of an undivided part interest

in the patent application/patent identified above by virtue of either:

A. [X] An Assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the Patent and Trademark Office at Reel _____, Frame ____, or for which a copy thereof is attached.

OR

B. [ ] A chain of title from the inventor(s) of the patent application/patent identified above to the current assignee as shown below:

1. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet.

[X] Copies of assignments or other documents in the chain of title are attached.

[**NOTE:** A separate copy (*i.e.*, the original assignment document or a true copy of the original document) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the PTO. See MPEP 302-302.8]

The undersigned (whose title is supplied below) is empowered to act on behalf of the assignee.

Date: ✓ 4/20/2001

Name: ✓ ANGELA LAI

Title: ✓ VP Engineering

Signature: ✓

DO NOT FORWARD
TO ASSIGNMENT BRANCH
NOT FOR RECORDATION

ASSIGNMENT

DO NOT FORWARD
TO ASSIGNMENT BRANCH
NOT FOR RECORDATION

In consideration of the sum of One Dollar ($1.00) or equivalent and other good and valuable consideration paid to each of the undersigned inventor(s): (1) Angela C.W. LAI, (2) James Peter HODDIE, (3) Howard E. CHARTOCK, (4) Christopher V. PIRAZZI, (5) Giovanni M. AGNOLI, (6) Harry M. CHOMSKY, (7) Steven H. CHEN and (8) Hitoshi HOKAMURA, the undersigned inventor(s) hereby sell(s) and assign(s) to Generic Media, Inc. (the Assignee) his/her entire right, title and interest, including the right to sue for past infringement and to collect for all past, present and future damages:

check applicable box(es) ☒ for the United States of America (as defined in 35 U.S.C. § 100),
☒ and throughout the world,

(a) in the invention(s) known as **Distributed On-Demand Media Transcoding System and Method** for which application(s) for patent in the United States of America has (have) been executed by the undersigned on (1) 3/21/2001 (2) 3/21/2001 (3) 3/23/2001 (4) 3/22/2001 (5) 3/22/01 (6) 3/27/2001 (7) 4/16/2001 (8) 3/26/2001 (also known as United States Application No. 09/742,294, filed December 22, 2000), in any and all applications thereon, in any and all Letters Patent(s) therefor, and

(b) in any and all applications that claim the benefit of the patent application listed above in part (a), including continuing applications, reissues, extensions, renewals and reexaminations of the patent application or Letters Patent therefor listed above in part (a), to the full extent of the term or terms for which Letters Patents issue, and

(c) in any and all inventions described in the patent application listed above in part (a), and in any and all forms of intellectual and industrial property protection derivable from such patent application, and that are derivable from any and all continuing applications, reissues, extensions, renewals and reexaminations of such patent application, including, without limitation, patents, applications, utility models, inventor's certificates, and designs together with the right to file applications therefor; and including the right to claim the same priority rights from any previously filed applications under the International Agreement for the Protection of Industrial Property, or any other international agreement, or the domestic laws of the country in which any such application is filed, as may be applicable;

all such rights, title and interest to be held and enjoyed by the above-named Assignee, its successors, legal representatives and assigns to the same extent as all such rights, title and interest would have been held and enjoyed by the Assignor had this assignment and sale not been made.

The undersigned inventor(s) agree(s) to execute all papers necessary in connection with the application(s) and any continuing (continuation, divisional, or continuation-in-part), reissue, reexamination or corresponding application(s) thereof and also to execute separate assignments in connection with such application(s) as the Assignee may deem necessary or expedient.

The undersigned inventor(s) agree(s) to execute all papers necessary in connection with any interference or patent enforcement action (judicial or otherwise) related to the application(s) or any continuing (continuation, divisional, or continuation-in-part), reissue or reexamination application(s) thereof and to cooperate with the Assignee in every way possible in obtaining evidence and going forward with such interference or patent enforcement action.

The undersigned inventor(s) hereby represent(s) that he/she has full right to convey the entire interest herein assigned, and that he/she has not executed, and will not execute, any agreement in conflict therewith.

The undersigned inventor(s) hereby grant(s) Robert Greene Sterne, Esquire, Registration No. 28,912; Edward J. Kessler, Esquire, Registration No. 25,688; Jorge A. Goldstein, Esquire, Registration No. 29,021; David

DO NOT FORWARD
TO ASSIGNMENT BRANCH
NOT FOR RECORDATION

K.S. Cornwell, Esquire, Registration No. 31,944; Robert W. Esmond, Esquire, Registration No. 32,893; Tracy-Gene G. Durkin, Esquire, Registration No. 32,831; Michele A. Cimbala, Esquire, Registration No. 33,851; Michael B. Ray, Esquire, Registration No. 33,997; Robert E. Sokohl, Esquire, Registration No. 36,013; Eric K. Steffe, Esquire, Registration No. 36,688; Michael Q. Lee, Esquire, Registration No. 35,239; Steven R. Ludwig, Esquire, Registration No. 36,203; John M. Covert, Esquire, Registration No. 38,759; and Linda E. Alcorn, Esquire, Registration No. 39,588; all of STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C., 1100 New York Avenue, N.W., Suite 600, Washington, D.C. 20005-3934, power to insert in this assignment any further identification that may be necessary or desirable in order to comply with the rules of the United States Patent and Trademark Office for recordation of this document.

IN WITNESS WHEREOF, executed by the undersigned inventor(s) on the date opposite his/her name.

Date: 3/21/2001 Signature of Inventor: _____
Angela C. W. LAI

Date: 3/21/1 Signature of Inventor: _____
James Peter HODDIE

Date: 3/23/01 Signature of Inventor: _____
Howard E. CHARTOCK

Date: 3/22/2001 Signature of Inventor: _____
Christopher V. PIRAZZI

Date: 3/22/2001 Signature of Inventor: _____
Giovanni M. AGNOLI

Date: 3/23/2001 Signature of Inventor: _____
Harry A. CHOMSKY

Date: 4/16/2001 Signature of Inventor: _____
Steven H. CHEN

Date: 3/26/01 Signature of Inventor: _____
Hitoshi HOKAMURA

POWER OF ATTORNEY FROM ASSIGNEE

Generic Media, Inc., a corporation of California, having a principal place of business at 136 Hamilton Avenue, Palo Alto, CA 94301, is assignee of the entire right, title and interest for the United States of America (as defined in 35 U.S.C. § 100), by reason of an Assignment to the Assignee executed on (1) 3/21/01 (2) 3/21/01 (3) 3/23/01 (4) 3/22/01 (5) 3/22/01 (6) 3/23/01 (7) 4/16/01 (8) 3/26/01 of an invention known as **Distributed On-Demand Media Transcoding System and Method** (Attorney Docket No. 1968.0020000), which is disclosed and claimed in a patent application of the same title by the inventor(s) (1) Angela C. W. LAI, (2) James Peter HODDIE, (3) Howard E. CHARTOCK, (4) Christopher V. PIRAZZI, (5) Giovanni M. AGNOLI, (6) Harry A. CHOMSKY, (7) Steve H. CHEN and (8) Hitoshi HOKAMURA (said application filed on December 22, 2000 at the U.S. Patent and Trademark Office, having Application Number 09/742,294).

The Assignee hereby appoints the following U.S. attorneys to prosecute this application and any continuation, divisional, continuation-in-part, or reissue application thereof, and to transact all business in the U.S. Patent and Trademark Office connected therewith: Robert Greene Sterne, Esq., Reg. No. 28,912; Edward J. Kessler, Esq., Reg. No. 25,688; Jorge A. Goldstein, Esq., Reg. No. 29,021; David K.S. Cornwell, Esq., Reg. No. 31,944; Robert W. Esmond, Esq., Reg. No. 32,893; Tracy-Gene G. Durkin, Esq., Reg. No. 32,831; Michele A. Cimbala, Esq., Reg. No. 33,851; Michael B. Ray, Esq., Reg. No. 33,997; Robert E. Sokohl, Esq., Reg. No. 36,013; Eric K. Steffe, Esq., Reg. No. 36,688, Michael Q. Lee, Esq., Reg. No. 35,239; Steven R. Ludwig, Esq., Reg. No. 36,203; John M. Covert, Esq., Reg. No. 38,759; and Linda E. Alcorn, Esq., Reg. No. 39,588. The Assignee hereby grants said attorneys the power to insert on this Power of Attorney any further identification that may be necessary or desirable in order to comply with the rules of the U.S. Patent and Trademark Office.

Send correspondence to:

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
U.S.A.

Direct phone calls to 202-371-2600.

FOR: Generic Media, Inc.

SIGNATURE: ✓ A. Lai

BY: ✓ ANGELA LAI

TITLE: ✓ VP Engineering

DATE: ✓ 4/20/2001

P:\USERS\AHOLMES\tcf\1968\0020000poa

Statement Claiming Small Entity Status
(37 C.F.R. §§ 1.9(d) and 1.27(c)) -- Small Business Concern

Applicant, Patentee or Identifier: Angela C. W. Lai et al.
Appl. or Patent No. 09/742,294 Attorney Docket No. 1968.0020000
Filed or Issued: December 22, 2000
Title: Distributed On-Demand Media Transcoding System and Method

I hereby state that I am

[ ] the owner of the small business concern identified below:
[x] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN Generic Media, Inc.
ADDRESS OF SMALL BUSINESS CONCERN 136 Hamilton Avenue, Palo Alto, CA 94301

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 C.F.R. Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office. Questions related to size standards for a small business concern may be directed to: Small Business Administration, Size Standards Staff, 409 Third Street, SW, Washington, DC 20416.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

[ ] the specification filed herewith with title as listed above.
[X] the application identified above.
[ ] the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention must file separate statements indicating their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 C.F.R. § 1.9(c) if that person made the invention or by any concern which would not qualify as a small business concern under 37 C.F.R. § 1.9(d) or a nonprofit organization under 37 C.F.R. § 1.9(e).

Each person, concern or organization having any rights in the invention (other than the small business concern named above) is listed below:

[X] no such person, concern, or organization exists.
[ ] each person, concern, or organization is listed below.

NAME _____

ADDRESS _____

( ) INDIVIDUAL ( ) SMALL BUSINESS CONCERN ( ) NONPROFIT ORGANIZATION

Separate statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 C.F.R. § 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. § 1.28(b))

NAME OF PERSON SIGNING ✓ ANGELA LAI

TITLE OF PERSON IF OTHER THAN OWNER ✓ VP Engineering

ADDRESS OF PERSON SIGNING ✓ 1190 MORTON COURT, MOUNTAIN VIEW, CA 94040

SIGNATURE ✓ _____ DATE ✓ 4/20/2001

1100 New York Avenue • Washington, DC 20005 • (202) 371-2600

P:\USERS\TFIALA\Generic Media\1968.0020000\1968\0020000smlentity' SKGF Rev. 1/3/00 mac

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
09/742,294	12/22/2000	Angela C. W. Lai	1968.0020000

CONFIRMATION NO. 8151

FORMALITIES LETTER

OC000000005800601

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Attorneys at Law
Suite 600
1100 New York Avenue, N. W.
Washington, DC 20005-3934

Date Mailed: 02/26/2001

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given TWO MONTHS from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
  Applicant must submit $ **710** *to complete the basic filing fee and/or file a small entity statement claiming such status (37 CFR 1.27).*
- Total additional claim fee(s) for this application is $1206.
  - **$486** for **27** total claims over 20.
  - **$720** for **9** independent claims over 3 .
- The oath or declaration is unsigned.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of $130 for a non-small entity, must be submitted with the missing items identified in this letter.
- **The balance due by applicant is $ 2046.**

A copy of this notice MUST be returned with the reply.

Customer Service Center
Initial Patent Examination Division (703) 308-1202
PART 2 - COPY TO BE RETURNED WITH RESPONSE

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
09/742,294	12/22/2000	Angela C. W. Lai	1968.0020000

CONFIRMATION NO. 8151
FORMALITIES LETTER

OC0000000005800601

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Attorneys at Law
Suite 600
1100 New York Avenue, N. W.
Washington, DC 20005-3934

Date Mailed: 02/26/2001

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given TWO MONTHS from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

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  Applicant must submit $ **710** *to complete the basic filing fee and/or file a small entity statement claiming such status (37 CFR 1.27).*
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  - **$486** for **27** total claims over 20.
  - **$720** for **9** independent claims over 3 .
- The oath or declaration is unsigned.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of $130 for a non-small entity, must be submitted with the missing items identified in this letter.
- **The balance due by applicant is $ 2046.**

A copy of this notice MUST be returned with the reply.

Customer Service Center
Initial Patent Examination Division (703) 308-1202
PART 1 - ATTORNEY/APPLICANT COPY

MVM TCF 3/1 3/1

Filing Fee, EC claim, Decl, Add'l Fees April 26, 2001
Stat Bar September 26, 2001

DOCKETED

DUPLICATE

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
ATTORNEYS AT LAW
1100 NEW YORK AVENUE, N.W. • WASHINGTON, D.C. 20005-3934
PHONE: (202) 371-2600 • FACSIMILE: (202) 371-2540 • www.skgf.com

April 26, 2001

WRITER'S DIRECT NUMBER:
(202) 371-2667
INTERNET ADDRESS:
MIKEM@SKGF.COM

Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utility Patent Application
Appl. No. 09/742,294; Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**
Inventors: Lai *et al.*
Our Ref: 1968.0020000/MVM/TCF

Sir:

Transmitted herewith for appropriate action are the following documents:

1. PTO Fee Transmittal Form PTO/SB/17;
2. Copy of the Notice to File Missing Parts;
3. Copy of executed Declaration;
4. Executed Certificate Under 37 C.F.R. §3.73(b) with a copy of the Assignment attached;
5. Executed Power of Attorney from Assignee;
6. Original executed Statement Claiming Small Entity Status-Small Business concern;
7. One (1) return postcard; and
8. Our check no. 31094 for $1023.00 to cover $355.00 basic filing fee; $65.00 government surcharge-late filing fee; and $603.00 for additional claim fees.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

for Michael V. Messinger
Attorney for Applicants
Registration No. 37,575

Reg No. 33,876

MVM/TCF:ayh
Enclosures

P:\USERS\TFIALA\Generic Media\1968.0020000\1968\0020000covltrnfmp
SKGF Rev. 4/27/00 mac

PTO/SB/17 (11-00)
Approved for use through 10/31/2002. OMB 0651-0032
...and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Pa...work Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL for FY 2001

Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT	($)1023.00

Complete if Known	
Application Number	09/742,294
Filing Date	December 22, 2000
First Named Inventor	Lai et al.
Examiner Name	To Be Assigned
Group Art Unit	2185
Attorney Docket No.	1968.0020000

METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any overpayment to:

Deposit Account Number	19-0036
Deposit Account Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.

☐ Charge Any Additional Fee Required Under 37 CFR §§ 1.16 and 1.17

☐ Applicant claims small entity status See 37 CFR 1.27

2. ☒ Payment Enclosed:

☒ Check ☐ Credit card ☐ Money Order ☒ Other*

*Charge any deficiencies or credit any overpayments in the fees or fee calculations of Parts 1, 2 and 3 below to Deposit Account No. 19-0036.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	355.00
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 355.00

2. EXTRA CLAIM FEES

	Extra	Fee from below	Fee Paid
Total Claims 47 - 20** =	27	X 9	= $243.00
Indep. Claims 12 - 3** =	9	X 40	= $360.00
Multiple Dependent			=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim
108	80	209	40	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 603.00

** or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee paid
105	130	205	65	Surcharge - late filing fee or oath	$65.00
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for *ex parte* reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	390	216	195	Extension for reply within second month	
117	890	217	445	Extension for reply within third month	
118	1,390	218	695	Extension for reply within fourth month	
128	1,890	228	945	Extension for reply within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,240	241	620	Petition to revive - unintentional	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	130	123	130	Petitions related to provisional applications	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	481	40	Recording each patent assignment per property (times number of properties)	
146	710	246	355	Filing a submission after final rejection (37 CFR 1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR 1.129(b))	
179	710	279	355	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	
Other fee (specify) :					
Other fee (specify) :					

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 65.00

SUBMITTED BY

Name (Print/Type)	Michael V. Messinger	Complete (if applicable) Telephone	202-371-2600
Signature	Donald Hunsucker Reg. No. 33,876	Date	4/26/01.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

SBGF Rev. 11/13/00 mars

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/742,294	12/22/00	LAI	A 1968.0020000

MMC2/1105
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C
ATTORNEYS AT LAW
SUITE 600
1100 NEW YORK AVENUE, N. W.
WASHINGTON DC 20005-3934

EXAMINER	
MAI, L	
ART UNIT	**PAPER NUMBER**
2819	

DATE MAILED: 11/05/01

4

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

PTO-90C (Rev. 2/95) 1- File Copy

*U.S. GPO: 2000-473-000/44602

Office Action Summary	Application No.	Applicant(s)	
	09/742,294	LAI ET AL.	
	Examiner	Art Unit	
	Lam T Mai	2819	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 December 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-5,7-18,20-33,35-37,39-42,46 and 47* is/are allowed.

6)☒ Claim(s) *6,19,34,38,43-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Specification

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 112

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

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

Claims 6, 19, and 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite in that it fails to point out "how the bit-rate, compression algorithm, communication protocol, physical can defined media content as set forth in medium (6(2)-6(5), 19(2)-19(5), 34(2)-34(5)). This claim is an omnibus type claim.

Claim 38 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted step is: receiving a transcoding request for the media content prior fetching the media content.

Claim 43 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted element is: a network interface.

Claims 44 and 45 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted step is: receiving a transcoding request for the media content prior fetching the media content.

Allowable Subject Matter

Claims 1-5, 7-18, 20-33, 35-37, 39-42 and 46-47 are allowable.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record, considered in combination or individually, fail to teach or suggest a method and system that utilize a technique of selecting the most affective transcoder from plurality of transcoders for transcoding media content over the internet.

Claims 6, 19, and 34 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Claims 38, 43-45 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lam T Mai whose telephone number is (703) 308-1703. The examiner can normally be reached on M-F 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Tokar can be reached on (703)305-3493. The fax phone numbers for

the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Lam T. Mai
Art Unit 2819
October 25, 2001

Michael J. Tokar
Michael Tokar
Supervisory Patent Examiner
Technology Center 2800

Notice of References Cited

Application/Control No.	Applicant(s)/Patent Under Reexamination	
09/742,294	LAI ET AL.	
Examiner	Art Unit	Page 1 of 1
Lam T Mai	2819	

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-3394352	07-1968	R. Wernikoff et al	341/50
*	B	US-5657015	08-1997	Nakajima et al	341/61
*	C	US-3913093	10-1975	De Vincentiis et al	341/51
*	D	US-3937881	02-1976	Hawkes	341/68
*	E	US-5526397	06-1996	Lohman	455/560
*	F	US-6215824	08-2001	Assuncao	375/240
*	G	US-6058143	05-2000	Golin	375/240
*	H	US-6058107	05-2000	Love et al	370/332
*	I	US-6339450	01-2002	Chang et al	348/470
*	J	US-5920354	07-1999	Fedele	348/446
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#5 SLange 11-21-01

In re application of:	Confirmation No. 8151
Lai *et al.*	Art Unit: 2819
Appl. No. 09/742,294	Examiner: Mai
Filed: December 22, 2000	Atty. Docket: 1968.0020000
For: **Distributed On-Demand Media Transcoding System and Method**	

Information Disclosure Statement

Commissioner for Patents
Washington, D.C. 20231

Sir:

Listed on accompanying Form PTO-1449 are documents that may be considered material to the examination of this application, in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.56, 1.97 and 1.98.

Where the publication date of a listed document does not provide a month of publication, the year of publication of the listed document is sufficiently earlier than the effective U.S. filing date and any foreign priority date so that the month of publication is not in issue. Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

Applicants have checked the appropriate boxes below.

☒ 1. This Information Disclosure Statement is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

☐ 2. This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an action that otherwise closes prosecution in the application.

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

□ c. Attached is our Check No. _____ in the amount of $ _____ in payment of the fee under 37 C.F.R. § 1.17(p).

□ 3. This Information Disclosure Statement is being filed more than three months after the U.S. filing date and after the mailing date of a Final Rejection or Notice of Allowance, but before payment of the Issue Fee. Enclosed find our Check No. _____ in the amount of $ _____ in payment of the fee under 37 C.F.R. § 1.17(p); in addition:

□ a. I hereby state that each item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

□ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

□ 4. The document(s) was/were cited in a search report by a foreign patent office in a counterpart foreign application. Submission of an English language version of the search report that indicates the degree of relevance found by the foreign office is provided in satisfaction of the requirement for a concise explanation of relevance. 1138 OG 37, 38.

□ 5. A concise explanation of the relevance of the non-English language document(s) appears below:

□ 6. Copies of the documents were cited by or submitted to the Office in an IDS that complies with 37 C.F.R. § 1.98(a)-(c) in Application No. _____, filed _____, which is relied upon for an earlier filing date under 35 U.S.C. § 120. Thus, copies of these documents are not attached. 37 C.F.R. § 1.98(d).

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO-1449, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this pleading is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Thomas C. Fiala
Attorney for Applicants
Registration No. 43,610

Date: 11/2/01

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

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2819

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JEFFREY T. HELVEY*
HEIDI L. KRAUS
JEFFREY R. KURIN
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MATTHEW J. DOWD**
AARON L. SCHWARTZ**

*LIMITED TO MATTERS AND PROCEEDINGS BEFORE FEDERAL COURTS & AGENCIES
**REGISTERED PATENT AGENT
***SENIOR COUNSEL

November 2, 2001

WRITER'S DIRECT NUMBER:
(202) 218-7835
INTERNET ADDRESS:
TFIALA@SKGF.COM

Commissioner for Patents
Washington, D.C. 20231

Art Unit ***2819***

Re: U.S. Utility Patent Application
Appl. No. 09/742,294; Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**
Inventors: Lai *et al.*
Our Ref: 1968.0020000

Sir:

Transmitted herewith for appropriate action are the following documents:

1. Information Disclosure Statement (*in duplicate*);
2. Form PTO-1449 accompanying two (2) documents; and
3. One (1) return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Thomas C. Fiala
Attorney for Applicants
Registration No. 43,610

TCF:ayh
Enclosures

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SKGF Rev. 11/01/01 mac

FORM PTO-1449

INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1968.0020000	09/742,294
APPLICANT: Lai *et al.*	
FILING DATE: December 22, 2000	GROUP: 2819

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA1						
	AB1						
	AC1						
	AD1						
	AE1						
	AF1						
	AG1						
	AH1						
	AI1						
	AJ1						
	AK1						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AL1						Yes No
	AM1						Yes No
	AN1						Yes No
	AO1						Yes No
	AP1						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

R	AR	1	Chapman, Nigel *et al.*, "Digital Multimedia," John Wiley & Sons, Ltd., Copyright 2000 (Entire book provided).
R	AS	1	Murray, James D. *et al.*, "Encyclopedia of Graphics File Formats: Second Edition," O'Reilly & Associates, Inc., Copyright 1994, 1996 (Entire book provided).
	AT	1	

EXAMINER: Sam Ne

DATE CONSIDERED: 3/19/02

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\CTWITTY\1968002.1449

SNOF Rev. 1/95

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No. 8151
Lai *et al.*	Art Unit: 2819
Appl. No. 09/742,294	Examiner: Mai
Filed: December 22, 2000	Atty. Docket: 1968.0020000
For: **Distributed On-Demand Media Transcoding System and Method**	

Information Disclosure Statement

Commissioner for Patents
Washington, D.C. 20231

Sir:

Listed on accompanying Form PTO-1449 are documents that may be considered material to the examination of this application, in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.56, 1.97 and 1.98.

Where the publication date of a listed document does not provide a month of publication, the year of publication of the listed document is sufficiently earlier than the effective U.S. filing date and any foreign priority date so that the month of publication is not in issue. Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

Applicants have checked the appropriate boxes below.

☒ 1. This Information Disclosure Statement is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

☐ 2. This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an action that otherwise closes prosecution in the application.

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

□ c. Attached is our Check No. _____ in the amount of $ _____ in payment of the fee under 37 C.F.R. § 1.17(p).

□ 3. This Information Disclosure Statement is being filed more than three months after the U.S. filing date and after the mailing date of a Final Rejection or Notice of Allowance, but before payment of the Issue Fee. Enclosed find our Check No. _____ in the amount of $ _____ in payment of the fee under 37 C.F.R. § 1.17(p); in addition:

□ a. I hereby state that each item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

□ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

□ 4. The document(s) was/were cited in a search report by a foreign patent office in a counterpart foreign application. Submission of an English language version of the search report that indicates the degree of relevance found by the foreign office is provided in satisfaction of the requirement for a concise explanation of relevance. 1138 OG 37, 38.

□ 5. A concise explanation of the relevance of the non-English language document(s) appears below:

□ 6. Copies of the documents were cited by or submitted to the Office in an IDS that complies with 37 C.F.R. § 1.98(a)-(c) in Application No. _____, filed _____, which is relied upon for an earlier filing date under 35 U.S.C. § 120. Thus, copies of these documents are not attached. 37 C.F.R. § 1.98(d).

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO-1449, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this pleading is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Thomas C. Fiala
Attorney for Applicants
Registration No. 43,610

Date: 11/2/01

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November 2, 2001

WRITER'S DIRECT NUMBER:
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INTERNET ADDRESS:
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Commissioner for Patents
Washington, D.C. 20231

Art Unit ***2819***

Re: U.S. Utility Patent Application
Appl. No. 09/742,294; Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**
Inventors: Lai *et al.*
Our Ref: 1968.0020000

Sir:

Transmitted herewith for appropriate action are the following documents:

1. Information Disclosure Statement (*in duplicate*);
2. Form PTO-1449 accompanying two (2) documents; and
3. One (1) return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Thomas C. Fiala
Attorney for Applicants
Registration No. 43,610

TCF:ayh
Enclosures

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Lai *et al.*
Appl. No. 09/742,294
Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**

Confirmation No.: 8151
Art Unit: 2819
Examiner: Lam T. Mai
Atty. Docket: 1968.0020000

Amendment And Reply Under 37 C.F.R. § 1.111

Commissioner for Patents
Washington, D.C. 20231

Sir:

In reply to the Office Action dated November 5, 2001, (PTO Prosecution File Wrapper Paper No. 4), Applicants submit the following Amendment and Remarks. This Amendment is provided in the following format:

(A) A clean version of each replacement paragraph/section/claim along with clear instructions for entry;

(B) Starting on a separate page, appropriate remarks and arguments. 37 C.F.R. § 1.111 and MPEP 714; and

(C) Starting on a separate page, a marked-up version entitled: "Version with markings to show changes made."

It is not believed that extensions of time or fees for net addition of claims are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Amendments

In the Claims:

Please substitute the following claims 38, 43-47 for pending claims 38, 43-47, respectively:

38. (Once amended) A method for transcoding media content from a source type to a destination type, comprising the steps of:

(a) receiving a request for the media content;

(b) fetching the media content;

(c) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on the source type and the destination type;

(d) sending the media content to said selected transcoder;

(e) transcoding the media content from the source type to the destination type, thereby generating transcoded media content; and

(f) transmitting said transcoded media content.

43. (Once amended) A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a network interface;

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to command said

transmitting server to fetch the media content, to select one of said plurality of transcoders based on the source type and the destination type, to command said selected transcoder to transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

44. (Once amended) A method for transcoding media content from a source type to a first destination type and a second destination type, comprising the steps of:

(a) receiving a request for the media content;

(b) fetching the media content;

(c) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said first transcoder is selected based on the source type and the first destination type;

(d) sending the media content to said first transcoder;

(e) transcoding the media content from the source type to the first destination type, thereby generating first transcoded media content;

(f) transmitting said first transcoded media content;

(g) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the source type and the second destination type;

(h) sending the media content to said second transcoder;

(i) transcoding the media content from the source type to the second destination type, thereby generating second transcoded media content; and

(j) transmitting said second transcoded media content.

45. (Once amended) A method for transcoding a first media content from a first source type to a destination type and transcoding a second media content from a second source type to the destination type, comprising the steps of:

(a) receiving a request for the first and second media content;

(b) fetching the first and second media content;

(c) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said first transcoder is selected based on the first source type and the destination type;

(d) sending the first media content to said first transcoder;

(e) transcoding the first media content from the first source type to the destination type, thereby generating first transcoded media content;

(f) transmitting said first transcoded media content;

(g) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the second source type and the destination type;

(h) sending the second media content to said second transcoder;

(i) transcoding the second media content from the second source type to the destination type, thereby generating second transcoded media content; and

(j) transmitting said second transcoded media content.

46. (Once amended) A media transcoding system for transcoding media content from a source type to a first destination type and a second destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to command said first transmitting server to fetch the media content, to select a first transcoder from said plurality of transcoders based on the source type and the first destination type, to command said first transcoder to transcode the media content from the source type to the first destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the media content, to select a second transcoder from said plurality of transcoders based on the source type and the second destination type, to

command said second transcoder to transcode the media content from the source type to the second destination type, thereby generating second transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

47. (Once amended) A media transcoding system for transcoding a first media content from a first source type to a destination type and for transcoding a second media content from a second source type to the destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to command said first transmitting server to fetch the first media content, to select a first transcoder from said plurality of transcoders based on the first source type and the destination type, to command said first transcoder to transcode the media content from the first source type to the destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the second media content, to select a second transcoder from said plurality of transcoders based on the second source type and the destination type, to command said second transcoder to transcode the second media content from the second source type to the destination type, thereby generating second transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-47 are pending in the application, with claims 1, 13, 28, 29, 35, 38, 39, and 43-47 being the independent claims. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Allowable Subject Matter

Applicants wish to thank the Examiner for the allowance of claims 1-5, 7-18, 20-33, 35-37, 39-42, 46 and 47 of the present application. Of the allowed claims, claims 46 and 47 have been amended as set forth herein in order to correct certain typographical errors in those claims. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Objection to the Title

The Examiner has indicated that the title of the application is not descriptive and required that Applicants change the title. This response does not change the title of the application. Applicants believe that the title is descriptive of the claims as pending after the above amendments. If the Examiner maintains the requirement that the title be changed, Applicants respectfully request that the Examiner suggest a new title or indicate why the Examiner believes the title is not descriptive.

Rejections under 35 U.S.C. § 112

The Examiner has rejected pending claims 6, 19 and 34 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to point out how a bit-rate, compression algorithm, communication protocol, or physical medium can define media content as recited in those claims. Applicants have carefully considered the Examiner's remarks, but believe that the claims are definite as written. The plain language of the claims reasonably apprise one skilled in the art of the scope of the invention. Further, the specification of the present application clearly teaches how each of the publishing variables recited in pending claims 6, 19 and 34 can define media content. As explained at pages 2-3 of the present application:

> Digital representations of media content come in different types. These types are generally defined according to a series of publishing variables which can include, but are not limited to, the file format, bit rate, communication protocol(s), physical medium, compression algorithm, and/or digital rights management information associated with the media content. The type of digitized media content which is used will depend upon a number of factors, such as, the computing and/or networking technology used in the process of publishing and the nature of the content itself.
>
> For example, many types of digitized media content are defined according to a file format. Common file formats include QUICK TIME, MPEG, AVI, MP3, REAL, WINDOWS MEDIA, H.263 video coding, and PALM-compatible formats. A format can define media content as a file or in a data stream. See, for example, the graphics file formats and other formats described by J. D. Murray and W. vanRyper, *The Encyclopedia of Graphics File Formats*, Second Edition (O'Reilly & Associates, Inc.: Sebastopol, CA), 1996, which is incorporated in its entirety herein by reference.
>
> Digitized media content types can also be categorized according to the type of encoding or compression technique that is used to reduce the physical size of the media content, or according to the type of physical medium that supports the storage of the media content. Different kinds of physical medium are used in publishing media content, such as magnetic or optical storage devices, memory devices, and wireless mediums.

> Digitized media content types may also be categorized by the type of communication protocol or protocols used to transmit the media content. In packet-switched networks such as the Internet, many layers of protocols are used. Such protocols can include network and transport protocols and application protocols. Network and transport protocols are in part responsible for delivering packets of digital data. Examples of network and transport protocols are Internet Protocol (IP), Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Real-Time Transport Protocol (RTP). Application protocols are higher level protocols that run on top of the network and transport protocols. Among other things, application protocols provide services that support digital media publishing. Examples of application protocols used in World Wide Web technology are HyperText Transport Protocol (HTTP) and Real-Time Streaming Protocol (RTSP).

With specific reference to the publishing variable of compression, the specification also teaches:

> Even within the same file format, digital data can be compressed according to different compression algorithms. In a QUICK TIME formatted file, for example, video can be compressed in accordance with H.263, CINEPAK, JPEG, QT ANIMATION, or QT VIDEO standards. As a further example, in a WINDOWS MEDIA ASF formatted file, audio can be compressed in accordance with the MICROSOFT AUDIO FORMAT, ACELP, VOXWARE, or MP3 standards. Compression algorithm choices can be made based on optimization according to bit-rate choices, or according to the nature of the content. For example, video files in which little motion occurs ("talking heads") and video files in which there is a substantial amount of motion ("high motion" video) may each be more efficiently compressed using different compression algorithms.

Application at pp. 36-37. Furthermore, Tables 2 through 5 of the present application provide a series of detailed examples of media content source types and destination types that may be transcoded in accordance with embodiments of the present invention, wherein the media content source types and destination types are defined by publishing variables that include physical medium, communication protocol(s), container format, encoding type, and bit rate. *See* Application at pp. 39-40.

Thus, pending claims 6, 19 and 34, read in light of the teachings of the specification, clearly point out how a bit-rate, compression algorithm, communication

protocol, or physical medium can define media content in satisfaction of 35 U.S.C. § 112, second paragraph. Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of pending claims 6, 19, and 34.

The Examiner also rejected pending claims 6, 19 and 34 under 35 U.S.C. § 112, second paragraph, as "omnibus type" claims. Applicants respectfully disagree with this rejection. Omnibus claims are claims that fail to point out what is included or excluded by the claim language. *See* MPEP § 706.03(d). A representative example of an omnibus claim is "[a] device substantially as shown and described." *Id.* In contrast, Applicants claims 6, 19 and 34 are properly formatted Markush claims[1]. For this additional reason, Applicants respectfully request that the Examiner withdraw the rejection of pending claims 6, 19, and 34.

The Examiner has also rejected pending claims 38, 44 and 45 under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting an essential step because they do not recite the step of receiving a request for the media content before fetching the media content. Applicants do not agree that this step is essential to the claimed subject matter. However, without waiver of Applicants' position in this regard, Applicants have amended each of pending claims 38, 44 and 45 to include the step of receiving a request for the media content in order to expedite allowance of the claims. Furthermore, because Applicants believe that the inventive concept was clear in the claims as originally presented, these amendments should not be considered limiting with respect to technical equivalents.

The Examiner has also rejected pending claim 43 under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting an essential element because it does not recite a network interface. Applicants do not agree that this element is essential to the claimed subject matter. However, without waiver of Applicants' position in this regard, Applicants have amended pending claim 43 to include a

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[1] The MPEP explicitly authorizes alternative claim limitations, stating that: "Alternative expressions using 'or' are acceptable, such as 'wherein R is A, B, C, or D.'" MPEP 2173.05(h). Claims 6, 19, and 34 follow this authorized format by reciting "wherein said at least one publishing variable is: (1) the file format of the media content; (2) the bit-rate of the media content; (3) the compression algorithm according to which the media content is stored; (4) the communication protocol according to which the media content is transferred; or (5) the physical medium on which the media content is stored."

network interface in order to expedite allowance of this claim. Furthermore, because Applicants believe that the inventive concept was clear in the claim as originally presented, this amendment should not be considered limiting with respect to technical equivalents.

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Thomas C. Fiala
Attorney for Applicants
Registration No. 43,610

Date: 2/5/02

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Version with markings to show changes made

Claims 38, and 43-47 have been amended as follows:

38. (Once amended) A method for transcoding media content from a source type to a destination type, comprising the steps of:

(a) receiving a request for the media content;

[(a)] (b) fetching the media content;

[(b)] (c) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on the source type and the destination type;

[(c)] (d) sending the media content to said selected transcoder;

[(d)] (e) transcoding the media content from the source type to the destination type, thereby generating transcoded media content; and

[(e)] (f) transmitting said transcoded media content.

43. (Once amended) A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a network interface;

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to command said transmitting server to fetch the media content, to select one of said plurality of transcoders based on the source type and the destination type, to command said selected transcoder to transcode the media content from the source type to the

destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

44. (Once amended) A method for transcoding media content from a source type to a first destination type and a second destination type, comprising the steps of:

(a) receiving a request for the media content;

[(a)] (b) fetching the media content;

[(b)] (c) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said first transcoder is selected based on the source type and the first destination type;

[(c)] (d) sending the media content to said first transcoder;

[(d)] (e) transcoding the media content from the source type to the first destination type, thereby generating first transcoded media content;

[(e)] (f) transmitting said first transcoded media content;

[(f)] (g) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the source type and the second destination type;

[(g)] (h) sending the media content to said second transcoder;

[(h)] (i) transcoding the media content from the source type to the second destination type, thereby generating second transcoded media content; and

[(i)] (j) transmitting said second transcoded media content.

45. (Once amended) A method for transcoding a first media content from a first source type to a destination type and transcoding a second media content from a second source type to the destination type, comprising the steps of:

(a) receiving a request for the first and second media content;

[(a)] (b) fetching the first and second media content;

[(b)] (c) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types,

wherein said first transcoder is selected based on the first source type and the destination type;

[(c)] (d) sending the first media content to said first transcoder;

[(d)] (e) transcoding the first media content from the first source type to the destination type, thereby generating first transcoded media content;

[(e)] (f) transmitting said first transcoded media content;

[(f)] (g) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the second source type and the destination type;

[(g)] (h) sending the second media content to said second transcoder;

[(h)] (i) transcoding the second media content from the second source type to the destination type, thereby generating second transcoded media content; and

[(i)] (j) transmitting said second transcoded media content.

46. (Once amended) A media transcoding system for transcoding media content from a source type to a first destination type and a second destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to [to] command said first transmitting server to fetch the media content, to select a first transcoder from said plurality of transcoders based on the source type and the first destination type, to command said first transcoder to transcode the media content from the source type to the first destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the media content, to select a second transcoder from said plurality of transcoders based on the source type and the second destination type, to command said second transcoder to transcode the media

content from the source type to the second destination type, thereby generating second transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

47. (Once amended) A media transcoding system for transcoding a first media content from a first source type to a destination type and for transcoding a second media content from a second source type to the destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to [to] command said first transmitting server to fetch the first media content, to select a first transcoder from said plurality of transcoders based on the first source type and the destination type, to command said first transcoder to transcode the media content from the first source type to the destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the second media content, to select a second transcoder from said plurality of transcoders based on the second source type and the destination type, to command said second transcoder to transcode the second media content from the second source type to the destination type, thereby generating second transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

2819

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February 5, 2002

WRITER'S DIRECT NUMBER:
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Art Unit ***2819***

Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utility Patent Application
Appl. No. 09/742,294; Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**
Inventors: Lai *et al.*
Our Ref: 1968.0020000

Sir:

Transmitted herewith for appropriate action are the following documents:

1. Amendment and Reply Under 37 C.F.R. §1.111; and
2. A return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Thomas C. Fiala
Attorney for Applicants
Registration No. 43,610

TCF:ayh
Enclosures

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SKGF Rev. 11/01/01 mac

Notice of Allowability	Application No.	Applicant(s)	
	09/742,294	LAI ET AL.	
	Examiner	Art Unit	
	Lam T Mai	2819	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *2/5/02*.
2. ☒ The allowed claim(s) is/are *1-47*.
3. ☒ The drawings filed on *22 December 2000* are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.
5. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
   (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

8. ☐ CORRECTED DRAWINGS must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No. ____.
   (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
   (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the top margin (not the back) of each sheet. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1☒ Notice of References Cited (PTO-892)
3☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
5☒ Information Disclosure Statements (PTO-1449), Paper No. ____.
7☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
2☐ Notice of Informal Patent Application (PTO-152)
4☐ Interview Summary (PTO-413), Paper No.____ .
6☐ Examiner's Amendment/Comment
8☒ Examiner's Statement of Reasons for Allowance
9☐ Other .

DETAILED ACTION

Specification

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Allowable Subject Matter

Claims 1-47 are allowable.

The following is an examiner's statement of reasons for allowance: Claims 1-47 are allowed over the prior art of record. The prior art of record fails to teach or suggest a method and a system that transcoding media content from plurality source types to plurality of destination types. In addition, prior art of record does not teach a method and system that fletch the media content then select one of plurality of transcoders for transcoding from plurality source type to a plurality of destination type based on source and destination types..

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Cited References

The prior art made of record and not replied upon is considered pertinent to application's disclosure. The cited references relate to digital code to digital code converter.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lam T Mai whose telephone number is (703) 308-1703. The examiner can normally be reached on M-F 6:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Tokar can be reached on (703)305-3493. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Lam Thanh Mai
Art Unit 2819
March 22, 2002

Michael J. Tokar

Michael Tokar
Supervisory Patent Examiner
Technology Center 2800

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
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NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 03/26/2002

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Attorneys at Law
Suite 600
1100 New York Avenue, N. W.
Washington, DC 20005-3934

EXAMINER	
MAI, LAM T	
ART UNIT	**CLASS-SUBCLASS**
2819	341-050000

DATE MAILED: 03/26/2002

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/742,294	12/22/2000	Angela C. W. Lai	1968.0020000/MVM/TCF	8151

TITLE OF INVENTION: DISTRIBUTED ON-DEMAND MEDIA TRANSCODING SYSTEM AND METHOD

TOTAL CLAIMS	APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
47	nonprovisional	YES	$640	$300	$940	06/26/2002

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above. If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is changed, pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above and notify the United States Patent and Trademark Office of the change in status, or

B. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check the box below and enclose the PUBLICATION FEE and 1/2 the ISSUE FEE shown above.

☐ Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (REV. 07-01) Approved for use through 01/31/2004.

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Complete and mail this form, together with applicable fee(s), to:

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Assistant Commissioner for Patents
Washington, D.C. 20231

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7590 03/26/2002

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Attorneys at Law
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(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/742,294	12/22/2000	Angela C. W. Lai	1968.0020000/MVM/TCF	8151

TITLE OF INVENTION: DISTRIBUTED ON-DEMAND MEDIA TRANSCODING SYSTEM AND METHOD

TOTAL CLAIMS	APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
47	nonprovisional	YES	$640	$300	$940	06/26/2002

EXAMINER	ART UNIT	CLASS-SUBCLASS
MAI, LAM T	2819	341-050000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the USPTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) ❑ individual ❑ corporation or other private group entity ❑ government

4a. The following fee(s) are enclosed:

❑ Issue Fee

❑ Publication Fee

❑ Advance Order - # of Copies _____

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❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Commissioner is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.

(Authorized Signature) (Date)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/742,294	12/22/2000	Angela C. W. Lai	1968.0020000/MVM/TCF	8151

EXAMINER
MAI, LAM T

ART UNIT	PAPER NUMBER
2819	

7590 03/26/2002

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Attorneys at Law
Suite 600
1100 New York Avenue, N. W.
Washington, DC 20005-3934

DATE MAILED: 03/26/2002

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The patent term adjustment to date is 0 days. If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the term adjustment will be 0 days.

If a continued prosecution application (CPA) was filed in the above-identified application, the filing date that determines patent term adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) system. (http://pair.uspto.gov)

PTOL-85 (REV. 07-01) Approved for use through 01/31/2004.

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APR 25 2002

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7590 03/26/2002

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Attorneys at Law
Suite 600
1100 New York Avenue, N. W.
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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/742,294	12/22/2000	Angela C. W. Lai	1968.0020000/MVM/TCF	8151

TITLE OF INVENTION: DISTRIBUTED ON-DEMAND MEDIA TRANSCODING SYSTEM AND METHOD

TOTAL CLAIMS	APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
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EXAMINER	ART UNIT	CLASS-SUBCLASS
MAI, LAM T	2819	341-050000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

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☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

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1 Sterne, Kessler,
2 Goldstein & Fox P.L.L.C.
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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(A) NAME OF ASSIGNEE: Generic Media, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Menlo Park, CA

Please check the appropriate assignee category or categories (will not be printed on the patent) ☐ individual ☒ corporation or other private group entity ☐ government

4a. The following fee(s) are enclosed:

☒ Issue Fee
☒ Publication Fee
☒ Advance Order - # of Copies 10

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(Authorized Signature) Thomas C Fiala (Date) 4/25/02

Thomas C. Fiala, Reg. No. 43,610

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04/26/2002 CV0222 00000169 09742294

01 FC:842 640.00 OP
02 FC:195 300.00 OP
03 FC:561 30.00 OP

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Sterne Kessler Goldstein Fox
ATTORNEYS AT LAW

April 25, 2002

WRITER'S DIRECT NUMBER:
(202) 218-7835
INTERNET ADDRESS:
TFIALA@SKGF.COM

Attn. Box Issue Fee

Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Allowed Utility Patent Application
Appl. No. 09/742,294; Filed: December 22, 2000
For: **Distributed On-Demand Media Transcoding System and Method**
Inventors: Lai *et al.*
Our Ref: 1968.0020000

Sir:

In response to the **Notice of Allowance and Issue Fee Due** dated **March 26, 2002**, the following documents are forwarded for appropriate action by the U.S. Patent and Trademark Office:

1. Issue Fee Transmittal (Form PTOL-85B);
2. Fee Transmittal (Form PTO/SB/17);
3. Return postcard; and
4. Our Check No. 34970 for $970.00 to cover:

$ 640.00 Issue Fee;
$ 300.00 Publication fee; and
$ 30.00 Advance copies of patent.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. If extensions of time under 37 C.F.R. § 1.136 other than those otherwise provided for herewith are required to prevent abandonment of the present patent application, then such extensions of time are hereby petitioned, and any fees therefor are hereby authorized to be charged to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Thomas C. Fiala
Attorney for Applicants
Registration No. 43,610

TCF:ahy
Enclosures

SKGF_DC1:7440.1

BRS	L1	1	media adj transcoding	USPAT
BRS	L3	0	transcoding near2 media adj content	USPAT
BRS	L4	2	transcoding near2 media	USPAT
BRS	L5	0	selecting near2 (plurality near1 transcoders)	USPAT
BRS	L6	3	selecting near2 transcoder	USPAT
BRS	L7	24	transcoding adj1 system	USPAT

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2000

Application or Docket Number

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS		
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	47 minus 20=	* 27
INDEPENDENT CLAIMS	12 minus 3 =	* 9
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	355.00	OR	BASIC FEE	710.00
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL		OR	TOTAL	

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 47	Minus	47	=
Independent	* 12	Minus	*** 12	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

(FOR USE WITH FORM PTO-875)

SERIAL NO.	FILING DATE
APPLICANT(S)	

CLAIMS

	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
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TOTAL IND.						
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TOTAL CLAIMS						

* *MAY BE USED FOR ADDITIONAL CLAIMS OR ADMENDMENTS*

FORM **PTO-1360** (REV. 3-78)

U.S.DEPARTMENT OF COMMERCE
Patent and Trademark Office

US006407680B1

(12) **United States Patent**
Lai et al.

(10) **Patent No.: US 6,407,680 B1**
(45) **Date of Patent: Jun. 18, 2002**

(54) **DISTRIBUTED ON-DEMAND MEDIA TRANSCODING SYSTEM AND METHOD**

(75) Inventors: **Angela C. W. Lai**, Mountain View; **James Peter Hoddie**, Menlo Park; **Howard E. Chartock**, Palo Alto; **Christopher V. Pirazzi**, Redwood City; **Giovanni M. Agnoli**, San Francisco; **Harry A. Chomsky**, Oakland; **Steve H. Chen**, Santa Clara; **Hitoshi Hokamura**, Sunnyvale, all of CA (US)

(73) Assignee: **Generic Media, Inc.**, Menlo Park, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/742,294**

(22) Filed: **Dec. 22, 2000**

(51) **Int. Cl.**[7] **H03M 7/00**

(52) **U.S. Cl.** **341/50**; 341/51; 341/52; 341/56; 341/62; 341/63; 341/75; 348/470; 348/192; 348/469; 348/434; 348/466; 348/384; 375/240; 375/270; 375/133; 370/255; 370/278; 370/282; 370/477; 709/203; 709/217; 709/218; 709/223; 709/229

(58) **Field of Search** 341/51, 50, 58, 341/61, 87, 65, 56; 709/203, 217, 218, 223, 229; 370/255, 278, 282, 477; 375/133, 220, 240; 348/192, 469, 434, 466, 384, 470

(56) **References Cited**

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OTHER PUBLICATIONS

Chapman, Nigel et al., "Digital Multimedia," John Wiley & Sons, Ltd., Copyright 2000 (Entire book provided).

Murray, James D. et al., "Encyclopedia of Graphics File Formats: Second Edition," O'Reilly & Associates, Inc., Copyright 1994, 1996 (Entire book provided).

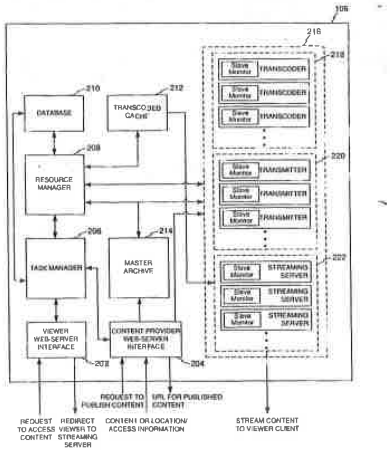
* cited by examiner

Primary Examiner—Michael Tokar
Assistant Examiner—Lam T. Mai
(74) *Attorney, Agent, or Firm*—Sterne, Kessler, Goldstein & Fox P.L.L.C.

(57) **ABSTRACT**

A system and method for the on-demand transcoding of media content from a source type to a destination type is provided, wherein the system includes a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, and wherein the system receives a transcoding request for media content, fetches the media content in response to the transcoding request, sends the media content to one of the plurality of transcoders based on the source type and destination type, transcodes the media content from the source type to the destination type, thereby generating transcoded media content, and transmits the transcoded media content. The system fetches, sends, and transcodes the media content and transmits the transcoded media content in a pipelined fashion. The system also provides for the publication of media content as a file or stream of digital data, for the archiving of media content, and the caching of transcoded media content to improve system efficiency.

47 Claims, 8 Drawing Sheets



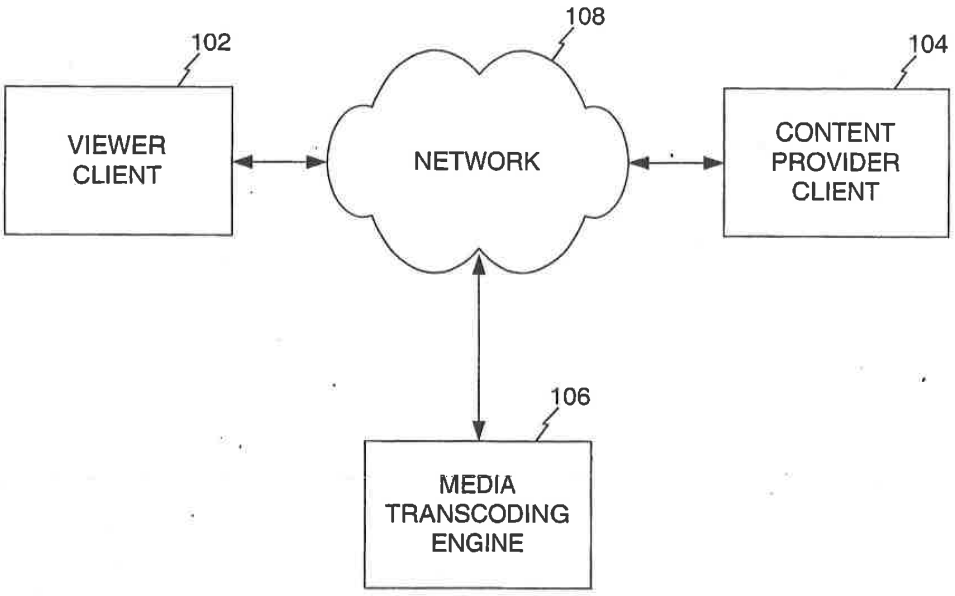

102
108
104
VIEWER CLIENT
NETWORK
CONTENT PROVIDER CLIENT
106
MEDIA TRANSCODING ENGINE

FIG. 1

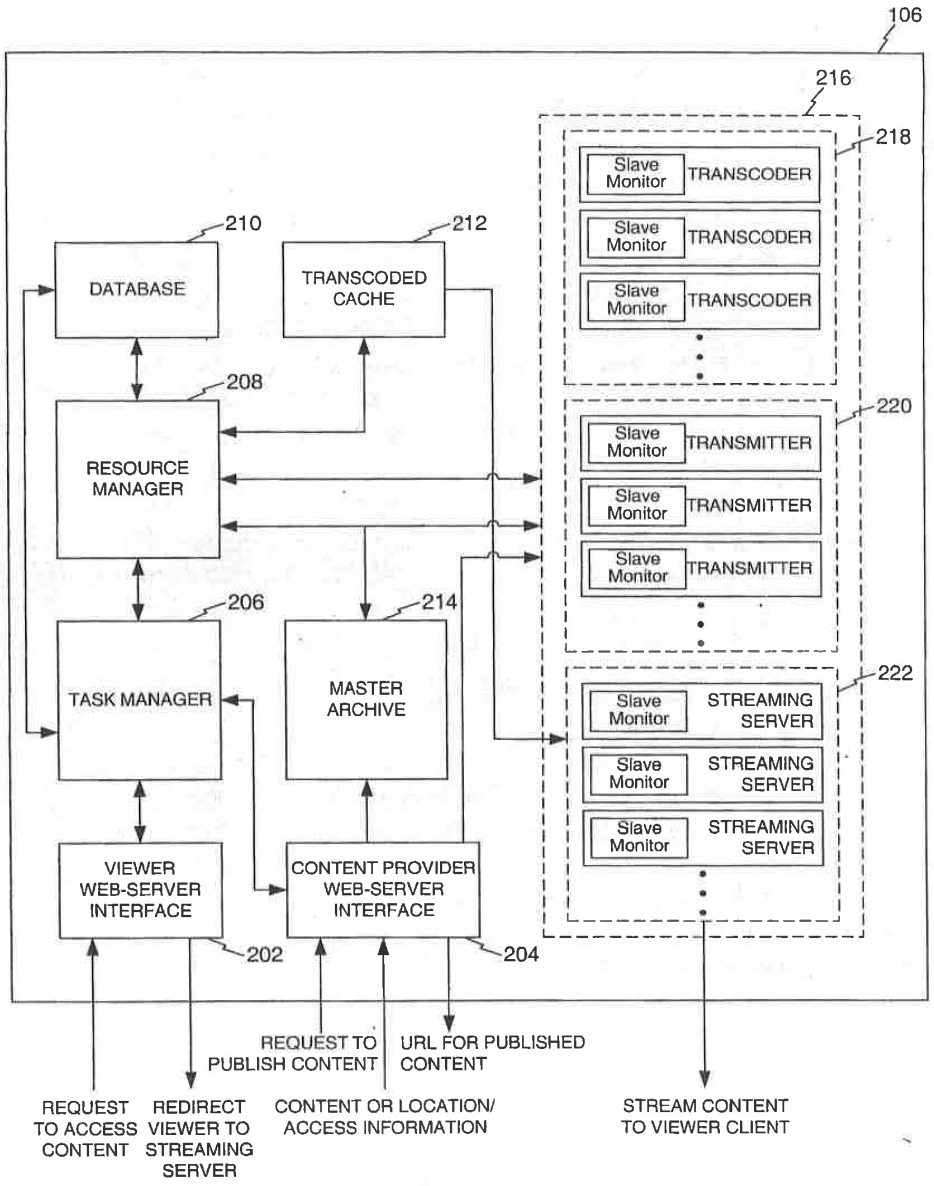

106
216
218
Slave Monitor
TRANSCODER
Slave Monitor
TRANSCODER
Slave Monitor
TRANSCODER
210
212
DATABASE
TRANSCODED CACHE
208
220
RESOURCE MANAGER
Slave Monitor
TRANSMITTER
Slave Monitor
TRANSMITTER
Slave Monitor
TRANSMITTER
206
214
222
TASK MANAGER
MASTER ARCHIVE
Slave Monitor
STREAMING SERVER
Slave Monitor
STREAMING SERVER
Slave Monitor
STREAMING SERVER
VIEWER WEB-SERVER INTERFACE
CONTENT PROVIDER WEB-SERVER INTERFACE
202
204
REQUEST TO PUBLISH CONTENT
URL FOR PUBLISHED CONTENT
REQUEST TO ACCESS CONTENT
REDIRECT VIEWER TO STREAMING SERVER
CONTENT OR LOCATION/ ACCESS INFORMATION
STREAM CONTENT TO VIEWER CLIENT

FIG. 2

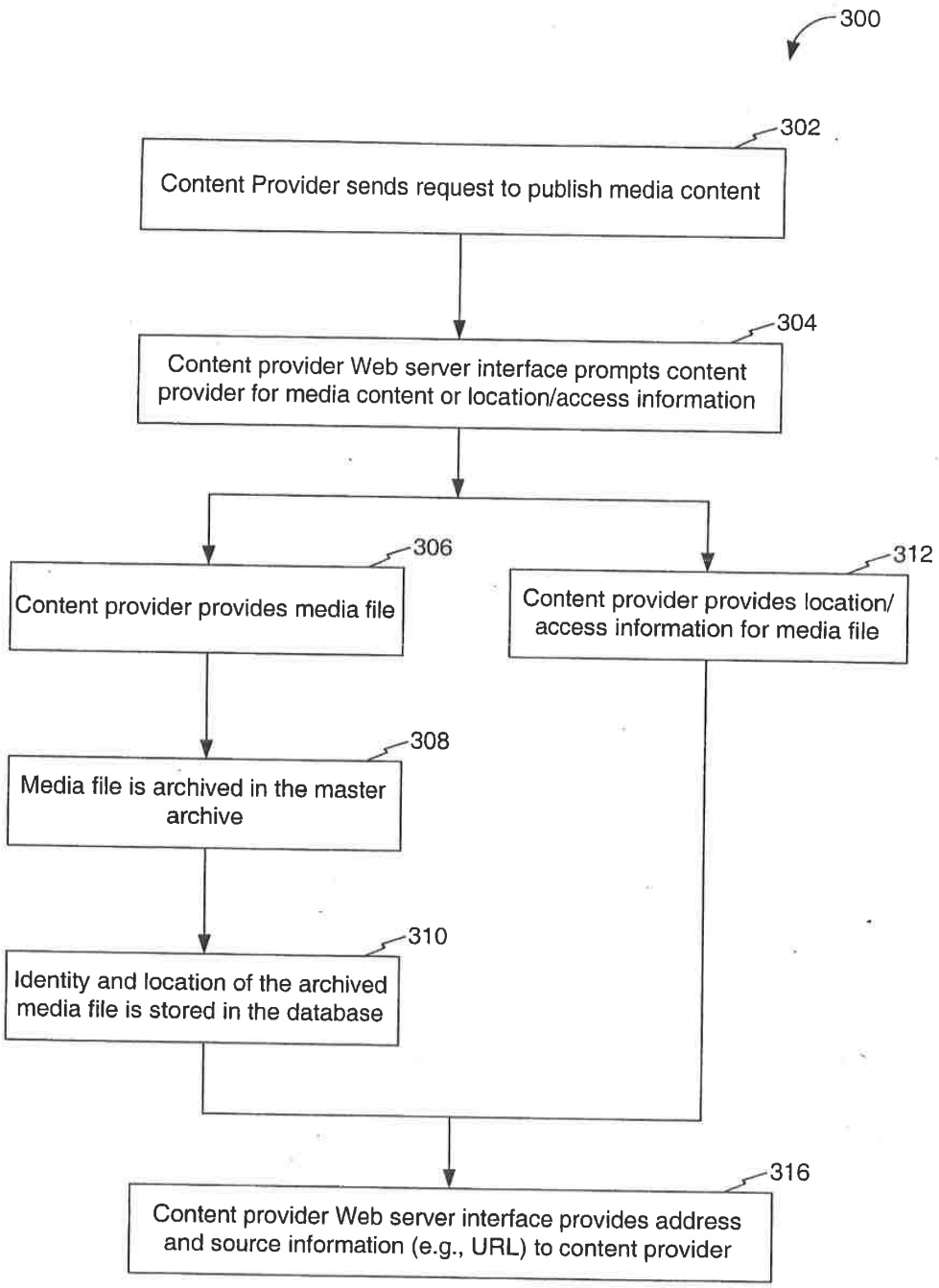

300
302
Content Provider sends request to publish media content
304
Content provider Web server interface prompts content provider for media content or location/access information
306
Content provider provides media file
312
Content provider provides location/ access information for media file
308
Media file is archived in the master archive
310
Identity and location of the archived media file is stored in the database
316
Content provider Web server interface provides address and source information (e.g., URL) to content provider

FIG. 3

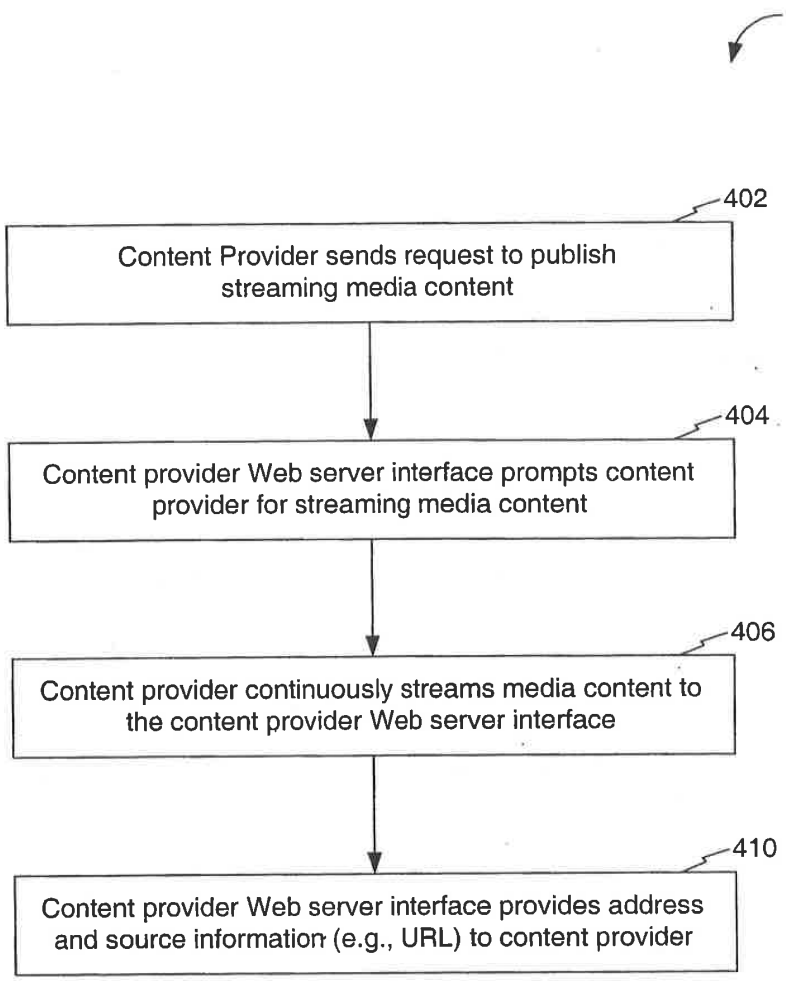

400
402
Content Provider sends request to publish streaming media content
404
Content provider Web server interface prompts content provider for streaming media content
406
Content provider continuously streams media content to the content provider Web server interface
410
Content provider Web server interface provides address and source information (e.g., URL) to content provider

FIG. 4

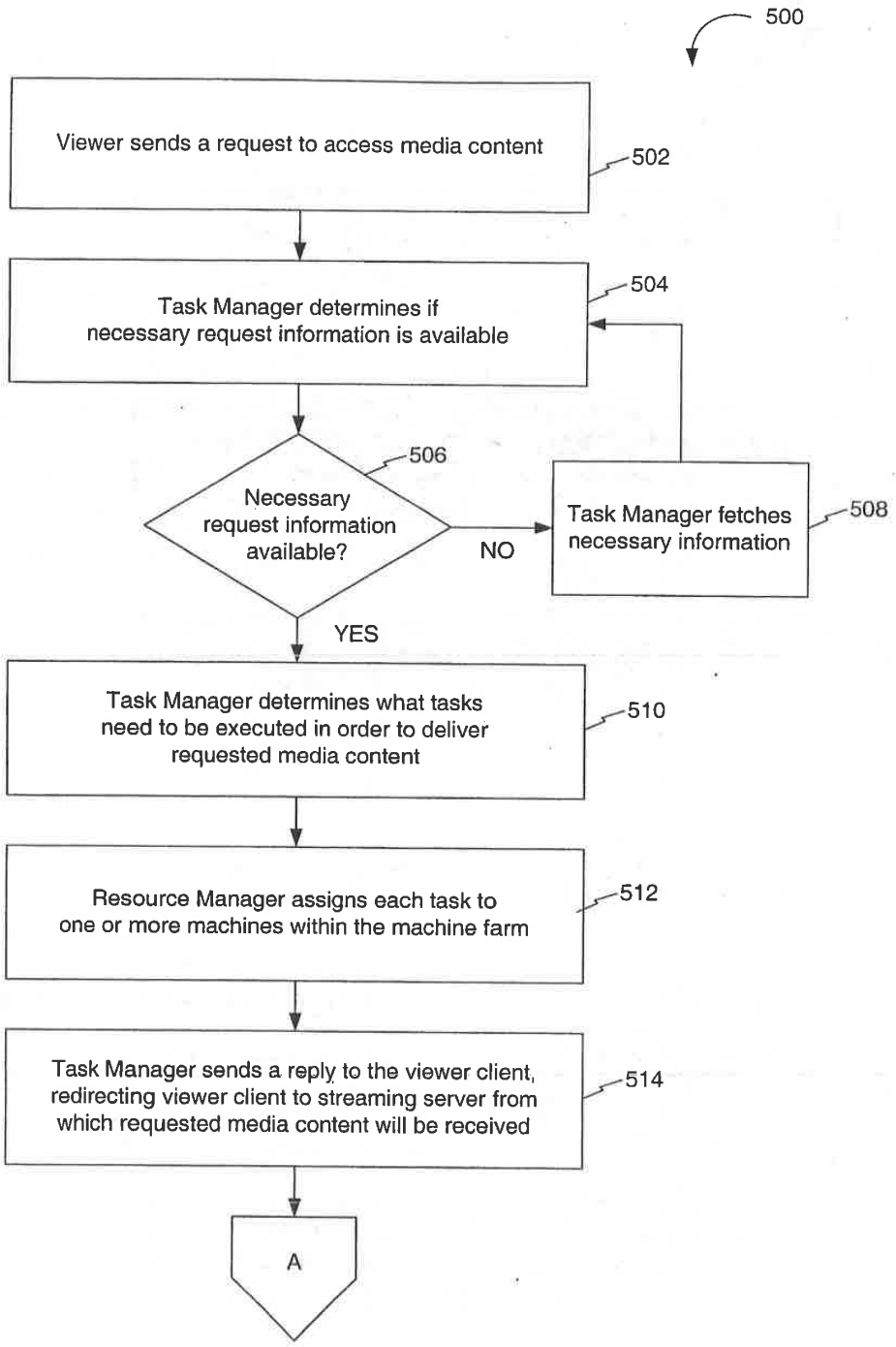

500
Viewer sends a request to access media content
502
Task Manager determines if necessary request information is available
504
Necessary request information available?
506
NO
Task Manager fetches necessary information
508
YES
Task Manager determines what tasks need to be executed in order to deliver requested media content
510
Resource Manager assigns each task to one or more machines within the machine farm
512
Task Manager sends a reply to the viewer client, redirecting viewer client to streaming server from which requested media content will be received
514
A

FIG. 5A

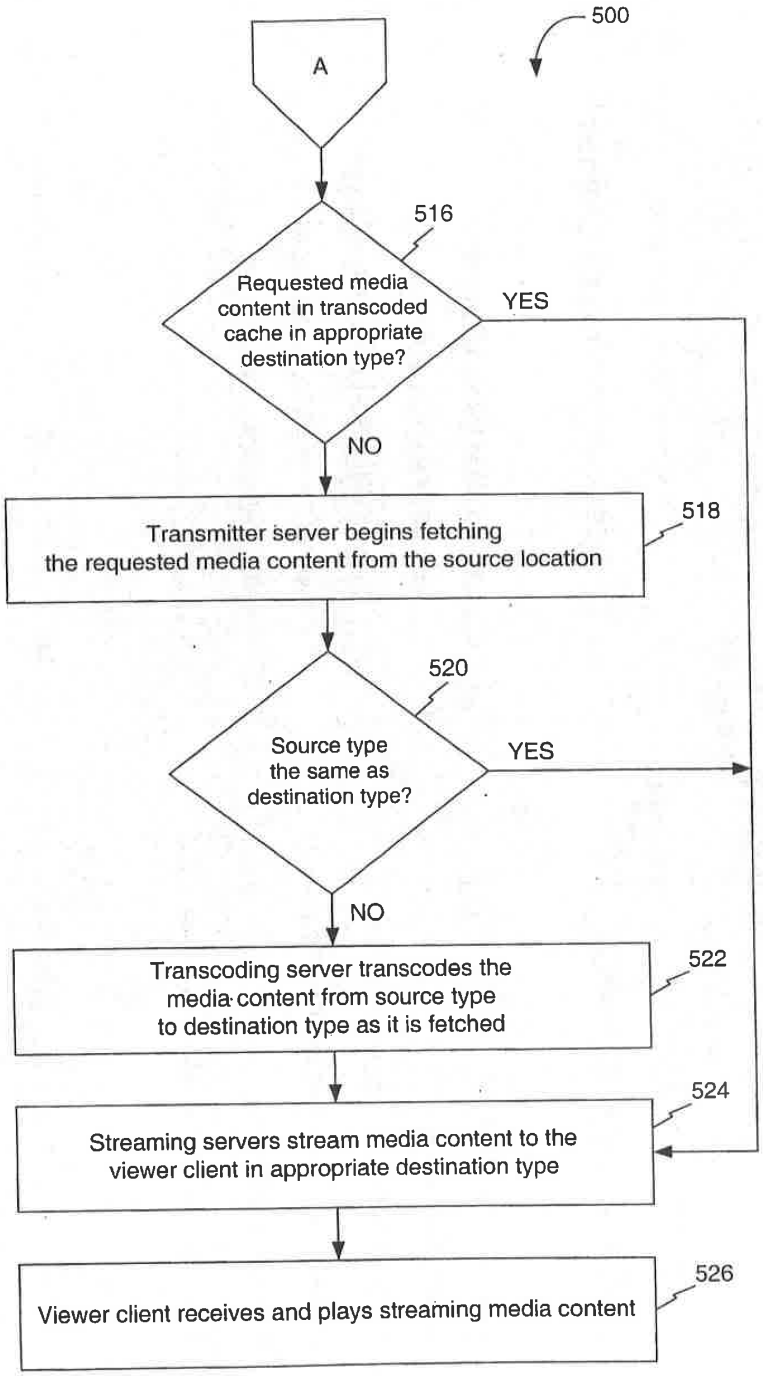

500
A
516
Requested media content in transcoded cache in appropriate destination type?
YES
NO
Transmitter server begins fetching the requested media content from the source location
518
520
Source type the same as destination type?
YES
NO
Transcoding server transcodes the media content from source type to destination type as it is fetched
522
524
Streaming servers stream media content to the viewer client in appropriate destination type
Viewer client receives and plays streaming media content
526

FIG. 5B

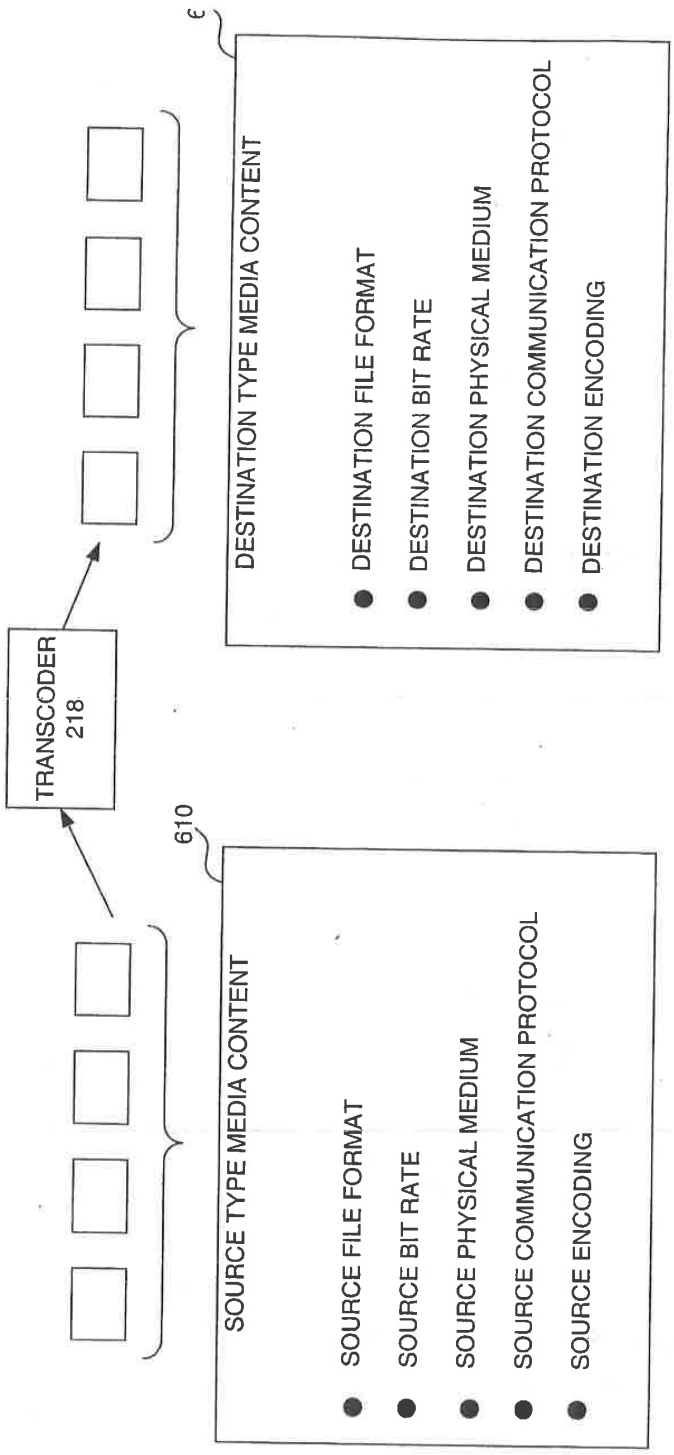

TRANSCODER
218
610
SOURCE TYPE MEDIA CONTENT
SOURCE FILE FORMAT
SOURCE BIT RATE
SOURCE PHYSICAL MEDIUM
SOURCE COMMUNICATION PROTOCOL
SOURCE ENCODING
620
DESTINATION TYPE MEDIA CONTENT
DESTINATION FILE FORMAT
DESTINATION BIT RATE
DESTINATION PHYSICAL MEDIUM
DESTINATION COMMUNICATION PROTOCOL
DESTINATION ENCODING

FIG. 6

PUBLISHING VARIABLES	SOURCE TYPE 710	DESTINATION TYPE 750	DESTINATION TYPE 760
PHYSICAL MEDIUM	LOCAL DISK	INTERNET	WIRELESS NETWORK
COMMUNICATION PROTOCOL	FILE I/O	WINDOWS MEDIA STREAMING MMS PROTOCOL	HTTP
CONTAINER FORMAT	MP3	WINDOWS MEDIA	MP3
ENCODING BIT RATE	128 kpbs	56 kbps	12 kbps

FIG. 7

DISTRIBUTED ON-DEMAND MEDIA TRANSCODING SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a system and method for transcoding information. More specifically, the present invention relates to a system and method for transcoding media content.

2. Related Art

The rapid publication of media content has been sought throughout human history. Publishers strive to deliver media content faster to larger audiences. As used herein, the term "media content" refers to any information, including audio, video, data, ideas, images, story, sound, text, or other content, that is perceived by one or more human senses.

The digital representation of media content combined with computing and networking technologies now provide a powerful way to publish. According to this new mode of publishing, networking technology permits the delivery of digitized media content over a network to end user computers. Communication protocols define how the digitized media content is exchanged over the network. A media player runs on the end user computer to allow the user to play or otherwise experience the media content.

Digital representations of media content come in different types. These types are generally defined according to a series of publishing variables which can include. but are not limited to, the file format, bit rate, communication protocol (s), physical medium, compression algorithm, and/or digital rights management information associated with the media content. The type of digitized media content which is used will depend upon a number of factors, such as, the computing and/or networking technology used in the process of publishing and the nature of the content itself.

For example, many types of digitized media content are defined according to a file format. Common file formats include QUICK TIME, MPEG, AVI, MP3, REAL, WINDOWS MEDIA, H.263 video coding, and PALM-compatible formats. A format can define media content as a file or in a data stream. See, for example, the graphics file formats and other formats described by J. D. Murray and W. vanRyper, The Encyclopedia of Graphics File Formats, Second Edition (O'Reilly & Associates, Inc.: Sebastopol, Calif.), 1996, which is incorporated in its entirety herein by reference.

Digitized media content types can also be categorized according to the type of encoding or compression technique that is used to reduce the physical size of the media content, or according to the type of physical medium that supports the storage of the media content. Different kinds of physical medium are used in publishing media content, such as magnetic or optical storage devices, memory devices, and wireless mediums.

Digitized media content types may also be categorized by the type of communication protocol or protocols used to transmit the media content. In packet-switched networks such as the Internet, many layers of protocols are used. Such protocols can include network and transport protocols and application protocols. Network and transport protocols are in part responsible for delivering packets of digital data. Examples of network and transport protocols are Internet Protocol (IP), Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Real-Time Transport Protocol (RTP). Application protocols are higher level protocols that run on top of the network and transport protocols. Among other things, application protocols provide services that support digital media publishing. Examples of application protocols used in World Wide Web technology are HyperText Transport Protocol (HTTP) and Real-Time Streaming Protocol (RTSP).

The emergence of a fast-growing number of media players has created a widening gap between the richness of the various types of media content and the diverse capabilities of the client devices to handle the content. As a result, the technology selection process for the end user has become quite complicated. For example, the user often cannot be certain that a given media player will be able to play the type of media content in which he or she is interested. Also, the user may be required to frequently download new media playing software in order to access desired content.

Furthermore, because users employ a wide variety of client media players, content providers are required to publish original media content in a number of source types in order to deliver the content to a large number of users. Content providers with archived media content also face a burden of having to publish archived media content into new or updated source types.

Transcoders convert certain types of media content (source type) to another type of media content (destination type). This conversion is known as "transcoding." Transcoding can involve a number of different conversion operations. The particular conversion operations used depend upon what publishing variables are being converted. For example, transcoding can involve a conversion operation from one encoded data format to another encoded data format (such as, converting CCITT Group 3 encoded data to RLE-encoded data.) See, Murray and vanRyper, p. 1095.

Conventional multi-type transcoding services are provided off-line, before the content provider publishes media content, adding an undesirable and unavoidable delay to the publishing process. Although arrangements for the real-time transcoding of media content are known, (e.g., transcoding and delivery of live media events over the Internet), these arrangements are limited in that they only allow for media content to be transcoded into a single destination type, and do not permit for the delivery of media content in multiple destination types.

Also, because off-line multi-format transcoding services are expensive, content providers can only afford to have their media content transcoded into a limited number of destination types. Users with media players incapable of accommodating the destination type of the transcoded files simply cannot access the content. Accordingly, conventional media production is limited to a "push" process in which content providers are forced to speculate about which media player users will employ to play their media files.

As a further result of this rapid development in media publishing technology, new internet and wireless device manufacturers must also invest heavily in the transcoding of media content so that a variety of content can be experienced on new media playing devices as new destination types. Thus, new internet and wireless device manufacturers experience the same setbacks and disadvantages from conventional transcoding schemes as described above.

SUMMARY OF THE INVENTION

The present invention is directed to a system and method for the on-demand transcoding of media content into from a plurality of source types to a plurality of destination types. In one embodiment, a method is provided for transcoding

media content from a source type to a destination type, comprising the steps of receiving a transcoding request for the media content, fetching the media content, selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types based on the source type and the destination type, sending the media content to the selected transcoder, transcoding the media content from the source type to the destination type, thereby generating a transcoded media file, and transmitting the transcoded media content.

In embodiments of the present invention, the media content may comprise either a file of digital information or a stream of digital data. In embodiments of the present invention, the media content is fetched, sent and transcoded as a stream of digital data, the transcoded media file is transmitted as a stream of digital data, and the fetching, sending, transcoding and transmitting are all performed in a pipelined fashion.

In embodiments of the present invention, the transcoding request is received over the Internet and the transcoded media content is transmitted over the Internet.

In embodiments of the present invention, the media content type is defined according to at least one publishing variable, wherein the publishing variable may be the file format of the media content, the bit-rate of the media content, the compression algorithm according to which the media content is stored, the communication protocol according to which the media content is transferred, or the physical medium on which the media content is stored, and the step of transcoding the media content comprises converting the publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

A media transcoding system in accordance with the present invention transcodes media content from a source type to a destination type. The media transcoding system includes a network interface, a resource manager, a transmitting server, a streaming server, and a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types. The network interface is adapted to receive a transcoding request for the media content. The resource manager is adapted to respond to the transcoding request and, in response to the transcoding request, to command the transcoding server to fetch the media content, to select one of the plurality of transcoders based on the source type and the destination type, to command the selected transcoder to transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command the streaming server to transmit the transcoded media content.

In embodiments of the present invention, the media content may comprise a file of digital information or a stream of digital data.

In embodiments of the present invention, the transmitting server is adapted to fetch the media content as a data stream, the selected transcoder is adapted to transcode the media content as a data stream, and the streaming server is adapted to transmit the transcoded media content as a data stream. The resource manager manages the operation of the transmitting server, the selected transcoder, and the streaming server so that the fetching, transcoding and transmitting occur in a pipelined fashion.

In embodiments of the present invention, the network interface is adapted to receive the transcoding request over the Internet and the streaming server is adapted to transmit the transcoded media content over the Internet.

In embodiments of the present invention, the media content type is defined according to at least one publishing variable, wherein the publishing variable may be the file format of the media content, the bit-rate of the media content, the compression algorithm according to which the media content is stored, the communication protocol according to which the media content is transferred, or the physical medium on which the media content is stored, and the selected transcoder is adapted to convert the publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

The invention is advantageous in that it permits the transcoding of media content on demand from a single source type to a variety of destination types in a manner that is transparent to the content provider and the user.

The invention is also advantageous in that it permits the transcoding of media content stored in files on demand from a single source type to a variety of destination types in a manner that is transparent to the content provider and the user.

Another advantage of the invention is that it permits the transcoding of live (i.e., streaming) media content on demand from a single source type to a variety of destination types in a manner that is transparent to the content provider and the user.

Another benefit of the invention is that it permits a user to play various types of media content regardless of the media player employed by the user.

Yet another benefit of the invention is that it obviates the need for a user to download a newer media player or upgrade an existing media player in order to access desired media content.

A further advantage of the invention is that it permits a content provider to provide original media content in a single source type to a large number of users using diverse media players that accept different media content types.

A further benefit of the invention is that it expedites the publishing process for media content providers by allowing them to publish media content without first employing off-line encoding services. The invention thus minimizes the time-to-market for the publication of media content.

Another benefit of the invention is that it creates a lower barrier of entry to media publication by permitting content providers to out-source necessary transcoding tasks and to avoid investment in transcoding servers and other equipment necessary for transcoding.

Yet another benefit of the invention is that it permits content providers to deliver media content to users with media players incapable of accommodating the source type of the original media content.

A further advantage of the invention is that it defers the transcoding of media content until the content is demanded by a user for a specific media player. Accordingly, content providers can avoid an unnecessary investment in the transcoding of original media content to types not requested by users.

Additional features and advantages of the invention will be set forth in the description that follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the system and method particularly pointed out in the written description and claims hereof as well as the appended drawings.

BRIEF DESCRIPTION OF THE FIGURES

The accompanying drawings, which are incorporated herein and form a part of the specification, illustrate the

present invention and, together with the description, further serve to explain the principles of the invention and to enable a person skilled in the pertinent art to make and use the invention. In the drawings:

FIG. **1** is a block diagram of a media transcoding system according to one embodiment of the present invention.

FIG. **2** is a block diagram of an example media transcoding engine according to one embodiment of the present invention.

FIG. **3** is a flowchart that describes a routine for publishing media content according to an embodiment of the present invention.

FIG. **4** is a flowchart that describes a routine for publishing media content according to an embodiment of the present invention.

FIGS. **5**A–**5**B are a flowchart that describes a routine for accessing media content according to an embodiment of the present invention.

FIG. **6** depicts an exemplary transcoder that may be used in accordance with embodiments of the present invention.

FIG. **7** is a table showing exemplary transcoding source types and destination types for various publishing variables according to an embodiment of the present invention.

The present invention will now be described with reference to the accompanying drawings. In the drawings, like reference numbers indicate identical or functionally similar elements. Additionally, the left-most digit(s) of a reference number identifies the drawing in which the reference number first appears.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

TABLE OF CONTENTS

A. Overview of the Invention

The present invention is directed to a system and method for the on-demand transcoding of media information from a variety of source types into a variety of destination types. According to the present invention, in a system comprising a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, a method is provided for transcoding media content from a source type to a destination type. The method includes receiving a transcoding request for the media content, fetching the media content, and sending the media content to a selected one of the plurality of transcoders. The transcoder is selected based on the source type and the destination type. The transcoder transcodes the media content from the source type to the destination type, thereby generating transcoded media content. The transcoded media content is then transmitted.

A media transcoding system in accordance with the present invention transcodes media content from a source type to a destination type. The transcoding system includes a network interface, a resource manager, a transmitting server, a streaming server, and a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types. The network interface receives a transcoding request for media content. The resource manager commands the transmitting server to fetch the media content. The resource manager further selects one of the plurality of transcoders based on the source type and destination type, and commands the selected transcoder to transcode the media content from the source type to the destination type to generate transcoded media content. The resource manager also commands the streaming server to transmit the transcoded media content.

The invention will now be further described with reference to FIGS. **1**–**7**.

B. Operating Environment

FIG. **1** is a block diagram representing an example operating environment **100** of the transcoding system of the present invention. It should be understood that the example operating environment **100** is shown for illustrative purposes only and does not limit the invention. Other implementations of the operating environment described herein will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein, and the invention is directed to such other implementations.

Referring to FIG. **1**, example operating environment **100** includes a viewer client **102**, a content provider client **104**, a media transcoding engine **106**, and a network **108**. Only one viewer client **102** and content provider client **104** is shown for clarity. In general, any number of these components can be included in the transcoding system of the present invention.

The viewer client **102**, the content provider client **104** and the media transcoding engine **106** are all connected via a network **108**. The network **108** connects all the components of the present invention, and can be any type of computer network or combination of networks including, but not limited to, circuit switched and/or packet switched networks, as well as wireless networks. In one example, the network **108** includes the Internet.

Any conventional communication protocol can be used to support communication between the components of the transcoding system **100**. For example, a Transmission Control Protocol/Internet Protocol (TCP/IP) suite can be used to establish links and transport data and Real-Time Streaming Protocol (RTSP) can be used to stream data between components of the transcoding system **100**. A World Wide Web-based application layer and browser (and Web server) can also be used to further facilitate communication between the components shown in FIG. **1**. However, these examples are illustrative. The present invention is not intended to be limited to a specific communication protocol or application, and other proprietary or non-proprietary network communication protocols and applications can be used.

The viewer client **102** is used by a user, or viewer. to request and receive media content via the network **108**, and to play received media content. In embodiments, the viewer client **102** is a personal computer that includes a Web browser and one or more media players running under the computer operating system. Alternately, the viewer client **102** can be a WEBTV, a WINDOWS CE device, a Personal Digital Assistant (PDA), a PALM handheld device, a console appliance with network access capability, an MP3 appliance, or any other client device and/or program capable of requesting, receiving and playing media content. However, the invention is not limited to these examples, and one skilled in the art will appreciate that a wide variety of

client devices and programs can be used to request, receive and play media content via the network **108**. The invention is directed to such other client devices and programs.

The viewer client **102** is capable of receiving and playing various types of media content. For example, the viewer client may receive and play media content in various well-known encoded formats including, but not limited to, MPEG, AVI, MP3, REAL, WINDOWS MEDIA, QUICK TIME, H.263 video coding, and PALM-compatible formats.

The content provider client **104** is used by the content provider to publish and/or transmit media content over the network **108**. In embodiments, the content provider client **104** includes a client workstation and media input device and/or program. For example, the content provider client **104** may comprise a personal computer with an attached media input device. The content provider client **104** can provide media content using a variety of media input devices and programs. For example, media content can be provided using cameras (8 mm, Hi-8, or any video digitizing device), line-in/microphone (either attached to any of the camera devices. or stand-alone audio input devices), digital cameras, devices that upload slide shows with voice-over illustrations, files previously encoded in a client-chosen format, or files available via a network accessible mount point (such as, but not limited to, Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), or remote servers). These examples are not limiting, and one skilled in the art will appreciate that a wide variety of client devices and programs can be used to publish and/or transmit media content via the network **108**. and that the invention is directed to such client devices and programs.

The content provider client **104** is capable of publishing and/or transmitting various types of media content. For example, the content provider client **104** can provide multimedia files in various well-known encoded formats including, but not limited to, MPEG, AVI, MP3, REAL, WINDOWS MEDIA, QUICK TIME, H.263 video coding, and PALM-compatible formats.

The media transcoding engine **106** acts as an intermediate between the content provider client **104** and the viewer client **102**. As will be described in more detail below, the media transcoding engine **106** receives requests for media content from the viewer client **102** and obtains the requested media content from the content provider client **104**. The media transcoding engine **106** then transcodes the media content received from the content provider client **104** from a source type to a destination type that can be accommodated by the viewer client **102** and delivers the transcoded media content to the viewer client **102**. The media transcoding engine **106** performs the transcoding and delivery of the requested media content on-demand in a manner that is transparent to the content provider as well as the viewer of the media content.

In accordance with the present invention, because the media transcoding engine **106** can transcode media content into a variety of destination types, the content provider can provide media content using a single media input device and still deliver the content to viewers using a variety of different media players, each of which requires a different destination type. Additionally, the present invention permits users to access a variety of media content published in different source types no matter what media player they are using. The media transcoding engine **106** of FIG. **1** will now be described in more detail.

C. Media Transcoding Engine of the Present Invention

FIG. **2** is a block diagram of the media transcoding engine **106** according to an embodiment of the present invention. The media transcoding engine **106** is comprised of a number of components including a viewer Web server interface **202**, a content provider Web server interface **204**, a task manager **206**, a resource manager **208**, a database **210**, a transcoded cache **212**, a master archive **214**, a machine farm **216**, and, within the machine farm **216**, transcoder servers **218**, transmitter servers **220**, and streaming servers **222**. The components of the media transcoding engine **106** are each operably connected to each other by an internal computer network represented, in part, by the arrows connecting the components in FIG. **2**. The computer network can include one or more computer buses for connecting components co-existing on the same server, as well as any other type of communication infrastructure for connecting remote components including, but not limited to, circuit switched and/or packet switched networks, as well as wireless networks. In embodiments, the network connecting the components within the media transcoding engine **106** includes a local area network (LAN).

Each of the components of the media transcoding engine **106** will now be described.

The content provider Web server interface **204** is a network interface between the media transcoding engine **106** and the content provider client **104** that permits a content provider to publish media content. The content provider Web server interface **204** receives and processes a request to publish media content from the content provider client **104**. In embodiments. the content provider Web server interface **204** also receives the media content itself from the content provider client **104** for archival purposes within the media transcoding engine **106**. Alternately, the content provider Web server interface **204** receives location and access information from the content provider client **104**, which permits the media transcoding engine **106** to locate and fetch the media content at a later time for transcoding and/or delivery of the media content to a viewer.

In embodiments, the content provider can download a software tool or "plug-in" from the content provider Web server interface **204** that facilitates the delivery of media content from the content provider client **104** to the content provider Web server interface **204**. The tool provides a configurable interface that resides on the content provider client **104** and permits the content provider to upload various types of media content to the content provider Web server interface **204**.

After it receives the media content, or, alternately, the necessary location and access information for fetching the media content, the content provider Web server interface **204** returns address and source information to the content provider client **104**. The address information points viewers who request the content provider's media content to the media transcoding engine **106** and the source information provides information concerning the source of the requested media content. As shown in FIG. **2**, in embodiments of the present invention, the address and source information comprise a URL (Uniform Resource Locator) that points the viewer client to the media transcoding engine **106** and provides information to the media transcoding engine **106** about the source of the requested media content. Content providers can post the URL as a link on their Web-site, thereby allowing viewers who visit their Web-site to click on the URL in order to access the media content via the media transcoding engine **106**.

The viewer Web server interface **202** is a network interface between the media transcoding engine **106** and the viewer client **102** that permits media content to be requested by and delivered to a viewer. The viewer Web server

interface **202** receives and processes a request to access media content from the viewer client **102**, thereby initiating the transcoding and delivery of the requested media content to the viewer client **102**. Because transcoded media content is streamed to the viewer client **102** by a streaming server and/or proxy server as will be discussed in more detail herein, the viewer Web server interface **202** sends a reply to the viewer client **102** redirecting the viewer client **102** to the appropriate server from which to receive the requested media content.

The media transcoding engine **106** is adapted to deliver requested media content to the viewer client **102** in an optimal destination type. The optimal destination type for the viewer client **102** may be determined in a number of ways.

In embodiments, the viewer can download a software tool or "plug-in" from the viewer Web server interface **202** that facilitates the delivery of media content from the media transcoding engine **106** to the viewer client **102**. The tool is a program that runs on the viewer client **102** and assists in determining the optimal destination type for the viewer client **102** to receive and play media content. In embodiments, the optimal destination type may be determined either by automatic tests run on the viewer client **102**, or by requiring the viewer to provide system and preference information explicitly. The optimal destination type may then be stored by the software tool as a "cookie" on the viewer client **102** for future reference by the media transcoding engine **106**.

Alternatively, the optimal destination type may be stored in a database within the media transcoding engine **106**, and a "cookie" may be stored on the viewer client **102** that simply identifies the user. Then, when the media transcoding engine **106** is required to transcode media content for delivery the viewer client **102**, it may read the cookie and map the identification of the user to the database to obtain the optimal destination type.

In further embodiments, the optimal configuration can be made adjustable for more sophisticated users, or may be updated periodically in case of network condition changes between the viewer client **102** and the network **108** (e.g., change of Internet Service Provider, or change of connection speed).

As described above, the content provider Web server interface **204** and the viewer Web server interface **202** each comprise network interfaces. In embodiments, the content provider Web server interface **204** and the viewer Web server interface **202** each comprise a Web server. In alternate embodiments, the content provider Web server interface **204** and the viewer Web server interface **202** each comprise a load-balancer that redirects requests to other physical Web servers (in other words, they are virtual Web servers).

The task manager **206** is a component of the media transcoding engine **106** that processes requests for media content received from the viewer Web server interface **202**. The task manager determines whether the media transcoding engine **106** has all the information necessary to deliver the requested media content, gathers any missing information, and determines what tasks need to be executed to deliver the requested media content. The task manager then interacts with the resource manager **208** to execute the required tasks.

The resource manager **208** is a program that determines what resources are available within the media transcoding engine **106** to carry out the tasks necessary to deliver the requested media content (e.g., fetching and transcoding the requested media content), allocates the necessary tasks to the appropriate resources, and then manages the tasks to completion. In a sense, the resource manager **208** works like a traditional load balancer. However, whereas a traditional load balancer operates by managing a virtual machine consisting of a set of machines that perform separate and identical tasks, the resource manager distributes tasks that are often different and interdependent. The process by which the resource manager **208** distributes tasks and allocates resources will be described in more detail below.

Although FIG. **2** shows only one resource manager **208**, it will be understood by one of ordinary skill in the relevant art(s) that alternate embodiments of the media transcoding engine **106** can include more than one resource manager for allocating tasks and resources within the media transcoding engine **106**.

In embodiments, the task manager **206** and the resource manager **208** may be implemented as software running on one or more general purpose server(s) within the media transcoding engine **106**.

The machine farm **216** includes a plurality of individual servers for performing the transcoding and delivery of requested media content within the media transcoding engine **106**. The machine farm **216** includes transmitter servers **220** that fetch the source data for the requested media content, transcoder servers **218** that transcode the source data to the appropriate destination type, and streaming servers **222** that stream the transcoded media content to the viewer client **102** or to a proxy server for delivery to the viewer client **102**.

The transmitter servers **220** run transmitter software that permits them to fetch the requested media content from a source location and transmit it to one of the transcoder servers **218**, streaming servers **222**, or a proxy server (not shown).

The transcoder servers **218** run transcoder software that permit them to transcode from a variety of known source types to a variety of known destination types. In embodiments, the machine farm **216** is implemented utilizing a plug-in architecture that permits new transcoding services to be added incrementally, thereby ensuring that the media transcoding engine **106** can accommodate new media types.

In alternate embodiments of the present invention, a single server may perform both the transmitter and transcoder functions. In further alternate embodiments. the transmitting of requested media content may be carried out by software external to the media transcoding engine **106**. For example, the transmitting of requested media content may be executed by software residing on the content provider client **104**.

In embodiments, each streaming server within the machine farm **216** is a type-specific streaming server dedicated to the delivery of media content of a single type. For example, a streaming server within the machine farm **216** may be dedicated to delivering transcoded media content in REAL format, WINDOWS MEDIA format, QUICK TIME format, etc. The streaming servers **222** within the machine farm may run off-the-shelf industry-standard streaming server programs, streaming server programs that are implemented according to a public standard, or proprietary streaming server programs.

In addition to streaming media content to the viewer client **102**, the streaming servers **222** keep usage statistics pertaining to the media content being delivered as well as the destination types in which the media content is being delivered. The streaming servers **222** provide the usage statistics to the resource manager **208**. thereby permitting the resource manager **208** to perform cache management

functions within the media transcoding engine **106**. For example, such usage statistics permit the resource manager **208** to cache the most frequently requested transcoded media content in the most frequently requested destination types. The caching of transcoded media content will be further described in regard to the transcoded cache **212**, below.

In alternate embodiments, the tracking of usage statistics is carried out by an optional proxy server (not shown) that channels streaming media content from the streaming servers **222** to the viewer client **102**. Such an implementation may be desired where the streaming servers **222** are not capable of tracking usage statistics.

As shown in FIG. **2**, each server within the machine farm **216** includes a slave monitor that serves as an interface between the server and the resource manager **208**. The slave monitor operates to receive tasks from the resource manager **208**, to initialize the tasks within the server, and to report the status of initialized tasks, including the reporting of the failure or completion of an assigned task. By reporting the status of each task within a server, the slave monitor thereby permits the resource manager **208** to manage the execution of all the tasks within the media transcoding engine **106**.

In an alternate embodiment, the slave monitor only initiates tasks received from the resource manager **208**, and the tasks themselves report directly to the resource manager **208** rather than to the slave monitor.

The database **210** is used by the resource manager **208** to assist in managing tasks and resources within the media transcoding engine **106**. The database **210** stores information concerning the status of each active and pending task as well as information concerning the status of each resource within the machine farm **216**, thereby aiding the resource manager **208** in determining which resources are currently available to the resource manager **208** for executing necessary tasks.

The database **210** is also used by the task manager **206** to keep track of published media content archived within the media transcoding engine **106**. The database **210** maintains source information about such published media content including the identity, source location, and source type of the media content, when available.

The database **210** can be implemented using any type of database structure known in the art for storing data, including, but not limited to, relational databases, object-oriented databases, flat-file databases or inverted-list databases. In embodiments, the database **210** can be stored on one or more general purpose servers, file servers, or network attached storage appliances internal to the media transcoding engine **106**.

The master archive **214** is an archive within the media transcoding engine **106** that stores the original media content published by the content provider and received by the content provider Web server interface **204** from the content provider client **104**. Also, where the media transcoding engine **106** is required to fetch original media content from a location outside the media transcoding engine **106**, the media transcoding engine **106** can cache a copy of the original media content in the master archive **214**. By caching a copy of the original media content in the master archive **214**, the media transcoding engine **106** avoids having to fetch the original media content from outside the internal network of the engine when a subsequent request for the same media content is received.

The transcoded cache **212** is a cache within media transcoding engine **106**. The transcoded cache **212** is used by the media transcoding engine **106** to store a copy of requested media content after it has been transcoded. When subsequent requests are received for the same media content in the same destination type, the media transcoding engine **106** delivers the content from the transcoded cache, thereby avoiding the expensive CPU overhead of repeatedly transcoding the same media content.

The resource manager **208** keeps track of what is cached within the master archive **214** and the transcoded cache **212** and manages the utilization of each cache using intelligent algorithms. In embodiments, the intelligent algorithm used by the resource manager **208** to manage the utilization of each cache is based on usage statistics received from the streaming servers **222** and/or optional proxy servers (not shown), as discussed above, regarding the frequency with which media content is requested in various destination types. For example, in embodiments, the resource manager **208** uses a Least-Recently-Used algorithm to determine whether a certain copy of media content should be retained within a cache or discarded. According to a Least-Recently-Used algorithm, a copy of media content is discarded if it has not met a predetermined threshold for a number of accesses in a given time. This example is not limiting and one skilled in the relevant art(s) will appreciate that any number of intelligent algorithms known in the art may be used to manage the utilization of the master archive **214** and the transcoded cache **212**. Such intelligent algorithms are within the scope and spirit of the present invention.

In embodiments, the master archive **214** and/or the transcoded cache **212** are implemented as one or more network attached storage appliances coupled to the internal network within the media transcoding engine **106**. However, the invention is not so limited, and any suitable storage device may be used to implement the master archive **214** and/or the transcoded cache **212**, including but not limited to, general-purpose servers running caching software, file servers, one or more disk arrays, or a storage area network (SAN).

The methods by which media content is published and accessed according to embodiments of the present invention will now be described.

D. Publishing of Media Content According to Embodiments of the Present Invention

In embodiments of the present invention, media content may be published either as an encoded file or delivered as a continuous stream of data, as in the case of a live audio or video feed.

FIG. **3** depicts a flowchart **300** of a method by which media content is published according to embodiments of the present invention wherein the media content is an encoded media file. The invention, however, is not limited to the description provided by the flowchart **300**. Rather, it will be apparent to persons skilled in the art from the teachings herein that other functional flows are within the scope and spirit of the present invention.

In step **302**, the content provider sends a request to publish content from the content provider client **104** to the content provider Web server interface **204**. In embodiments, the request comprises an HTTP request.

In step **304**, the content provider Web Server interface **204** sends a prompt to the content provider client **104** asking for the media content itself or the necessary location and access information to fetch the media content. As discussed above, according to embodiments of the present invention, the content provider can either archive media content within the media transcoding engine **106**, or can store media content in an alternate location outside of the media transcoding engine **106**, such as on the content provider's own server.

As shown in step **306**, where the content provider wishes to store the encoded media file in an archive within the media transcoding engine **106**, the content provider delivers the media file to the content provider Web server interface **204** via the content provider client **104**. At step **308**, after the content provider Web server interface **204** receives the encoded media file, it transmits the file to the master archive **214** for archival within the media transcoding engine **106**. From the master archive **214**, the encoded file is available to the resource manager **208** and other components of the media transcoding engine **106**. At step **310**. the identity and location of the archived file is reported by the content provider Web-Server interface **204** to the task manager **206**, which stores the information within the database **210** for future reference. In embodiments, the source type of the archived file is also stored within the database **210** for future reference.

As shown in step **312**, where the content provider wishes to store the encoded media file in an alternate location outside of the media transcoding engine **106**, the content provider provides the location and access information necessary to fetch the encoded media file to the content provider Web server interface **204** via the content provider client **104**.

At step **316**, after receiving either the encoded media file or the location and access information necessary to fetch the encoded media file, the content provider Web server interface **204** provides the content provider client **104** with address and source information. The address information points viewers who request the content provider's media content to the media transcoding engine **106** and the source information provides information concerning the source of the requested media content. Where the encoded media file is stored in an alternate location outside of the media transcoding engine **106**, the source information includes the location and access information provided by the content provider in earlier step **312**.

In embodiments, the address and source information comprises a URL (Uniform Resource Locator) that points the viewer client **102** to the media transcoding engine **106** and provides information to the media transcoding engine **106** about the source of the requested media content. Content providers can post the URL as a link on their web-site, thereby allowing viewers who visit their web-site to click on the URL in order to access the media content via the media transcoding engine **106**.

After step **316**, the flowchart **300** ends.

FIG. **4** depicts a flowchart **400** of a method by which media content is published according to embodiments of the present invention wherein the media content is delivered as a continuous stream of data, as in the case of a live audio or video feed. The invention, however, is not limited to the description provided by the flowchart **400**. Rather, it will be apparent to persons skilled in the art from the teachings herein that other functional flows are within the scope and spirit of the present invention.

In step **402**. the content provider sends a request to publish streaming media content from the content provider client **104** to the content provider Web server interface **204**. In embodiments, the request comprises an HTTP request.

In step **404**. the content provider Web Server interface **204** sends a prompt to the content provider client **104** asking for the streaming media content.

As shown in step **406**, the content provider continuously streams the media content to the content provider Web server interface **204** via the content provider client **104**.

At step **410**, after receiving the streaming media content, the content provider Web server interface **204** provides the content provider client **104** with address and source information. The address information points viewers who request the content provider's media content to the media transcoding engine **106** and the source information provides information concerning the source of the requested media content. In embodiments, the address and source information comprises a URL (Uniform Resource Locator) that points the viewer client **102** to the media transcoding engine **106** and provides information to the media transcoding engine **106** about the source of the requested media content. Content providers can post the URL as a link on their web-site, thereby allowing viewers who visit their web-site to click on the URL in order to access the media content via the media transcoding engine **106**.

After step **410**, the flowchart **400** ends.

Methods by which published media content is accessed by a viewer according to embodiments of the present invention will now be described.

E. Accessing Media Content According to Embodiments of the Present Invention

As described herein, embodiments of the present invention perform the transcoding of media content on demand, in response to a viewer's request to access media content. Additionally, embodiments of the present invention essentially perform the transcoding of media content in "real-time" after the publication of the media content, as part of the media content delivery process. In particular embodiments of the present invention, the delay between the submission of a request to view media content to the media transcoding engine **106** and the delivery of the media content to the viewer client **102** will be approximately thirty seconds or less. However, the invention is not limited to a specific delivery time and can encompass a variety of delivery times greater than or less than thirty seconds.

FIG. **5** depicts a flowchart **500** of a method by which media content is accessed by a viewer according to embodiments of the present invention. The invention, however, is not limited to the description provided by the flowchart **500**. Rather, it will be apparent to persons skilled in the art from the teachings herein that other functional flows are within the scope and the spirit of the present invention.

In step **502**, the viewer sends a request to access media content via the viewer client **102** to the viewer Web server interface **202** within the media transcoding engine **106**. In embodiments, the request is an HTTP request generated by the viewer client **102** when the viewer clicks on a URL on the content provider's web-site. As discussed above, the URL link, which may be provided by the media transcoding engine **106** to the content provider during the media content publishing process, contains address information and source information that points the viewer client **102** to the media transcoding engine **106** and provides information to the media transcoding engine **106** about the source of the requested media content.

After the viewer Web server interface **202** receives the request, it forwards it to the task manager **206**.

In step **504**, the task manager **206** parses the request to determine if the necessary request information is included in order to service the request. In embodiments of the invention where the request comprises an HTTP request, the task manager **206** parses the header of the HTTP request to determine if the necessary information is included in order to service the request. In embodiments, the necessary information includes at least a source location, a source type, a destination location, and a destination type. The source type and destination type are each defined by at least one publishing variable. In embodiments, publishing variables for

media content can include, but are not limited to, the file format, bit rate, communication protocol(s), physical medium, compression algorithm, digital rights management information, or any combination thereof. In one embodiment, the information required for servicing the request includes at least a source location, a source format, a source bit-rate, a destination location, a destination format, and a destination bit rate.

If the task manager **206** determines that the request information is not complete, the task manager **206** will fetch the necessary information as shown in steps **506** and **508**. For example, if the source type or source location is not included in the request and the requested media content is stored within the media transcoding engine **106**, the task manager **206** can consult the database **210** to find the necessary source information. Alternately, if the media content is stored externally with respect to the media transcoding engine **106**, the task manager **206** can perform a network request to fetch the necessary information from the content provider's web-site. For example, the task manager **206** can perform an HTTP request, an RTSP request, or a request using any other standard network application protocol. Additionally, if the destination type is not available, the task manager **206** can fetch the needed information by querying the viewer client **102**. As discussed above, in embodiments, the optimal destination type for the destination location may be stored as a "cookie" on the viewer client **102**, which may be accessed by the task manager **206**.

At step **510**, once the task manager **206** has the necessary information to service the request, it then determines what tasks need to be executed in order to deliver the requested media content. The tasks include all the steps necessary to deliver the requested media content, and may include fetching the requested media content, transcoding the requested media content from the source type into the destination type, and streaming the transcoded media content to the viewer client **102**. Once the task manager **206** has determined what tasks need to be executed, it then interfaces with the resource manager **208** and instructs the resource manager **208** to execute the required tasks.

The resource manager **208** receives the instruction to execute the required tasks from the task manager **206** and. at step **512**, assigns each task to one or more machines within the machine farm **216**. The resource manager **208** is programmed to achieve an efficient execution of tasks by the available resources. In embodiments, the allocation of resources to a given task by the resource manager **208** is determined based on a variety of factors including, but not limited to, which machines support the necessary utilities for performing the required task, which machines have available resources (for example, available CPU), and which machines can coordinate with each other to carry out the task when coordination is required for execution. The resource manager **208** can also be programmed to distribute tasks based on a variety of other criteria including the avoidance of network congestion. For example, the resource manager **208** may be programmed to assign decompression and compression tasks to the same machine in order to avoid the network congestion that may result from transmitting uncompressed data from one machine to another within the internal network of the media transcoding engine **106**.

In accordance with the present invention, the resource manager **208** oversees tasks after they are assigned to make sure that they are properly executed. The resource manager **208** oversees the execution of assigned tasks by maintaining a list of all assigned tasks in the database **210** and periodically communicating with the slave monitor of each machine running a given task in order to determine the status of the task.

In embodiments, the resource manager **208** periodically polls the slave monitor of the machine to which the task has been assigned to determine the status of the task. In alternate embodiments, the slave monitor itself sends periodic status messages to the resource manager **208**, informing it of the status of an assigned task. The resource manager **208** stores information that it receives from the slave monitors about the status of each task and each machine in the database in order to assist in its function of assigning and monitoring necessary tasks.

In an alternate embodiment of the present invention, the slave monitors only initiate tasks received from the resource manager **208**, and the tasks themselves report directly to the resource manager **208** rather than to the slave monitors.

The resource manager **208** monitors each assigned task in accordance with a fault tolerance routine that permits the resource manager **208** to determine when a task has failed and to execute the necessary steps for correcting the problem and ensuring the delivery of the requested media content. For example, if a machine to which a task has been assigned does not respond to a status query for a predetermined period of time, the resource manager **208** can be programmed to reassign the task to a different machine and re-boot the machine that is not responding. Additionally, where the failure of a task also results in the failure of a chain of distributed dependent tasks, the resource manager **208** can be programmed to shut down all the dependent tasks and re-assign the entire set of tasks in order to ensure the delivery of the requested media content. These examples are not limiting, and other fault tolerance schemes will be apparent to one of ordinary skill in the relevant art based on the teachings contained herein, and the invention is directed to such other fault tolerance schemes.

In a further embodiment of the present invention, individual tasks are each assigned a priority. The resource manager **208** monitors new tasks and when the priority of an existing task is lower than that of a new task that needs to be assigned, the resource manager **208** will instruct the existing task to kill itself to accommodate the new higher-priority task. Alternately, the slave monitor can kill the existing task. An example of a low priority task includes the transcoding of media content for a viewer after the viewer has stopped viewing the requested content.

At step **514**, after all the tasks have been assigned, the task manager **206** constructs a reply to the initial request to access media content received from the viewer client **102**. The reply serves to redirect the viewer client **102** to a streaming server or proxy server from which the requested media content will ultimately be received by the viewer client **102**. In embodiments, the reply comprises an HTTP reply.

At steps **516–526**, the machines within the machine farm **216** perform the steps necessary to deliver the requested media content in accordance with the assigned tasks received from the resource manager **208**. In embodiments of the present invention, the delivery of media content is a pipelined process in which the fetching, transcoding and streaming of different portions of the same media content stream may occur simultaneously. The resource manager **208** arranges for the pipelining of these steps through resource allocation within the media transcoding engine **106**. The pipelining of these steps results in a faster delivery time for requested media by the media transcoding engine **106**.

As shown at step **516**, if the requested media content already resides in the transcoded cache **212** transcoded into the appropriate destination type (e.g., the appropriate destination format and bit-rate or other appropriate publishing variables), then the delivery of content is achieved by the streaming servers **222** at step **524**, which stream the transcoded media content to the viewer client **102** as described below.

If, however, the requested media content does not reside in the transcoded cache **212** transcoded into the appropriate

destination type, then one of the transmitter servers **220** within the machine farm **216** begins fetching the requested media content as a data stream from the source location as shown at step **518**. As discussed above in regard to FIGS. **3** and **4**, in embodiments of the invention, the requested media content can initially either reside within the master archive **214** within the media transcoding engine **106**, in an archive external to the media transcoding engine **106**, or be received as a streaming feed directly from the content provider client **104**.

Where the requested media content resides within the master archive **214**, one of the transmitter servers **220** fetches the requested media content over the internal network of the media transcoding engine **106**.

Where the requested media content resides in an archive outside of the media transcoding engine **106**, one of the transmitter servers **220** uses the access information provided during the publishing process to fetch the requested media content. In embodiments, after the transmitter server uses the access information to fetch the requested media content, the requested media content may be temporarily cached in the master archive **214**, permitting expedited access to the media content when subsequent requests for the same media content are received by the media transcoding engine **106**.

Where the requested media content is a streaming feed directly from the content provider client **104**, one of the transmitter servers **220** fetches the streaming data from the content provider Web server interface **204**. Because embodiments of the present invention do not fetch and transcode the streaming data until it is actually requested by a viewer, unnecessary transcoding of media content is thereby avoided.

As shown in step **520**, after the transmitter server begins fetching the requested media content, if the source type is the same as the destination type (e.g., the source format and bit rate is the same as the destination format and bit-rate), then no transcoding is necessary and the media content is transmitted to the streaming servers **222** as soon it is fetched. The streaming servers **222** then stream the content to the viewer client **102** at step **524**, as described below. However, if the source type is not the same as the destination type, then one of the transcoding servers **218** within the machine farm **216** will transcode the media content from the source type to the destination type as shown in step **522**. In accordance with the discussion in regard to step **512**, above, the resource manager **208** assigns the transcoding task to a transcoder server that runs the necessary transcoder software for performing the appropriate conversion of publishing variables. In embodiments, the transcoding is carried out using one of a variety of well-known methods and for converting media content of one type to another, including conventional codec routines for transcoding media content. Further description of transcoding operation and examples are provided below.

In embodiments, after the transcoding is complete, a copy of the transcoded media content is temporarily stored in the transcoded cache **212**, permitting expedited delivery of the media content when subsequent requests for the same media content transcoded into the same destination type are received by the media transcoding engine **106**.

In step **524**, one of the streaming servers **222** streams the media content in the appropriate destination type to the viewer client **102** as soon as it is received from either a transcoder, a transmitter or the transcoded cache **212**. In embodiments, the transcoded media content is streamed to the viewer client **102** via an optional proxy server, as discussed above in regard to FIG. **2**. In further embodiments, either the streaming server or the optional proxy server keep usage statistics pertaining to the media content being delivered as well as the destination types in which the media content is being delivered that are used by the resource manager **208** for cache management purposes.

In embodiments, the protocol used for streaming media to the viewer client and for streaming data between the transmitter servers **220**, transcoder servers **218** and the streaming servers **222** is a standard protocol for streaming media, such as RTSP. Alternately, a proprietary protocol defined over standard network protocols like TCP/UDP can be used. In further embodiments, different protocols may be used to accommodate different network infrastructure needs. For example, protocols may be implemented that dynamically change according to network traffic conditions. However, these examples are illustrative. The present invention is not intended to be limited to a specific communication protocol or application, and other proprietary or non-proprietary network communication protocols and applications can be used.

At step **526**, the viewer client **102** receives the streaming media content from either the streaming server or the proxy server. At this point, the viewer client **102** plays the media content in accordance with the destination type associated with the media player resident on the viewer client **102**. In alternate embodiments of the present invention, the media content may be received and stored as a downloaded file on the viewer client **102** for playing at a later time, or for transfer to an alternate media playing device.

After step **526**, the flowchart **500** ends.

F. Further Transcoder Operation and Media Content Examples

As described above, media transcoding engine **106** includes one or more transcoders **218**. Transcoders **218** convert certain types of media content (referred to herein as a source type) to another type of media content (referred to herein as a destination type). Transcoding can involve a number of different conversion operations. The particular conversion operations used depend upon the media content and associated publishing variables being converted. Publishing variables as used herein refers to different characteristics of media content.

According to the present invention, media content is digital data being published over a network. In this case, publication refers to digital data which has been formatted for delivery over a network and for viewing by a destination media player. Publishing variables for media content can include, but are not limited to, the file format, bit rate, communication protocol(s), physical medium, compression algorithm, and/or digital rights management information.

The digital data can be any type of file format including but not limited to container formats, bitmap formats, video formats, audio formats, vector formats, metafile formats, scene formats, animation formats, multimedia formats, hybrid formats, hypertext and hypermedia formats, three-dimensional data (3D) formats, virtual reality modeling language (VRML) formats, font formats (bitmap fonts, stroke fonts, spline-based outline fonts), page description language (PDL) formats, and any other type of graphics file format or other file format. Table 1 lists examples of such file formats that can be used in embodiments of the present invention:

TABLE 1

Example File Formats

Format	Type
ADOBE ILLUSTRATOR	Metafile
ADOBE PHOTOSHOP	Bitmap
ATARI ST GRAPHICS FORMATS	Bitmap and Animation
AUTOCAD DXF	Vector
AUTODESK 3D STUDIO	Scene Description
BDF	Bitmap
BRL-CAD	Other

TABLE 1-continued

Example File Formats

Format	Type
BUFR	Other
CALS RASTER	Bitmap
CGM	Metafile
CMU FORMATS	Multimedia
DKB	Scene Description
DORE RASTER FILE FORMAT	Bitmap
DPX	Bitmap
DR. HALO	Bitmap
DVM MOVIE	Animation
ENCAPSULATED POSTSCRIPT	Metafile (page description language)
FACESAVER	Bitmap
FAX FORMATS	Bitmap
FITS	Other
FLI	Animation
GEM RASTER	Bitmap
GEM VDI	Metafile
GIF	Bitmap
GRASP	Animation
GRIB	Other
HARVARD GRAPHICS	Metafile
HIERARCHICAL DATA FORMAT	Metafile
IFF	Bitmap
IGES	Other
INSET PIX	Bitmap
INTEL DVI	Multimedia
JPEG FILE INTERCHANGE FORMAT	Bitmap
KODAK PHOTO CD	Bitmap
KODAK YCC	Bitmap
LOTUS DIF	Vector
LOTUS PIC	Vector
LUMENA PAINT	Bitmap
MACINTOSH PAINT	Bitmap
MACINTOSH PICT	Metafile
MICROSOFT PAINT	Bitmap
MICROSOFT RIFF	Multimedia
MICROSOFT RTF	Metafile
MICROSOFT SYLK	Vector
MICROSOFT WINDOWS BITMAP	Bitmap
MICROSOFT WINDOWS METAFILE	Metafile
MIFF	Bitmap
MPEG	Other
MTV	Scene Description
NAPLPS	Metafile
NFF	Scene Description
OFF	Scene Description
OS/2 BITMAP	Bitmap
P3D	Scene Description
PBM., PGM., PNM., and PPM.	Bitmap
PCX	Bitmap
PDS	Other
PICTOR PC PAINT	Bitmap
PIXAR RIB	Scene Description
PLOT-10	Vector
PNG	Bitmap
POV	Vector
PRESENTATION MANAGER METAFILE	Metafile
PRT	Scene Description
QRT	Scene Description
QUICK TIME	Other
RADIANCE	Scene Description
RAYSHADE	Scene Description
RIX	Bitmap
RTRACE	Scene Description
SAF	Bitmap and other
SENSE8 NFF	Scene Description
SGI IMAGE FILE FORMAT	Bitmap
SGI INVENTOR	Scene Description
SGI YAODL	Scene Description
SGO	Vector
SPIFF	Bitmap

TABLE 1-continued

Example File Formats

Format	Type
SUN ICON	Bitmap
SUN RASTER	Bitmap
TDDD	Vector and Animation
TGA	Bitmap
TIFF	Bitmap
TTDDD	Vector and Animation
URAY	Scene Description
UTAH RLE	Bitmap
VICAR2	Bitmap
VIFF	Bitmap
VIS-5D	Vector
VIVID AND BOB	Scene Description
WAVEFRONT OBJ	Vector
WAVEFRONT RLA	Bitmap
WORDPERFECT GRAPHICS METAFILE	Metafile
XBM	Bitmap
XPM	Bitmap
XWD	Bitmap
ZBR	Metafile

See, Murray and vanRyper, pp. 12–26. These examples are illustrative and not intended to necessarily limit the present invention. Other file formats (now known or developed in the future) can be used as would be apparent to a person skilled in the art given this description.

Even within the same file format, digital data can be compressed according to different compression algorithms. In a QUICK TIME formatted file, for example, video can be compressed in accordance with H.263, CINEPAK, JPEG, QT ANIMATION, or QT VIDEO standards. As a further example, in a WINDOWS MEDIA ASF formatted file, audio can be compressed in accordance with the MICROSOFT AUDIO FORMAT, ACELP, VOXWARE, or MP3 standards. Compression algorithm choices can be made based on optimization according to bit-rate choices, or according to the nature of the content. For example. video files in which little motion occurs ("talking heads") and video files in which there is a substantial amount of motion ("high-motion" video) may each be more efficiently compressed using different compression algorithms.

Within any one compression algorithm, there can be further variations. For example. files compressed according to the JPEG standard can be either YUB-based or RGB-based.

In addition to the publishing variables set forth above, there are also publishing variables unique to video data and audio data.

Publishing variables for video data include the width and height of the video image in pixels as well as the frame rate of the video. Depending on the bit-rate requirements and the nature of the data, different settings may be necessary in order to ensure the best picture quality. For example, some video may be better viewed at 15 frames per second at 160×120 pixels, while some others may be better viewed at 5 frames per second at 320×240 pixels, even at the same bit-rate. Where the bit-rate is 56 K bps, picture quality becomes very limited, and it is almost never optimal to deliver video in 640×480 pixel resolution. Yet another publishing variable for video data is the number of bits per component.

Publishing variables for audio data include the number of samples per second, the number of channels (e.g., mono, stereo, 5-channel) and the sample size (8-bit, 16-bit, etc.). Different settings may be necessary to ensure audio quality in light of a particular content type and bit-rate.

Publishing variables may also include the size of data packets being sent and the choice of transmission protocol (e.g., TCP vs. UDP).

FIG. **6** shows an example transcoder **218** that transcodes on demand source type media content **610** to destination type media content **650**. Source type media content **610** is digital data delivered over a network in one or more packets. The digital data that forms source type media content **610** is defined by one or more publishing variables. The publishing variables as shown in FIG. **6** include one or more of the following variables: source file format, source bit rate, source physical medium, source communication protocol, source encoding, or any combination thereof. Destination type media content **650** is digital data delivered over a network in one or more packets to an end user that demands the media content. The digital data that forms destination type media content **650** is also defined by one or more publishing variables. The publishing variables as shown in FIG. **6** include one or more of the following variables: destination file format, destination bit rate, destination physical medium, destination communication protocol, destination encoding, or any combination thereof.

FIG. **7** shows a table of an example implementation where one or more transcoders **218** transcodes on demand from a source type media content **710** to a first destination type **750**. FIG. **7** also shows an example implementation where one or more transcoders **218** transcodes on demand from a source type media content **710** to a second destination type **760**. The source type media content **710** includes digital data published according to the following source publishing variables: namely, the physical medium is a local disk, the communication protocol includes a file I/O, the file format is MP3 using MP3 encoding at a bit rate of **128** kilobits per second (kbps). The first destination type media content **750** includes digital data transcoded for publication according to the following destination publishing variables: namely, the physical medium is a packet-switched network (the Internet), the communication protocol includes WINDOWS MEDIA STREAMING MMS protocol. the file format is WINDOWS MEDIA FILE, using MP3 encoding at a bit rate of 56 kbps. The second destination type media content **760** includes digital data transcoded for publication according to the following destination publishing variables: namely, the physical medium is a Wireless Network, the communication protocol includes HTTP, the file format is MP3 including MP3 encoding at a bit rate of 12 kbps.

Other examples are shown in the following tables:

Tables 2–5: Example Transcoder Operations

TABLE 2

Publishing Variables	Source Type	Destination Type
physical medium	Disk	Network
communication protocol(s)	File I/O	RTSP
container format	MPEG1	QUICK TIME
encoding	MPEG1	SORENSON (video) QDESIGN (audio)
bit rate	1.5 Mbps	300 kbps

TABLE 3

Publishing Variables	Source Type	Destination Type
physical medium	Wired Network	Wireless Network
communication protocol(s)	HTTP	MMS
container format	MPEG1	WINDOWS MEDIA
encoding	MPEG1	MPEG4 (video) MSAUDIO (audio)
bit rate	1.5 Mbps	100 kbps

TABLE 4

Publishing Variables	Source Type	Destination Type
physical medium	Wired Network	Wired Network
communication protocol(s)	HTTP	RTSP
container format	QUICK TIME	REAL
encoding	H.263	REAL PROPRIETARY G2 Video/Audio
bit rate	56 kbps	56 kbps

TABLE 5

Publishing Variables	Source Type	Destination Type
physical medium	Disk	Wireless Network
communication protocol(s)	File I/O	HTTP
container format	MPEG1	MP3
encoding	MPEG1	audio only - MP3
bit rate	1.5 Mbps	16 kbps

These examples are illustrative and not intended to limit the present invention. Other types of on demand transcoding operations that are known now or developed in the future can be used as would be apparent to a person skilled in the art given this description.

G. Alternate Embodiments of the Present Invention

Example embodiments of the methods and systems of the present invention have been described herein. As noted elsewhere, these example embodiments have been described for illustrative purposes only, and are not limiting. Alternate embodiments, differing slightly or substantially from those described herein, will be apparent to persons skilled in the relevant art based on the teachings contained herein. For example, one skilled in the relevant art will appreciate that the transcoding system and method of the present invention is not limited to the transcoding and delivery of media content alone, but also encompasses the transcoding and delivery of information of all types, including, but not limited to compressed files, electronic documents, HTML pages, XML documents, and any other information that can be stored in a plurality of formats and delivered electronically. Other alternate embodiments include, but are not limited to, hardware, software, and software/hardware implementations of the methods, systems, and components of the invention. Such alternate embodiments fall within the scope and spirit of the present invention.

H. Conclusion

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. It will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined in the appended claims. Accordingly, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A method for transcoding media content from a source type to a destination type, comprising the steps of:

(a) receiving a transcoding request for the media content;

(b) fetching the media content in response to said transcoding request;

(c) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on the source type and the destination type;

(d) sending the media content to said selected transcoder;

(e) transcoding the media content from the source type to the destination type, thereby generating transcoded media content; and

(f) transmitting said transcoded media content.

2. The method of claim **1**, wherein the media content comprises a file of digital information.

3. The method of claim **1**, wherein the media content comprises a stream of digital data.

4. The method of claim **1**, wherein the media content is fetched, sent and transcoded as a stream of digital data and said transcoded media file is transmitted as a stream of digital data, and wherein steps (b), (d), (e) and (f) are performed in a pipelined fashion.

5. The method of claim **1**, wherein said transcoding request is received over the Internet and wherein said transcoded media content is transmitted over the Internet.

6. The method of claim **1**, wherein the media content type is defined according to at least one publishing variable, wherein said at least one publishing variable is:

(1) the file format of the media content;

(2) the bit-rate of the media content;

(3) the compression algorithm according to which the media content is stored;

(4) the communication protocol according to which the media content is transferred; or

(5) the physical medium on which the media content is stored; and

wherein said step (e) comprises converting said at least one publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

7. The method of claim **1**, further comprising the steps of:

(g) storing said transcoded media content in a transcoded cache; and

(h) responding to subsequent transcoding requests for the media content by fetching said transcoded media content from said transcoded cache, and transmitting said transcoded media content.

8. The method of claim **7**, further comprising the step of:

(i) determining whether to keep said transcoded media content in said transcoded cache based on an intelligent algorithm.

9. The method of claim **8**, wherein said intelligent algorithm is a Least Recently Used algorithm.

10. The method of claim **1**, further comprising the step of publishing the media content, wherein said publishing step further comprises the steps of:

(1) receiving the media content;

(2) archiving the media content in a master archive;

wherein said publishing step precedes step (a), and wherein said step (b) comprises fetching said archived media content from said master archive in response to said transcoding request.

11. The method of claim **1**, further comprising the step of publishing the media content, wherein said publishing step further comprises the step of:

(1) receiving location and access information for the media content;

wherein said publishing step precedes step (a), and wherein said step (b) comprises fetching the media content in response to said transcoding request using said location and access information.

12. The method of claim **1**, further comprising the step of publishing the media content, wherein said publishing step further comprises the step of:

(1) receiving the media content as a stream of digital data;

wherein said publishing step precedes step (a), and wherein said step (b) comprises fetching said stream of digital data in response to said transcoding request.

13. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a network interface;

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to command said transmitting server to fetch the media content, to select one of said plurality of transcoders based on the source type and the destination type, to command said selected transcoder to transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

14. The media transcoding system of claim **13**, wherein the media content comprises a file of digital information.

15. The media transcoding system of claim **13**, wherein the media content comprises a stream of digital data.

16. The media transcoding system of claim **13**, wherein said transmitting server is adapted to fetch the media content as a data stream, said selected transcoder is adapted to transcode the media content as a data stream, and said streaming server is adapted to transmit said transcoded media content as a data stream, and wherein said resource manager manages the operation of said transmitting server, said selected transcoder, and said streaming server so that said fetching, transcoding and transmitting occur in a pipelined fashion.

17. The media transcoding system of claim **13**, wherein said network interface comprises a Web server interface.

18. The media transcoding system of claim **13**, wherein said network interface is adapted to receive said transcoding request over the Internet and wherein said streaming server is adapted to transmit said transcoded media content over the Internet.

19. The media transcoding system of claim 13, wherein the media content type is defined according to a least one publishing variable, wherein said at least one publishing variable is:

(1) the file format of the media content;

(2) the bit-rate of the media content;

(3) the compression algorithm according to which the media content is stored;

(4) the communication protocol according to which the media content is transferred; or

(5) the physical medium on which the media content is stored; and

wherein said selected transcoder is adapted to convert said at least one publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

20. The media transcoding system of claim 13, further comprising:

a transcoded cache;

wherein said transcoded cache is adapted to store said transcoded media content and wherein said resource manager is adapted to command said transmitter server to fetch said transcoded media content from said transcoded cache and to command said streaming server to transmit said transcoded media content when said network interface receives a subsequent transcoding request for the media content.

21. The media transcoding system of claim 20, wherein said resource manager is adapted to determine whether to keep said transcoded media file in said transcoded cache based on an intelligent algorithm.

22. The media transcoding system of claim 21, wherein said intelligent algorithm is a Least Recently Used algorithm.

23. The media transcoding system of claim 13, further comprising:

a master archive; and

a content provider network interface;

wherein said content provider network interface is adapted to receive the media content and to archive the media content in said master archive, and wherein said transmitter server is adapted to fetch said archived media content from said master archive.

24. The media transcoding system of claim 13, further comprising:

a content provider network interface;

wherein said content provider network interface is adapted to receive location and access information for the media content, and wherein said transmitter server is adapted to fetch the media content using said location and access information.

25. The media transcoding system of claim 13, further comprising:

a content provider network interface;

wherein said content provider network interface is adapted to receive the media content as a stream of digital data, and wherein said transmitter server is adapted to fetch said stream of digital media content.

26. The media transcoding system of claim 13, wherein said transmitting server, said streaming server, and each of said plurality of transcoders each further comprise a slave monitor, wherein each of said slave monitors is adapted to receive a command from said resource manager and to initiate a task in response to said command.

27. The media transcoding system of claim 26, wherein each of said slave monitors is further adapted to report a status of said task to said resource manager.

28. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a network interface;

a resource manager;

a streaming server; and

a plurality of transcoding servers for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to select one of said plurality of transcoders based on the source type and the destination type, to command said transcoding server to fetch and transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

29. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a plurality of transcoding means for transcoding from a plurality of source types to a plurality of destination types;

transmitting means:

streaming means;

means for receiving a transcoding request;

means for responding to said transcoding request, wherein said means for responding to said transcoding request include resource management means for commanding said transmitting means to fetch the media content, for selecting one of said plurality of transcoding means based on the source type and the destination type, for commanding said selected transcoding means to transcode the media content from the source type to the destination type, thereby generating transcoded media content, and for commanding said streaming means to transmit said transcoded media content.

30. The media transcoding system of claim 29, wherein the media content comprises a file of digital information.

31. The media transcoding system of claim 29, wherein the media content comprises a stream of digital data.

32. The media transcoding system of claim 29, wherein said transmitting means is adapted to fetch the media content as a data stream, said selected transcoding means is adapted to transcode the media content as a data stream, and said streaming means is adapted to transmit said transcoded media content as a data stream, and wherein said resource management means manages the operation of said transmitting means, said selected transcoding means, and said streaming means so that said fetching, transcoding and transmitting occur in a pipelined fashion.

33. The media transcoding system of claim 29, wherein said means for receiving said transcoding request is adapted to receive said transcoding request over the Internet and wherein said streaming means is adapted to transmit said transcoded media content over the Internet.

34. The media transcoding system of claim 29, wherein the media content type is defined according to a least one publishing variable, wherein said at least one publishing variable is:

(1) the file format of the media content;

(2) the bit-rate of the media content;

(3) the compression algorithm according to which the media content is stored;

(4) the communication protocol according to which the media content is transferred; or

(5) the physical medium on which the media content is stored; and

wherein said selected transcoding means is adapted to convert said at least one publishing variable of the media content from a source publishing variable type to a destination publishing variable type.

35. A method for transcoding media content, comprising the steps of:

(a) receiving a transcoding request for the media content, wherein said transcoding request includes a source type, a source location, a destination type, and a destination location;

(b) fetching the media content from said source location in response to said transcoding request;

(c) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on said source type and said destination type;

(d) sending the media content to said selected transcoder;

(e) transcoding the media content from said source type to said destination type, thereby generating transcoded media content; and

(f) transmitting said transcoded media content to said destination location.

36. The method of claim **35**, further comprising the step of parsing said transcoding request to determine said source type, said source location, said destination type, and said destination location.

37. The method of claim **36**, further comprising the step of fetching at least one of said source type, said source location, said destination type, or said destination location when it is determined in said parsing step that said transcoding request is incomplete.

38. A method for transcoding media content from a source type to a destination type, comprising the steps of:

(a) receiving a request for the media content;

(b) fetching the media content;

(c) selecting one of a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said one transcoder is selected based on the source type and the destination type;

(d) sending the media content to said selected transcoder;

(e) transcoding the media content from the source type to the destination type, thereby generating transcoded media content; and

(f) transmitting said transcoded media content.

39. A media transcoding system for transcoding media content, comprising:

a network interface;

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, wherein said transcoding request includes a source type, a source location, a destination type, and a destination location and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to command said transmitting server to fetch the media content from said source location, to select one of said plurality of transcoders based on said source type and said destination type, to command said selected transcoder to transcode the media content from said source type to said destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content to said destination location.

40. The media transcoding system of claim **39**, further comprising:

a task manager;

wherein said task manager is adapted to parse said transcoding request to determine said source type, said source location, said destination type, and said destination location.

41. The media transcoding system of claim **40**, wherein said task manager is further adapted to fetch at least one of said source type, said source location, said destination type, or said destination location when it is determined that said transcoding request is incomplete.

42. The media transcoding system of claim **39**, wherein said network interface is a Web server interface.

43. A media transcoding system for transcoding media content from a source type to a destination type, comprising:

a network interface;

a resource manager;

a transmitting server;

a streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said network interface is adapted to receive a transcoding request for the media content, and wherein said resource manager is adapted to respond to said transcoding request and, in response to said transcoding request, to command said transmitting server to fetch the media content, to select one of said plurality of transcoders based on the source type and the destination type, to command said selected transcoder to transcode the media content from the source type to the destination type, thereby generating transcoded media content, and to command said streaming server to transmit said transcoded media content.

44. A method for transcoding media content from a source type to a first destination type and a second destination type, comprising the steps of:

(a) receiving a request for the media content;

(b) fetching the media content;

(c) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said first transcoder is selected based on the source type and the first destination type;

(d) sending the media content to said first transcoder;

(e) transcoding the media content from the source type to the first destination type, thereby generating first transcoded media content;

(f) transmitting said first transcoded media content;

(g) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the source type and the second destination type;

(h) sending the media content to said second transcoder;

(i) transcoding the media content from the source type to the second destination type, thereby generating second transcoded media content; and

(j) transmitting said second transcoded media content.

45. A method for transcoding a first media content from a first source type to a destination type and transcoding a

second media content from a second source type to the destination type, comprising the steps of:

(a) receiving a request for the first and second media content;

(b) fetching the first and second media content;

(c) selecting a first transcoder from a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types, wherein said first transcoder is selected based on the first source type and the destination type;

(d) sending the first media content to said first transcoder;

(e) transcoding the first media content from the first source type to the destination type, thereby generating first transcoded media content;

(f) transmitting said first transcoded media content;

(g) selecting a second transcoder from said plurality of transcoders, wherein said second transcoder is selected based on the second source type and the destination type;

(h) sending the second media content to said second transcoder;

(i) transcoding the second media content from the second source type to the destination type, thereby generating second transcoded media content; and

(j) transmitting said second transcoded media content.

46. A media transcoding system for transcoding media content from a source type to a first destination type and a second destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to command said first transmitting server to fetch the media content, to select a first transcoder from said plurality of transcoders based on the source type and the first destination type, to command said first transcoder to transcode the media content from the source type to the first destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the media content, to select a second transcoder from said plurality of transcoders based on the source type and the second destination type, to command said second transcoder to transcode the media content from the source type to the second destination type, thereby generating second transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

47. A media transcoding system for transcoding a first media content from a first source type to a destination type and for transcoding a second media content from a second source type to the destination type, comprising:

a resource manager;

a first and second transmitting server;

a first and second streaming server; and

a plurality of transcoders for transcoding from a plurality of source types to a plurality of destination types;

wherein said resource manager is adapted to command said first transmitting server to fetch the first media content, to select a first transcoder from said plurality of transcoders based on the first source type and the destination type, to command said first transcoder to transcode the media content from the first source type to the destination type, thereby generating first transcoded media content, to command said first streaming server to transmit said first transcoded media content, to command said second transmitting server to fetch the second media content, to select a second transcoder from said plurality of transcoders based on the second source type and the destination type, to command said second transcoder to transcode the second media content from the second source type to the destination type, thereby generating second transcoded media content, and to command said second streaming server to transmit said second transcoded media content.

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ISSUE SLIP STAPLE AREA (for additional cross references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION			
O.I.P.E. CLASSIFIER		59	2/12/1
FORMALITY REVIEW	BT	897	02-26-01
RESPONSE FORMALITY REVIEW	M	905	8/11/01

INDEX OF CLAIMS

✓ ..... Rejected
= ..... Allowed
— (Through numeral)... Canceled
÷ ..... Restricted
N ..... Non-elected
I ..... Interference
A ..... Appeal
O ..... Objected

Claim Final	Claim Original	Date
1	1	2
2	2	=
3	3	=
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5	5	=
6	6	✓
7	7	=
8	8	=
9	9	=
10	10	=
11	11	=
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If more than 150 claims or 10 actions
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[redacted]

SEARCHED

Class	Sub.	Date	Exmr.
341	57 50 58 61 87 68 56	10/18/01	[illegible]
709	203 217 218 223 229	10/18/01	[illegible]
370	255 278 282 477	10/18/01	[illegible]
375	133 220 240	10/18/01	[illegible]
348	192 469 434 466 384 470	10/18/01	[illegible]

INTERFERENCE SEARCHED

Class	Sub.	Date	Exmr.
341	50	3/20/02	[illegible]
"	57	"	

SEARCH NOTES
(INCLUDING SEARCH STRATEGY)

	Date	Exmr.
EAST TEXT SEARCH 341/50, 57, 87, 61, 68, 56 58	10/18/01	[illegible]
Consulted with primary Howard William	10/18/01	[illegible]
Consulted with primary Brian Young	10/18/01	[illegible]
Consulted with primary Ken Vanderpuye from class 370; A.U 2661 No Search	10/17/02	[illegible]
Consulted with primary Bourne Testa from A.U 2631 Class 375 No Search	10/19/02	[illegible]
Consulted with primary Nguyen from A.U 2171 class 709 No Search	10/17/02	[illegible]
Consulted with primary Sherrie Hazin from class 340	10/17/02	[illegible]

(RIGHT OUTSIDE)

CLASSIFICATION NOTES

Examiner/ Classifier	Class	Date	Initials

J. Travis
7501

FEB 12 0116

INITIALS ______

CONTENTS

		Date Received (Incl. C. of M.) or Date Mailed		Date Received (Incl. C. of M.) or Date Mailed
1. Application 8 papers.			42.	
2. Lmr. @ Dec., Fee		05-26-01	43.	
3. Decl., Fee, Small Entity		4/26/01	44.	
4. Rej.		11/5/01	45.	
5. 1	2	11-2-01	46.	
6. Or	2	2/5/02	47.	
7. PTOL		3/26/02	48.	
8.			49.	
9.			50.	
10.			51.	
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U.S. DEPARTMENT OF COMMERCE
PATENT & TRADEMARK OFFICE