(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification⁷: **G06F 17/00**

(21) International Application Number:
PCT/KR2004/000623

(22) International Filing Date: 22 March 2004 (22.03.2004)

(25) Filing Language: Korean

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **NITGEN TECHNOLOGIES INC.** [KR/KR]; 3rd Floor, Sanhak Research Foundation Building, 1337-31 Seocho-dong, Seocho-gu, Seoul 137-860 (KR).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **LEE, Nam-Yul** [KR/KR]; 104 ho Jiyoung Villa, 292-5 Junmin-dong, Yousung-gu, 305-810 Daejeon (KR). **YOON, Kee-Joo** [KR/KR]; 203, Ho Solgreen Villa, 57-13 Songpa-dong, Songpa-gu, Seoul 138-849 (KR).

(74) Agent: **KIM, Sung-Soo**; Room No. 1133, Opian 1258,, Sanggye-dong, Nowon-gu,, Seoul 139-838 (KR).

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

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
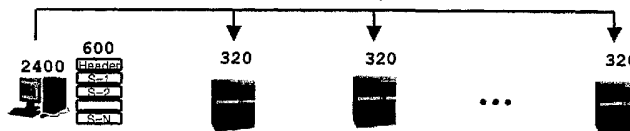— with international search report

[Continued on next page]

(54) Title: A STREAMING BASED CONTENTS DISTRIBUTION NETWORK SYSTEM AND METHODS FOR SPLITTING, MERGING AND RETRIEVING FILES
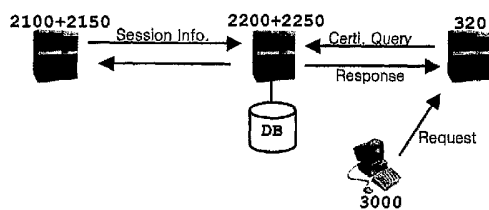

Step 1. Split Original Multimedia file
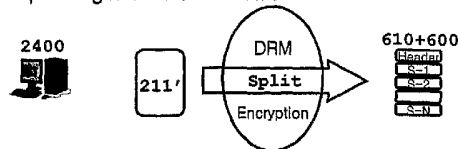
Step 2. Contents Distribution(Using CDMaster)

Step 3. Certification Server

(57) Abstract: A process for splitting, transforming and reproducing a multimedia file has the steps of uploading the file to an Admin Server after splitting or merging the file; synchronizing contents; selecting contents by a client's connection to a web server; performing authentication; downloading a desired file from the optimal contents server; saving the downloaded file as a temporary file form on a temporary file storage; reproducing the downloaded data (the contents) on a dedicated player; and deleting the temporary file with the completion of the reproduction.

A STREAMING BASED CONTENTS DISTRIBUTION NETWORK SYSTEM AND METHODS FOR SPLITTING, MERGING AND RETRIEVING FILES

5   **TECHNICAL FIELD**

This invention relates to a streaming-based contents distribution network system. More specifically speaking, this invention relates to a technology that splits contents into a number of small capacity files and transmits them in

10   order to safely download large capacity multimedia contents including moving picture data so that a user can download a large capacity contents safely and as a result he/she can reproduce multimedia data in high quality while downloading files.

15

BACKGROUND TECHNOLOGY

In transmitting and receiving a large capacity of multimedia contents files like voice files, picture files, moving picture files and animation files on Internet, a

20   prior art has used a method in which at first a corresponding file was downloaded into a hard disk and then was reproduced. However the method was inconvenient, for it took a long time in case of downloading a large capacity file like multimedia contents. And also it has a problem

25   that when generally a file is reproduced, the connection is disconnected frequently because of small buffer size and so in this case the file should be downloaded again from the beginning.

Figure 20 shows a concept of a prior art streaming

30   service. A contents provider server (CP Server)(10) provides contents to a user (20) through a number of Internet service providers (called 'Edge' too)(40) that are connected to each other. That is, in the existing streaming service users physically passed through a plurality of ISPs

35   (40) in order to connect to a contents provider server (CP Server)(10).

The existing streaming methods have problems that in a server-client structure, when a central management server transmits contents to a plurality of clients, server load may be increase and it is hardly to provide high quality of
5   multimedia streaming service due to a bottleneck phenomenon of a network bandwidth.

And since according to the clients' requests of multimedia files the existing streaming methods download the entire contents files through only one open session,
10 the methods increase server load if there are a number of clients.

Moreover in reproducing them by using a client multimedia player, because contents buffering starts from a server to a local client PC, the whole file should be re-transmitted
15 and it is impossible to reproduce it from a desired part.

The existing streaming service has defects like low quality of multimedia streaming service, high cost for storage, demand of large bandwidth etc. And besides, if data-receiving speed is not high enough, a problem that
20 data does not flow smoothly like a picture disconnection phenomenon may occur. Therefore there are problems that it is difficult to manage the rapidly changing traffic if it has low capacity compared with an investing cost and a bottleneck phenomenon like an Internet Middle-Mile, an
25 instant connection increase, and a domino phenomenon of concentration and obstacle of traffic and server load occur.

An SCDN always has to be able to perform a Global ITM (Internet Traffic Management) on the basis of accurate information for network distance regardless of setting up a
30 user's DNS (Domain Name Server). And it has to be able to perform an accurate Local ITM on the basis of more detailed Health Check for a server regardless of an Edge server's kind and installation environment. For example it is necessary to check CPU, Memory, session number for each
35 port and the like of a server carefully.

On the one hand, to cope with the instantaneous traffic

congestion by the increase of the amount of instantaneous connection requests, a Stand-aside type ITM solution that can simplify network structure of each Edge is advantageous. In case that an ITM solution operates depending on a DNS,
5   the quality of service falls off and a manager can hardly cope with severe obstacles that may occur suddenly. Therefore a solution independent of a DNS is needed.

In order to solve the problems of continuously increasing traffic and Edge server load, constructing a network as a
10 pyramid shape brings about higher costs inevitably. Therefore a new type of an ITM solution that can solve the above problems is needed. And also is needed a technology that is capable of distributing and synchronizing contents to each other efficiently in case that a number of Origin
15 servers and Edge servers are dispersed on Internet.

And the existing Streaming Service is not coping with the change of a user actively. That is, previously a condition of 320 x 240 and 100~300Kbps was satisfactory as services but at present a condition of 512 x 384 and more than 1Mbps
20 (DVD level) is needed and yet countermeasures are not sufficient. And the existing method doesn't adopt an active-type downloading method.

BRIEF DESCRIPTION OF THE DRAWINGS
25 Figure 1 is a structural view of an SCDN (Streaming Contents Distribution Network) system according to a preferred embodiment of the present invention.

Figures 2, 3, 4 and 5 are flow charts of a preferred embodiment of an operating method of an SCDN system
30 according to the present invention.

Figures 6, 7, 8 and 9 are block diagrams of a system for splitting a file, merging files and reproducing media for an SCDN system according to the present invention.

Figures 10, 11, 12 and 13 illustrate preferred
35 embodiments of a splitting process for a contents file according to the present invention.

Figure 14 is an exemplary view of a method for using service according to the present invention.

Figure 15 is an exemplary view of structure of an SCDN (Streaming Contents Distribution Network) according to the present invention.

Figure 16 is an exemplary view of a Stand-aside type ITM solution according to the present invention.

Figure 17 is a structural view of a header file according to the present invention.

Figures 18 and 19 are flowcharts of an authentication process according to the present invention.

Figure 20 is a concept view of a prior art of a streaming service.

DETAILED DESCRIPTION OF THE INVENTION
TECHNICAL SUBJECT

1. A structure of an SCDN system

Figure 1 shows a structure of an SCDN (Streaming Contents Distribution Network) system according to a preferred embodiment of the present invention. The service forms provided by this invention are as follows:

The first, one of the service forms that this invention can provide is a Streaming Service. UI (User Interface) functions like a Seek function and a time restrict function by an Interactive Player are provided. This service can be applied to Contents provision for education and to other various forms.

The second, other service form provided by this invention is a Download Service. This service saves split files in a Client and restricts the number of reproducing times and reproducing time.

The third, the other service forms provided by this invention are Global Load Balancing, Server Load Balancing (IPMaster is in charge of it), Contents Distribution (CDMaster is in charge of it) and non-stop service. The non-stop service is to make progress the process

continuously by connecting to other servers automatically when some of Contents Servers do not operate. And this service supports various formats. For example it supports MPEG1, AVI and ASF series (WMT). And because its structure
5   is independent of Codec's, it is not necessary to consider Upgrade per Codec to occur in the future. Moreover, since it uses an Interactive Playing method, a real time Seek for the already watched parts is possible without buffering.

Figure 14 is an exemplary view of a method for service
10   usage according to the present invention. The upper part of the figure shows a picture using a dedicated player and the lower part of the figure shows a picture using a player that Web and ActiveX Control are combined. In this invention, if the dedicated player is used, a network
15   manager downloads a header file into a temp directory by using a HTTP and downloads split contents files into a predetermined folder of Windows System. But, if the player that Web and ActiveX Control are combined is used, it opens a new Window page and transmits a header URL to the new
20   page. Then the network manager downloads the header file and the split contents files into a predetermined folder of Windows System by using HTTP.

Now the structure of a system according to the present invention is described more clearly. The system of this
25   invention aims at realizing Multimedia File Playing through a Network. For this, the system of this invention comprises an Admin Client, an Admin Server including a CMS Server, a Contents Web Server including an Authentication Server for users, an Authentication Proxy Server, a Primary
30   Authentication Gateway Server, a Secondary Authentication Gateway Server, a Contents Server including a plurality of CASes and an SM Agent, and an Enpia Player for file reproducing. Furthermore the system of this invention comprises a DRM (Digital Rights Management) solution for
35   protection of contents, an IPMaster for realizing Internet Traffic Management, and a CDMaster for realizing

synchronization of contents file.

1-1. An Admin Client

An Admin Client splits a large capacity of multimedia
5   contents by using a Split function of an Enpia Splitter
program and then creates a number of files (600) and a
Header file.

That is, it provides a function that splits a multimedia
file into object files having a desired capacity and saves
10   them.

Further it restores multimedia files that were split by a
Splitter using a Merge function of the Enpia Splitter
program, to the original state.

The Admin Client provides a simple GUI (Graphic User
15   Interface) based on Windows and makes it possible to check
the process for implementing a Split/Merge function and its
result.

DRM (Digital Rights Management) is applied to the split
multimedia files. It has an encrypt function for each split
20   file in order to protect the information of each split file.
The DRM function can be applied partially according to a
Protect Policy of Multimedia Files when it is needed.

1-2. An Admin Server
25   An Admin Server briefly provides an addition/deletion
function of a user session, a user session list function, a
validity inspection function about a user session request
required by an authentication proxy server, a modification
function of a configuration file by an authentication
30   Gateway server, a save and management function of
connection records log about contents transmitted from a
contents server, a real time monitoring function and a
statistics function and the like.

A real time data monitoring function of a CMS server
35   (200) detects data creation, modification and deletion like
deleting or uploading data from an Admin Client in real

time.

   Each split file whose creation, modification or deletion
has been monitored is transmitted to a Contents Server
including its own CAS server Module respectively.

5   A CMS server performs the synchronization with an
original contents file.

   1-3. An Authentication Proxy server.
   It provides a response function to an authentication Key
10 request of a user Authentication Server. It shares
authenticate information, authenticate ID, contents,
completion time of contents, and an authentication key with
a Primary Authentication Gateway Server.

15   1-4. A Primary Authentication Gateway Server and a
Secondary Authentication Gateway Server
   A Primary Authentication Gateway Server or a Secondary
Authentication Gateway Server has an authority to be able
to permit approaching to the contents saved on each
20 contents server and therefore it performs User
Authentication.

   1-5. A Contents Server
   A Contents Server plays a role of a file server having
25 contents. It comprises largely a CAS Server (300) and an SM
Agent server. As a contents server distributing and saving
split original contents file and a Header File, a CAS
Server (300) performs a function of contents
synchronization. Each CAS Server (300) copies the files
30 that were split by a CMS (200) and saves them on a database
(320). The database (320) has a UUID (Universal Unique
Identifier) File List (322). The Contents of each contents
server are synchronized in real—time. Therefore even if a
fault occurs in any one of a plurality of CAS servers (300),
35 other CAS servers (300) can provide the same contents. And
so this system according to the present invention is more

excellent in fault tolerance than the prior arts.

A CAS server (300) transmits split contents files and a Header File in a folder designated by a manager to other CAS Servers (300) in accordance with the command of the CMS

5   server, or receives data from other CAS servers (300).

An SM Agent performs a monitoring function of a Contents server in real time.

The SM Agent (Server Monitoring Agents) collects the information of CPU, Memory and Session of a Contents Server

10 at an interval of predetermined time and provides it as Server load balancing information.

1-6. An IPMaster

An IPMaster Server receives the information of CPU,

15 Memory, Session of a Contents Server at an interval of predetermined time from an SM Agent installed in each Contents Server in real time. The collected server information is a requirement that lets a client select the optimal contents server among servers saving split contents

20 files.

When an authenticated client (500) requests, an IPMaster (400) selects the optimal Contents Server (300) for a corresponding client (500) and lets the client receive desired contents (600) from a corresponding Contents Server

25 (300) by using its function for monitoring the information of CPU, Memory and Session of the Contents Server (300) in real time.

1-7. A Client/Player

30 If the authentication of contents is completed normally, a Client/Player (500) downloads a Header File into a Database (510) and parses it and takes charge of scheduling for download. And in the Database (510) there are a UUID File List (514) having a split file list and a Temp List

35 (516) having reproduction data information.

And in the Client/Player (500) there are a manager of

local files and a DRM decoder (518).

The Client/Player (500) can download split files in parallel by a number of Threads. The Client/Player (500) is based on MS Window series OS being capable of multi-tasking. So it can download the split files in parallel and therefore the system is more stable, can reproduce and download the files in high speed. In this case the Client/Player (500) reproduces a file by reading the configuration information of split files recorded in the Header File. Since the reproducing order is determined by prescribed scheduling information, there is no matter especially in reproduction.

The Client/Player (500) reproduces a plurality of split files that have been downloaded by using a manager of local files and a DRM decoder (518) as if the files are in one HDD. For this, header information of a header file as shown in the figure 17 is used. And at the same time with the reproduction, it downloads the files that will be reproduced next time from a CAS server (300). Therefore a file can be reproduced continuously and it has a high quality of reproduction. In addition, as the split files have small sizes, although a buffer has a small capacity, there is no matter especially in buffering. Moreover the Client/Player (500) decodes the encoded files by using a DRM. A player used in this invention is the dedicated player for this invention.

2. Operation of an SCDN system

The flow charts of preferred embodiments for an operating method of an SCDN system according to the present invention are shown in from figure 2 to figure 5. The figure 2 shows the processes of a server side by dividing them into three steps large.

In the first step, an original multimedia file of an Admin Client is split into certain sizes of files by a file Splitter. As a result of it, the files split into certain

sizes and a header file including the split information are
created. Contents may be encoded under the necessity of
protection by using a DRM technology. The encoded contents
are decoded when they are reproduced on a Client Player.

5   In the second step, contents are synchronized through a
CDMaster solution. That is, by using a function for
monitoring a file in real time of a CMS server placed in an
Admin server, a Contents server including a plurality of
CAS servers synchronizes Header Files and Split Files,
10   which are created, modified and deleted.

In the third step, the Authentication Gateway Server is
in charge of the authentication about a user. A detailed
authentication process is shown in figures 18 and 19.
Clients request the authentication about an authentication
15   Key downloaded from an authentication server of a user side
and a Primary Authentication Gateway server having the
authenticate information judges whether it will
authenticate the requested authentication or not.

An Authentication Server performing a real authentication
20   process comprises an Authentication Proxy server and a
Primary authentication Gateway server, and when a failure
in Primary Authentication Gateway Server occurs, a
Secondary Authentication Gateway Server located at an
automatic alternative routing performs an authentication.

25   Figure 3 shows a reproduction process of a contents file
performed in a customer side. A Client/Player (500)
comprises a Network Manager, a Local File Manager and a DRM
Decryption Manager (518).

The Client/Player (500) requests data needed for
30   reproducing contents to a Contents server. According to the
request, by making a reference to a UUID List (322), the
Contents server searches a corresponding file saved on a
database (320) and provides a Header File to a Network
Manager (410). If the Header File is transferred to the
35   Client/Player (500), the Client/Player (500) parses it and
then transmits the parsing result to the network manager

(410). According to this, if the Network Manager (410) requests a file to a Contents server (300), the Contents server transmits the corresponding file to the Network Manager (410). The Network Manager (410) saves this file on

5   a database (510) and if the Client/Player (500) requests the data, the Local File Manager and the DRM Decryption Manager (518) open the corresponding file from the database (510) and transmit it to the Client/Player (500) and then the Client/Player reproduces it.

10   Figure 4 shows an example of a service process according to the present invention. The service process comprises a step for requesting contents for reproduction by a Client/Player (500), a step for performing authentication, a step for downloading a Header File and an authentication

15   Key if the authentication is completed normally, a step for requesting contents query to an IPMaster server for the sake of selecting the optimal contents server, a step for checking whether authenticated or not by an Authentication Gateway Server, a step for downloading a schedule and

20   contents and a step for reproducing the contents by an Enpia Player.

     Figure 5 shows a detailed example of a service process according to the present invention. The Client/Player (500) is connected to a Web server and selects contents. The

25   Authentication Server of a user side performs authentication for a user ID, contents, the completion time of contents and the like, and then requests a billing process about an authenticated user to a billing system server. The Authentication Server of a user side requests

30   the authenticate information to an Authentication Proxy server. The Authentication Proxy server transmits the authenticate information to the Authentication Server of a user side. After completion of authentication the user-side Authentication Server downloads an authentication Key about

35   contents and a Header File into the Client/Player (500). If the Client/Player (500) received the authentication Key

requests contents to an IPMaster (400)①, then the IPMaster
(400) appoints a contents server and the Client/Player
(500) requests contents files to the appointed contents
server with the authentication Key. And then the contents
5   server requests verification to the Primary Authentication
Gateway Server (100) whether the Key is authenticated or
not, and if it is authenticated, then a schedule and
contents files are downloaded. And a Player (500)
reproduces the data ⑤. At this time a management module
10 saves the authentication Key and the downloaded data on a
storage appointed by a user and deletes temporary files
when the reproduction is completed.

3. A system for splitting a file, merging files and
15 reproducing media for an SCDN system
Figure 6 to figure 9 show block diagrams of a system for
splitting a file, merging files and reproducing media for
an SCDN system according to the present invention. As shown
in figure 6, the main components of this system are an
20 ENSplitter (210), an ENNetwork (230), and an ENSource (310).
Each of them has the following function.

3-1. An ENSplitter
An ENSplitter (210) splits an original multimedia file of
25 a contents server into a plurality of UUID files (620) and
creates a Header file saving connecting information for the
split file. The Header file uses a type of data called as
UUID (Universally unique identifier) used in a Microsoft
based operating system.
30 This data has a type of 6B29FC40-CA47-1067-B31D-
00DD010662DA and duplicate data cannot be created.
In this case the reasons of using 'UUID' as a split file
name are as follows. Firstly, there is no possibility for
other split file names to be used repeatedly. Secondly,
35 although the split files are open to the public, it is
impossible for them to re-merge the split files since their

12

order is indistinguishable. And when a contents provider
wishes to restore original multimedia file, it performs a
file merging. It creates and analyzes a Header File (610)
and encrypts/decrypts UUID files (620) with the

5   interlocking of an IENSource interface of an ENSource (310).

    3-2. An ENNetwork
    An ENNetwork (230) downloads a plurality of UUID files
    (620) saved on a database (220) in each contents server

10 into a database (510) of a Client (500) side, and then
    saves them on a Hard Disk of a client as a form of
    Temporary Files (512) and manages them. And at the same
    time if an ENSource (310) requests a certain UUID file
    (620), then the ENNetwork downloads the corresponding file

15 or searches it and transmits the file handle (a Header
    file) to the ENSource (310). And the ENNetwork (230) has a
    table (232) saving the lists of UUID files (620) and their
    corresponding lists of Temporary files (512).

20   3-3. An ENSource
    An ENSource (310) participates in both of the process of
    file split/mergence and the process of media reproduction,
    and operates differently in each process. The ENSource
    (310) really splits/merges media files and creates/analyzes

25 their corresponding Header files (610) and at this time it
    encrypts/decrypts the UUID files (620). Moreover the
    ENSource (310) operates as a regular Direct Show Source
    Filter and transmits the media data according to the data
    requests of a Filter Graph (520), in addition it operates

30 as a source plug-in DDL when a Window media file is
    reproduced. The ENSource (310) has UUID files (620) and a
    table (312) having information for the positions and
    capacities of the files.

35   3-4. An ENPlayer
    An ENPlayer not shown in figure 6 is a Direct Show

Application and plays a role as a real Filter Graph (520).
The ENPlayer requests data with clear description for its
position and capacity to an ENSource (310) through a Filter
Graph Manager, and processes the transmitted data and
5   reproduces media. In addition to the ENPlayer, every Direct
Show Application like Window media player control can
reproduce media through the present system. The Filter
Graph (520) is placed in an ENPlayer and has a play
function of moving pictures.
10

   3-5. A file split method
   As shown in figure 7 an ENSplitter (210) plays a role as
a main starting point in splitting a media file. The file
split process according to the present invention is as
15   follows: the ENSplitter (210) transmits a path of a source
file (211) through an IENSource interface of an ENSource
(310). The ENSplitter (210) lets a Filter Graph Manager
operate so that the ENSource (310) participates in
connecting a Filter Graph (520). In this process a Parser
20   Filter (not shown in figure) requests data to an ENSource
(310). The ENSource (310) transmits the requested data
saved on a Filter Graph (520) and records the particulars.
If the ENSplitter (210) gives a split order through an
IENSource interface, the ENSource (310) splits a media file
25   based on the information of connection and split capacity.
UUID files (620) needed in splitting are allotted
dynamically. And in this case an encryption process can be
included. After completion of the file splitting the
ENSource (310) arranges UUID files (620) and their tables
30   (312) for position and capacity, and then creates a Header
file (610).
   <A preferred embodiment of a file splitting>
   An ENSplitter (210) has a source file, an object file, a
capacity of a file to be split, means of function selection,
35   means of format selection and a Window. The means of
function selection has a split button and a mergence button,

and a means of format selection has an AVI button, an MPEG
button and a Window Media button. In the means of function
selection of this invention the split button is selected
basically. A source file can be selected here.

5   On the other hand if a source file is appointed, a path
of an object file is appointed automatically as a changed
Extension form of '*.enp'. It can be changed if necessary.
The split capacity can be appointed by a manager
arbitrarily in the consideration of the whole capacity of a
10   multimedia file and the efficiency of a CMS server and a
CAS server.

The next task to do is to appoint a format of a source
file in the means of format selection. If a file splitter
detects an incorrect appointment of a file format by the
15   analysis of properties of a multimedia file, it outputs a
Rendering error message like 'The file format is incorrect'.
If we appoint a file format correctly and push a start
button, then the file split process is executed. If a
message 'A Header file was copied' is displayed on a screen,
20   it represents that the file split was completed normally.

A File splitter splits a multimedia file to a plurality
of files whose file sizes are appointed and creates the
information of a Header file. The data of a Text Area
appeared after the file split is connection information
25   needed when the corresponding source files construct a
filter graph (520). Because only after the construction of
the filter graph (520), it is possible to discriminate
whether it is to be reproduced or not, this information
plays a role as important primary data in splitting files.
30   In (x, y), x and y imply position data in a file, namely
header information, respectively. A starting point is 0.
Figure 10 shows a preferred embodiment of an information
analysis in splitting of a contents file according to the
present invention.

35   And in a file split process based on connection
information, a plurality of small file parts are created

and accordingly a process to arrange them is needed. If the information to be connected with each other is arranged, it can be simplified to two files like a (0, 2114) file and a (28798033, 28798133) file as shown in figure 11.

5   And the file information to be split finally according to an appointed split size is shown with arranged connection information. In this case, because the connection information is important, the connection information like 2114, 10487874, 20973634, 28798133 is put at the top of

10 Header information. And the rest data is split like 10487874, 20973634, 28798033, 28804137 to be a size of 10MB for each file according to an appointed split size (213) for preventing from duplication to each other. Figure 12 shows the final split information.

15 Figure 13 shows a process of splitting an actual file and copying a Header file based on analyzed information. The name of a split file appears as a form of a GUID (Globally Unique Identifier) as shown in the figure.

In here the Extension (at present: *.enp), which is

20 appointed basically in an ENSplitter, has no any further means above an Extension. Therefore if we want to change a basic Extension, what is necessary is only to change the EXTENSION defined at a header file 'ENSplitterDlg.h'. And because a function of OnFileOpen() has a function to add a

25 parser filter in accordance with a format, if a supported format is added, it has to be added to it too. Because it is necessary to format verification and improvement of efficiency.

On the other hand, in use of a Window media format, a

30 protocol appointed at an ENSource (310) is used. Therefore if a format is changed, the protocol also has to be changed. And care should be given to a fact that a WM (Windows Media) Reader as a filter to use a Window media format SDK (Software Development Kit) provides a Reader object and

35 provides a source plug-in normally from version above 9.0, and in this case it is installed with Window media player

9.0 together. In order to support a new version of Window
media file, a new DLL has to be obtained through a format
SDK of a Windows Media Technology 9.0. In addition if we
wish to use a Window media format of Microsoft, a
5   predetermined license contract has to be made but it has
nothing to do with this invention.

     3-6. A method for merging files
     In restoring multimedia files split by a File splitter
10   into an original file, Merge function of an ENSplitter is
used. Explaining with reference to Figure 8 about a method
for merging files, an ENSplitter (210) operates as a Merger
and becomes a start point of a file merging process in case
of merging UUID files. The File merging processes according
15   to the present invention are as follows: An ENSplitter
(210) transmits a Header file (610) path to an ENSource
through an IENSource interface of an ENSource (310). The
ENSource (310) analyzes the Header file (610) and restores
UUID files (620) and their tables for position and capacity.
20   The ENSource (310) requests a UUID file (620) through an
IENManager interface of an ENNetwork (230) in accordance
with the information recorded in a Header file (610). The
ENNetwork (230) copies or downloads the UUID file (620)
which the ENSource (310) requested and saves it on a
25   temporary storage (510) and transmits the corresponding
file handle to the ENSource (310). The ENSource (310) reads
data through a file handle transmitted from the ENNetwork
(230) and performs file merging and restores an original
file (630). If a file is encrypted, a merging process is
30   performed after decrypting it.

     < A preferred embodiment of file mergence>
     Now we describe a preferred embodiment of file mergence.
This function is in order to verify whether split files are
35   restored as they were. If 'Mergence' is selected among
Means of function selection, an ENSplitter (210) performs

                                17

merging. And then a header file whose Extension is *.enp, is appointed at a source file. Then it analyze s the appointed format of the source file and displays it on a Window screen. At the same time, a format in Means of format selection is decided automatically. Therefore in the process of file mergence it is needless to appoint a format.

If a source file is a file header that cannot be de tected, an error message of 'The file cannot be detected' app ears.

The file merging process is executed by pushing a 'start button' and appearance of a message 'File merging was completed' implies normal completion of a merging pro cess.

3-7. A method for reproducing media

In case of reproducing media, explaining with ref erence to figure 9, a Direct show application is a main st arting point. Therefore in the position of this system the operation according to the request of a filter graph (520) starts. Media reproduction processes according t o the present invention are as follows: A Header file path appointed by a Direct show application is transmitted to an IfileSourceFillter interface of an ENSource (310) thr ough a filter graph manager. The ENSource (310) analyzes a Header file (610) and restores UUID files (620) and their tables for position and capacity. The Filter graph (520) re quests the data, which is needed to the connection and reproduction, to the ENSource (310) in sequenc e. In transmitting it describes the data position and ca pacity clearly. For the data requested by a filter graph (520), the ENSource (310) searches UUID files (620) in acco rdance with the information recorded in a Header file (61 O) and requests the file through an IENManager interface of an ENNetwork (230). The ENNetwork (230) copies or dow nloads the UUID files (620) that the ENSource (310) request ed and saves them on a temporary storage (510) and transmi ts the file handle to the ENSource (310). The ENSource (310) reads data through the file handle transmitted from the ENN etwork

(230) and transmits them to a Filter graph (520). If a file
is encrypted, a decryption process is to do.

    3-8. A method for scheduling (downloading) Media
5   Multimedia files that were split by a File Splitter can
be divided into two parts: One is a media header part file
list having connection information needed in reproduction
and the other is a data part file list having information
of pictures and sound that are being reproduced.
10   A Client/Player (500) analyzes a downloaded header file
and starts to download a necessary file list.
    In program execution, it starts to download a media
header part needed in reproduction and the program is
blocked during the downloading. At this time a plurality of
15   files are downloaded simultaneously by using a plurality of
threads and if there is a file having a larger capacity
compared to a user's appointment, it is divided into a
plurality of threads again and the files are downloaded
quickly and merged. These processes are repeated.
20   If the downloading process of a media-header is completed,
a program reconstructs the information of the media-header
and downloads a data part file. It receives a plurality of
data files simultaneously by using suitable number of
sockets, and then the program gets activated and starts to
25   reproduce data files.
    In this case for continuous and quick data saving, a
plurality of data files is downloaded simultaneously by
using suitable number of sockets (threads). A downloading
process of the previous files is completed after completing
30   a necessary task for downloading a file list that will be
necessary later in advance by using header information.
Then a downloading process of prepared files is performed.
These processes are repeated.
    In case that a reproduction part was moved (seek
35   function), it waits the completion of a previous work that
was being downloaded. And a necessary part of a file list

is sought by analyzing the position value of the moved part.
And then it starts to download and reproduce the file from
the necessary part of a file simultaneously by using
suitable number of threads.

5   And basically contents can be downloaded through five
sockets (one socket per thread). Simultaneous socket number
can be calculated by the consideration of a user's network
state. If the user's network state is slow not enough to
reproduce contents, it can be set up by using a function

10   like 'reserve view' so that the contents can be reproduced
after the completion of downloading a predefined file list.
       In this case a point of time for reproduction is
calculated by the consideration of reproduction time and
downloading time of a whole file.

15

ADVANTAGEOUS EFFECTS

       The expected effects from the above present invention are
as follows. A high speed streaming technique according to

20   the present invention can be applied to a Business Video on
Demand that rises as a main issue of business
competitiveness.
       The present invention can be applied to a high speed
streaming technique and can solve a bottleneck phenomenon

25   of an Internet Middle-Mile. And it can cope with an
instantaneous connection increase, a domino phenomenon of a
server load, a domino phenomenon of congestion and obstacle
of traffic quickly.
       In addition it is easy to manage rapidly changing traffic

30   by executing this invention. And it can solve the ROI (Rate
of Investment) problem of a streaming service because this
invention provides a multicasting technology in which 1:N
transmission is possible. Figure 15 is an exemplary view of
a structure of an SCDN (Streaming Contents Distribution

35   Network) according to the present invention. A Business
user (800) and a private user (900) can use multimedia data,

which an Original media server palm (700) provides. The
Business user (800) receives data directly from the
Original media server palm (700) through LAN and the
private user (900) receives data through an Edge Media

5   (1000) of an ISP. The SCDN of Figure 15 can solve the
previous ROI (Rate of Investment) problem.

According to this invention, construction cost of
equipment, network cost, and labor cost can be reduced
above 11% at least and new business chances can be made.

10 That is, a hardware cost can be reduced because if infra
for transmitting data is built once, nothing is needed any
more, and a management cost can be reduced because of a
distributed system management through central and remote
management, and a bandwidth cost can be reduced because of

15 an integrated contents networking system.

By The present invention, flexibility of management,
Centralized management, and Centralized monitoring can be
performed. It has excellent functions for Global load
balancing, Local server load balancing, and network

20 architecture in a point of view of performance. Accordingly
it is possible to perform always a Global ITM based on
accurate information for network distance by an SCDN of
this invention regardless of a user's setting for a DNS.
That is, Accurate Proximity is obtained. And regardless of

25 types of Edge servers and install environment we can
perform an accurate local ITM through checking deep server
health like hardware load, process health, and contents
health.

And because ITM solution of Stand aside type is used in

30 order to simplify the network structure of each Edge,
although the amount about instantaneous connection request
increases, it can cope with instantaneous traffic
congestion. That is, in a point of view of traffic
management, if there is a query of a domain name, it

35 replies through the optimal server IP address, and provides
service according to service request. Figure 16 is an

exemplary view of ITM solution of a Stand aside type according to the present invention. An ITM solution like this type can solve the problem for increasing Edge server load despite of continuous increasing of traffic.

5   Because ITM solution according to this invention is independent of DNS, a manager can cope easily with an occurrence of serious fault as well as a falling-off in service quality.

In this invention, like Global Internet broadcasting
10   service, even though a number of Origin servers and Edge servers are distributed on Internet, they can divide contents and synchronize with each other effectively.

And this invention provides a single management point for all works like traffic management, contents synchronization,
15   clustering, contents distribution performed on a Global network and therefore has the effect reducing management cost.

Further because this invention applies a DRM technology about split files or distinguishes identification number of
20   split files, it can protect on-line privacy and file that can be imperiled as a result of using a file exchange program widely.

WHAT IS CLAIMED IS:

1.A Streaming based contents distribution network system for implementing Multimedia File Playing using networks, said system comprising:

5   a splitter creating a file list and a header file about a plurality of UUID (Universally unique identifier)-type files by splitting a multimedia file having large capacity;

a merger restoring the multimedia files split by said
10   splitter to an original file state when necessary;

an admin client having said splitter and said merger;

an original contents server receiving split files from said admin client and saving said files on a first internal database;

15   a CMS server installed in said original contents server detecting data creation, modification and deletion in real time;

a plurality of CAS servers receiving contents files and header files from said original contents server,
20   the received files split from an original file by said splitter and saving said received files separately and said saved files being synchronized by said CMS server;

an IPMaster server managing Internet traffic of said system;

25   a CDMaster server synchronizing with a contents file saved on each of said CAS server by cooperating with said CMS server;

a CDMaster server synchronizing with contents files saved on each of said CAS servers by cooperating with
30   said CMS server;

a plurality of SM Agents (Server Monitoring Agents) installed in each of said CAS servers, transmitting information for CPU, memory and session of a corresponding CAS server to said IPMaster server in
35   real time so that if a client requests, said IPMaster server can select the optimal CAS server to the

corresponding client and provides the requested contents from the corresponding CAS server;

a plurality of contents servers, each of them having a pair of said CAS server and said SM Agent;

5   a user-side Authentication Server performing authentication when a user logs in;

a Web server letting a client authenticated by said user-side Authentication Server connect to a web site constructed on Internet and access to a variety of

10   contents;

a Primary Authentication Gateway Server having an authority to let a user access to contents saved on each contents server and checking whether each of said split contents files can be downloaded or not;

15   a Secondary Authentication Gateway Server realizing non-stop service by providing alternative routing for authentication in case of faults of said Primary Authentication Gateway Server;

an Authentication Proxy server installed in each of

20   said Primary Authentication Gateway Server and said Secondary Authentication Proxy Server and sharing Authentication information among said Primary/Secondary Authentication Gateway Server and said user-side Authentication Server, and transmitting said

25   Authentication information among said Primary/Secondary Authentication Gateway Server and said user-side Authentication Server; and

a dedicated client/player for said system getting authentication by requesting the authentication to said

30   Primary Authentication Gateway Server in case that there are desired contents to download, and requesting the information about said desired contents to said IPMaster server to download said desired contents from an optimal contents server appointed by said IPMaster

35   server and saving the downloaded information on a second internal database, and reproducing only the

files saved on said second database according to a
predefined schedule although all of said split files
are not saved on said second database, and downloading
the rest files while the reproduction is being made and

5   saving the downloaded files on said second database so
that the reproduction can be made continuously without
a break.

2.A system as set forth in claim 1, wherein said
system   further   comprises   a   DRM   (Digital   Rights

10   Management) Encryption/Decryption Module in charge of
copyright protection and management about said split
and merged multimedia contents in encrypting each of
said split files and in decrypting said merged file.

3.A system as set forth in claim 1, wherein a manager

15   considers network traffic, state of network traffic and
state of said system and makes it possible to split a
desired file into files having a desired form and size
and to transmit data without delay by using the most
rapid method.

20   4.A system as set forth in claim 1, wherein said
client/player downloads files to be reproduced in
future from a plurality of contents servers saving the
same contents through multi thread in parallel with the
reproduction of downloaded files at the same time.

25   5. A system as set forth in claim 1, wherein said
client/player is a multi-tasking system capable of
parallel downloading of the split files by using a
Multi-Thread and uses an ITM solution of a Stand-aside
type, which makes it possible to download files

30   continuously by comparing a file list of a Media-header
part through normally operating servers even though a
fault occurs in some servers among a plurality of
contents servers.

6. A streaming contents distribution network system

35   having an original contents server and a plurality of
contents servers copying and saving the original

contents, said system comprising:

an ENSplitter splitting a multimedia file to a plurality of UUID(Universally unique identifier) type files and creating a header file and saving the header file on a database of said original contents server and also performing file merging, encrypting and decrypting of said UUID files;

an ENSource participating in both a process of file split/mergence and a process of media reproduction and operation differently in each process and really splitting/merging media file and creating/analyzing a corresponding Header file, wherein said ENSource encrypts/decrypts UUID file and operates as a regular Direct Show Source Filter and transmits media data according to data requests of a Filter Graph and operates as a source plug-in DDL when reproducing Window media file and has UUID files and a table having information for positions and capacities of said UUID files;

an ENNetwork downloading a plurality of UUID files saved on a database in each contents server into a database of a Client side and saving on a Hard Disk of a client as a form of a Temporary File and managing the saved files, wherein at the same time if said ENSource requests a certain UUID file, said ENNetwork downloads or searches the file and then transmits a file handle (a Header file) to said ENSource and has a list of UUID files and a table saving a list of a Temporary file corresponding to the UUID files; and

an ENPlayer being a Direct Show Application and playing a role as a real Filter Graph and requesting data by using a clear description for its position and capacity to said ENSource through a Filter Graph Manager, and processing the transmitted data and reproducing media and having a play function of media files.

7. A system as set forth in claim 6, wherein said ENSplitter has a source file, an object file, a capacity of a file to be split, a Means of function selection, a Means of format selection and a Window where said Means of function selection has a split button and a mergence button, and said means of format selection has an AVI button, an MPEG button and a Window Media button and said system uses an ITM solution of a Stand-aside type.

8. A system as set forth in claims 6 or 7, wherein in encrypting said split files and in decrypting said merged file said system further comprises a DRM (Digital Rights Management) Encryption/Decryption Module in charge of copyright protection and management about said split and merged multimedia contents.

9. In a streaming contents distribution network system having an Original contents server saving original contents and a plurality of contents servers copying and saving said original contents for implementing Multimedia File Playing using a network, a method for splitting a multimedia file, transmitting and reproducing the transmitted files, said method comprising:

a step for splitting a multimedia file or merging multimedia files through a File Splitter;

a step for uploading said split or merged multimedia files to an Admin Server;

a step for copying said split contents files and a Header file to a database of a plurality of contents servers by using the Admin Server and synchronizing the contents;

a step for connecting to a Web server and selecting contents by a Client, wherein an Authentication Server of a user side performs authentication for a user ID, contents, completion time of contents and requests a billing process about an authenticated user to a

Billing System Server and the Authentication Server of
a user side requests authenticate information to the
Authentication Proxy server and then the Authentication
Proxy server transmits authenticate information to the
5   Authentication Server of a user side;
         a step for downloading Authentication Key and a Header
File into a Client;
         a step for requesting an optimal contents server to an
IPMaster for downloading contents by a Client;
10   If an IPMaster selects the optimal contents server
according to said request and notifies the selected
result to the client, a step for requesting contents
files to the corresponding contents server with an
authentication Key by the Client, and requesting
15   verification to a Primary Authentication Gateway Server
whether authenticated or not by the contents server
according to the user's request;
         a step for downloading the requested file if said
Primary Authentication Gateway Server makes the
20   Authentication;
         a step for saving downloaded file on a temporary
storage as a temporary file by a client according to a
schedule;
         a step for reproducing said downloaded data by using a
25   dedicated player; and
         a step for deleting said temporary file saved on a
temporary storage with the completion of the
reproduction.
         10.A method as set forth in claim 9, wherein in
30   splitting of a file, said split file is encrypted by
using a DRM Encryption/Decryption Module and said
system uses an ITM solution of a Stand-aside type.
         11. In a streaming contents distribution network
system having an Original contents server saving
35   original contents and a plurality of contents servers
copying and saving said original contents for

implementing Multimedia File Playing using a network, a
method for splitting a multimedia file comprising:

a step for transmitting a Header file path to an
ENSource by an ENSplitter that is a file splitter;

5   a step for operating a Filter Graph Manager by an
ENSplitter so that an ENSource participates in
connecting a Filter Graph;

if a Parser Filter requests data to the ENSource in
said participating process, a step for transmitting the
10   data requested by the Parser Filter existing in a
Filter Graph and recording the particulars by an
ENSource;

a step for splitting a media file based on the
information of connection and split capacity by the
15   ENSource if the ENSplitter gives a split order through
an IENSource interface; and

a step for dynamically allotting UUID type files
needed in said file split and performing encryption
when necessary, wherein the ENSource arranges the UUID
20   files and their tables for position and capacity after
completion of the file split, and then creates a Header
file.

12.A method as set forth in claim 11, wherein in
splitting a file, said split files are encrypted by
25   using a DRM Encryption/Decryption Module and said
system uses an ITM solution of a Stand-aside type.

13.A method as set forth in claim 11, wherein in case
that a corresponding source file is defined as
connection information needed in structuring a filter
30   graph, said method further comprises a step for
performing said information analysis in order to
complete file split perfectly and in this case x and y
of (x, y) are indices for searching header information
that denotes a position in a file and the position
35   information 0 is a starting point of a header file.

14.A method as set forth in claim 13, wherein said

method further comprises a step for arranging a
plurality of small-sized file pieces created in file
split on the basis of said connection information.

15.A method as set forth in claim 11, wherein said
method further comprises a step for adding a parser
filter and changing a protocol in accordance with a
format for the format verification and the improvement
of efficiency.

16.In a Streaming contents distribution network system
for implementing Multimedia File Playing using a
network, a file merging method for verifying whether a
multimedia file was restored normally or not, wherein
the multimedia file was split in the system and
transmitted from the system, said method comprising:

a step for transmitting a Header file path to an
ENSource through an IENSource interface of the ENSource
by an ENSplitter, wherein the ENSplitter operates as a
Merger and is a starting point for file merging in case
merging UUID files;

a step for analyzing the Header file and restoring
UUID files, their tables for position and capacity by
the ENSource;

a step for requesting UUID files through an IENManager
interface of an ENNetwork in accordance with the
information recorded in a Header file by the ENSource;

a step for copying or downloading the UUID files which
the ENSource requested and saving the downloaded files
on a temporary storage and transmitting a corresponding
file handle to the ENSource by the ENNetwork; and

a step for reading data through the file handle
transmitted from the ENNetwork and performing file
merging and restoring an original file by the ENSource,
and in this case if a file is encrypted, merging
process is performed after decryption of the file.

17. A reproduction method of a multimedia file that is
split and transmitted in a Streaming contents

distribution network system for implementing Multimedia
File Playing using a network, said method comprising:

　　a step for making a Direct show application play a
role as a main starting point when reproducing
5   multimedia files, and operating in accordance with the
request of a filter graph and transmitting a Header
file path appointed by the Direct show application to
an IfileSourceFillter interface of an ENSource through
a filter graph manager;

10   　　a step for analyzing the Header file and restoring
UUID files and their tables for position and capacity
by the ENSource;

　　a step for requesting data needed in connection and
reproduction to the ENSource in sequence by filter
15   graph and at this time transmitting the information
specifying the data position and capacity of a desired
file;

　　a step for finding UUID files in accordance with the
information recorded in a Header file about the data
20   requested by a filter graph and requesting the file
through an IENManager interface of an ENNetwork by the
ENSource;

　　a step for copying or downloading a UUID file which
the ENSource requests and saving the copied or
25   downloaded file on a temporary storage and transmitting
a corresponding file handle to the ENSource by the
ENNetwork; and

　　a step for reading data through a file handle
transmitted from the ENNetwork and transmitting the
30   read data to a filter graph and in this case if a file
is encrypted, performing decryption by the ENSource.

FIGURE 1
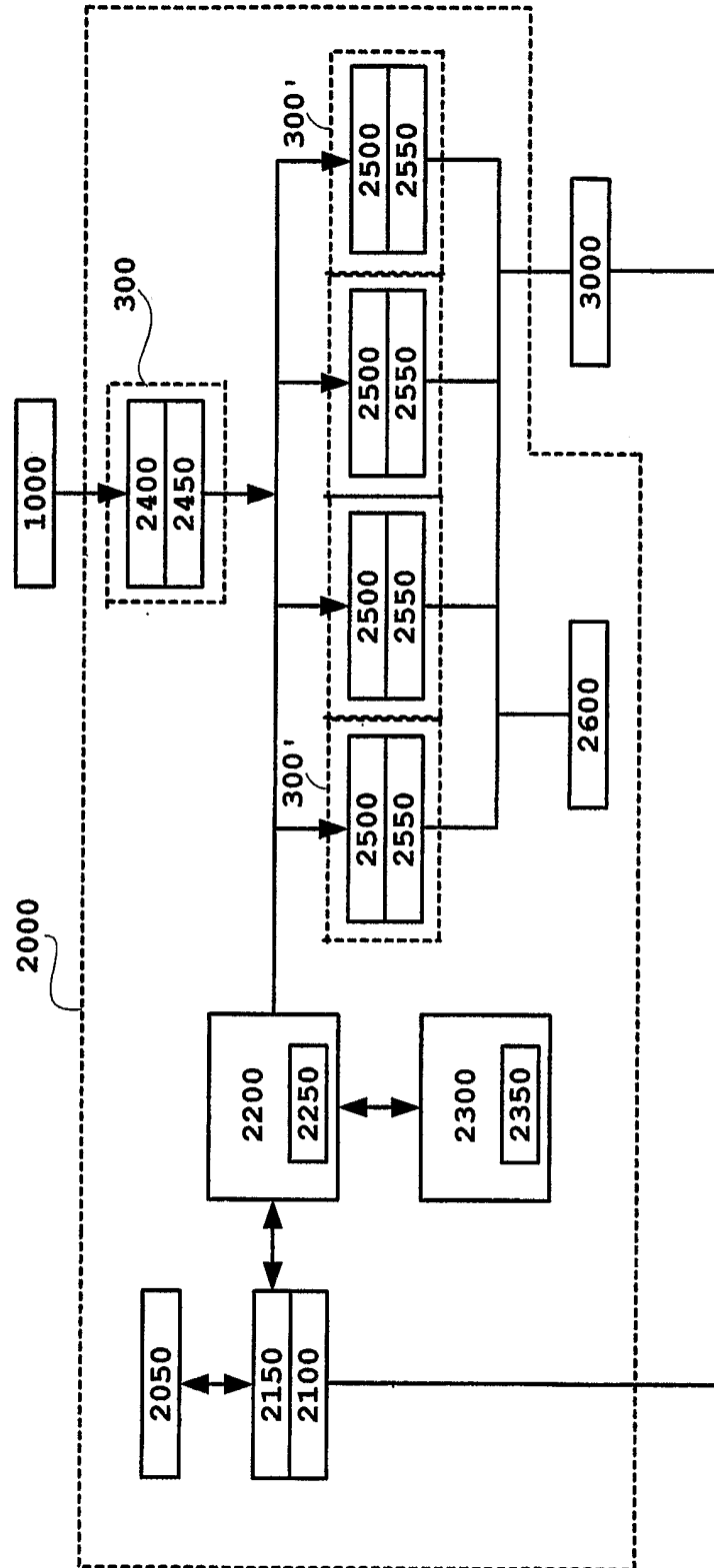
FIGURE 2

Step 1. Split Original Multimedia file
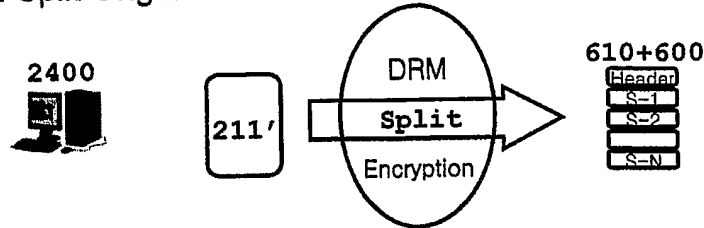
2400

211'

DRM
Split
Encryption

610+600
Header
S-1
S-2
S-N

Step 2. Contents Distribution(Using CDMaster)

2400

600
Header
S-1
S-2
S-N

320

320

• • •

320

Step 3. Certification Server

2100+2150
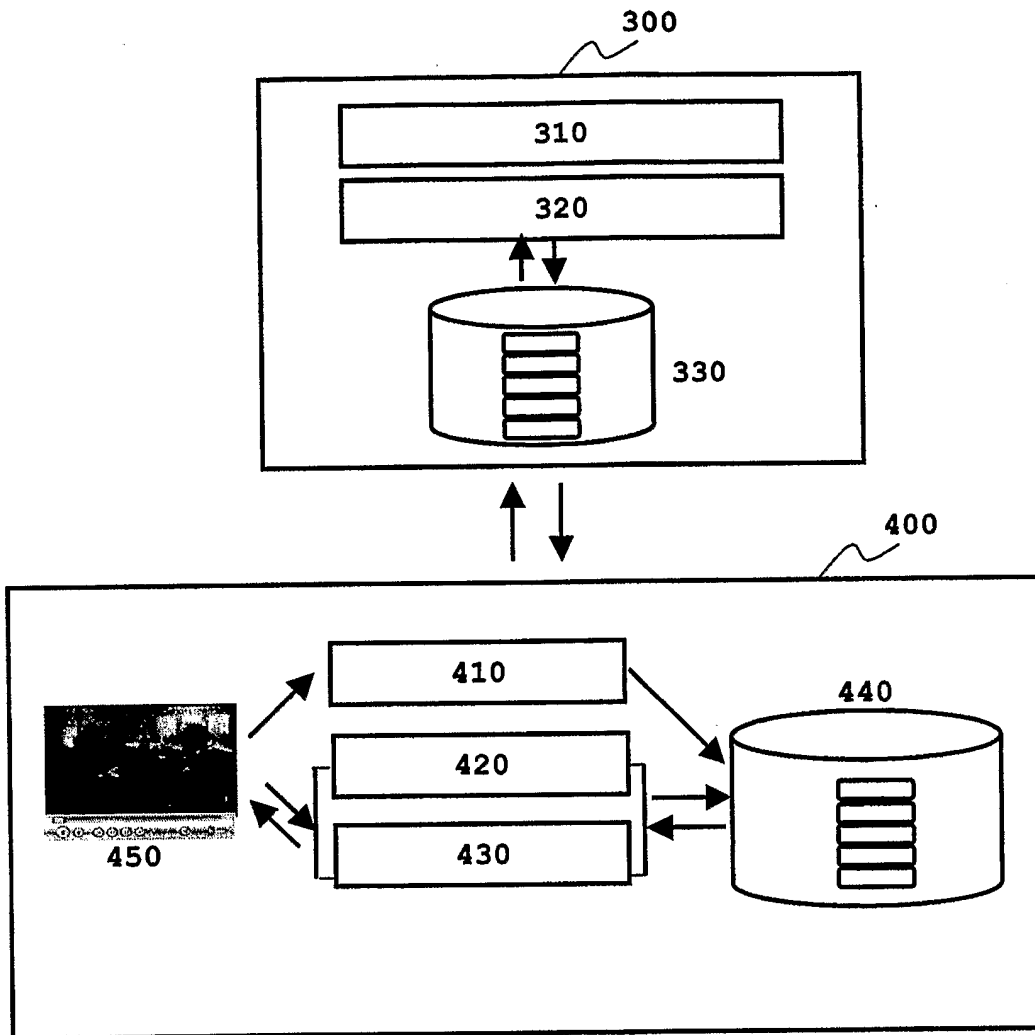
Session Info.

2200+2250
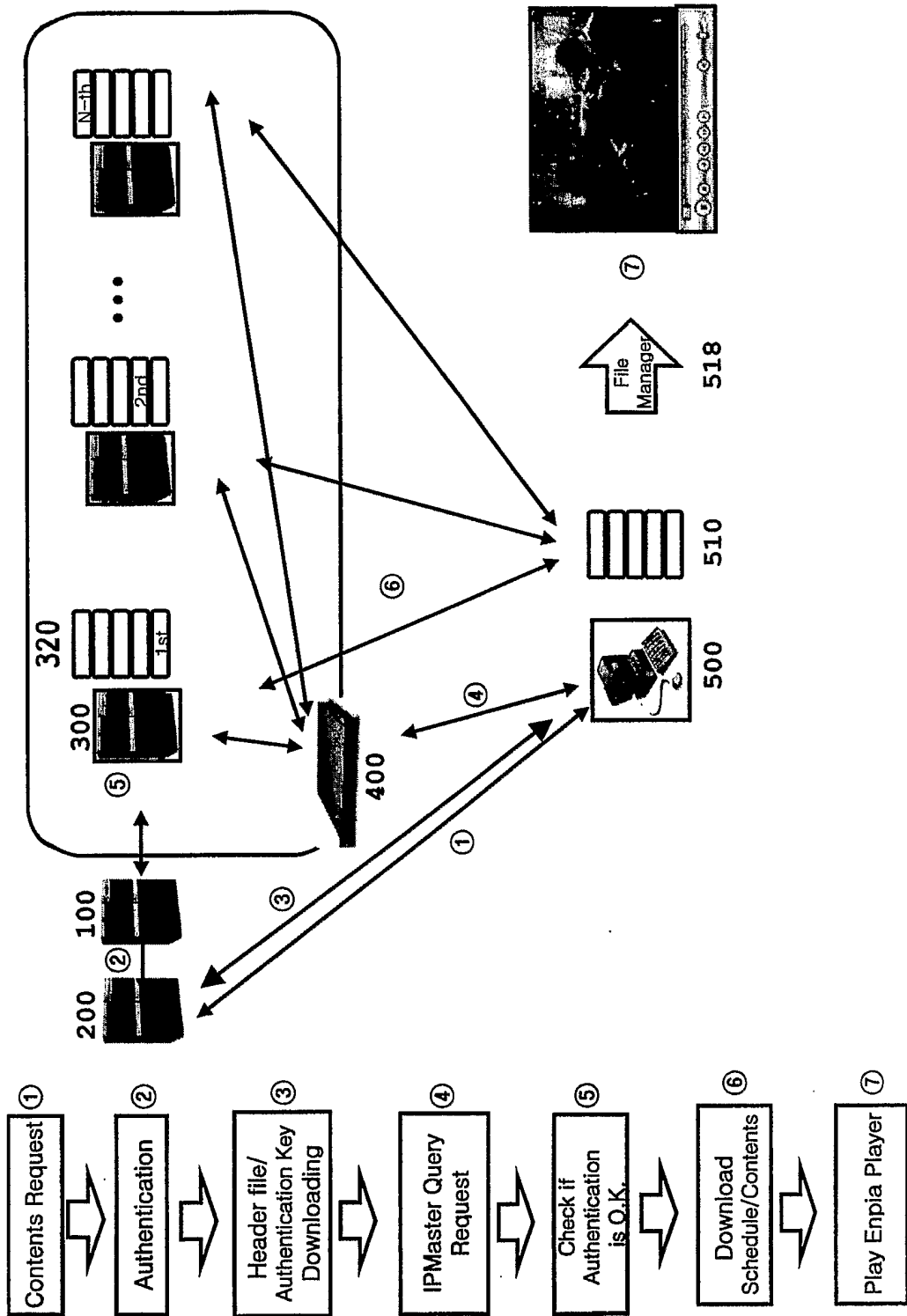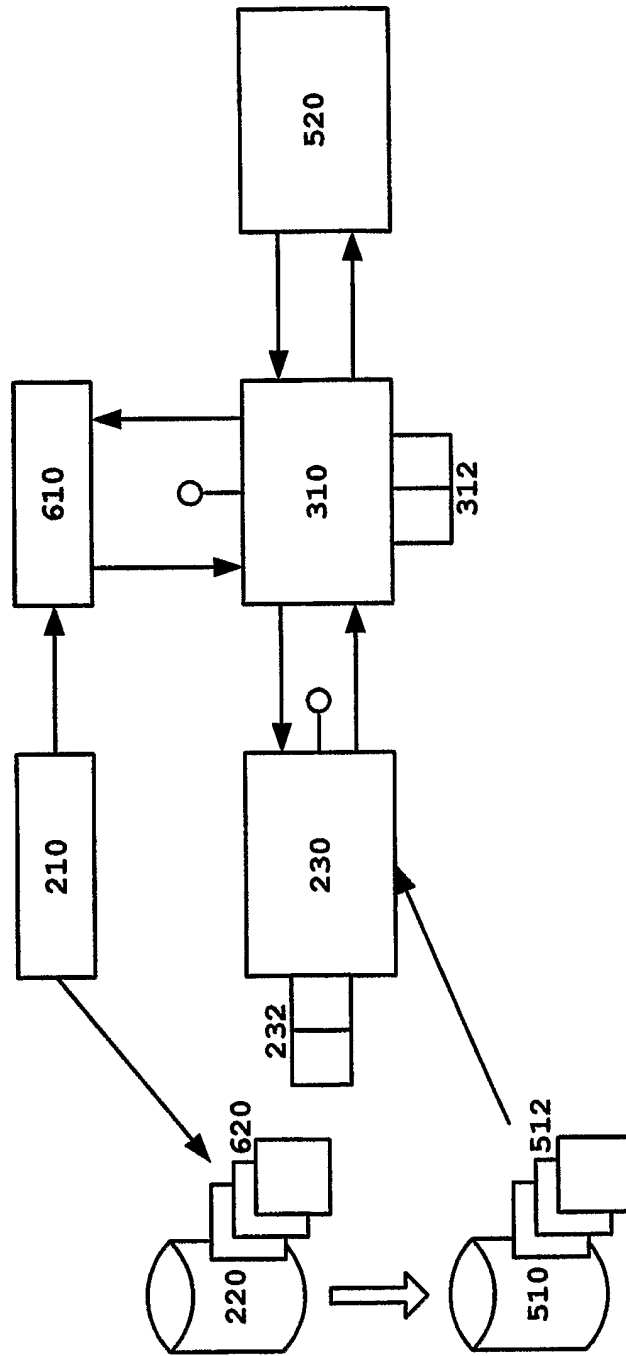
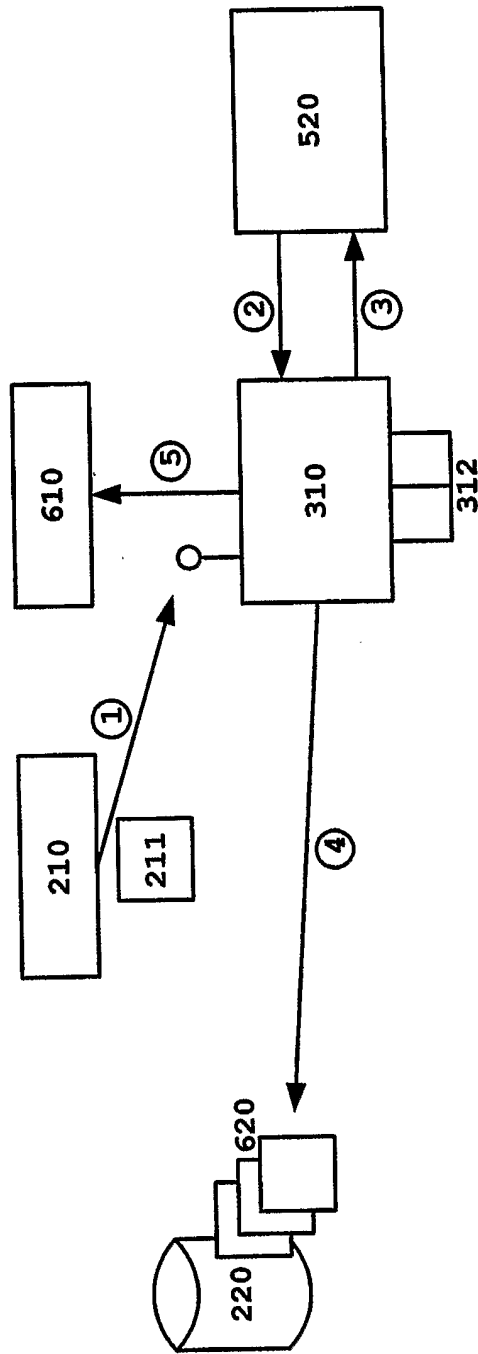Certi. Query

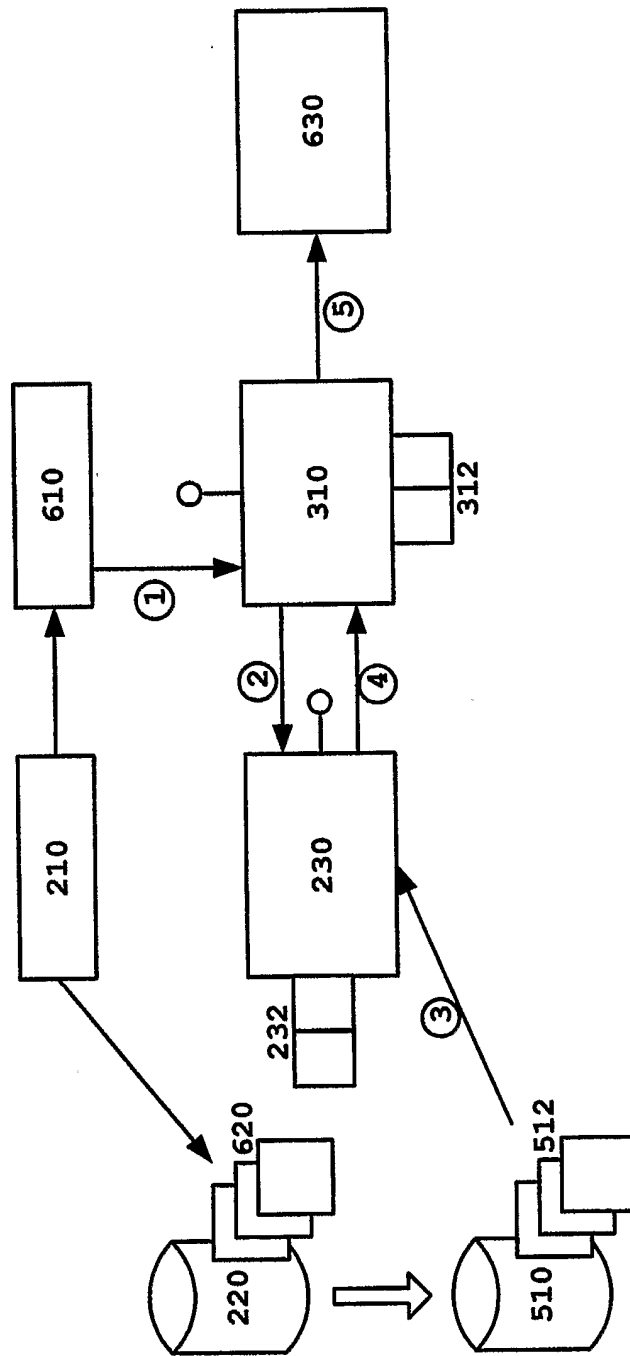320

Response
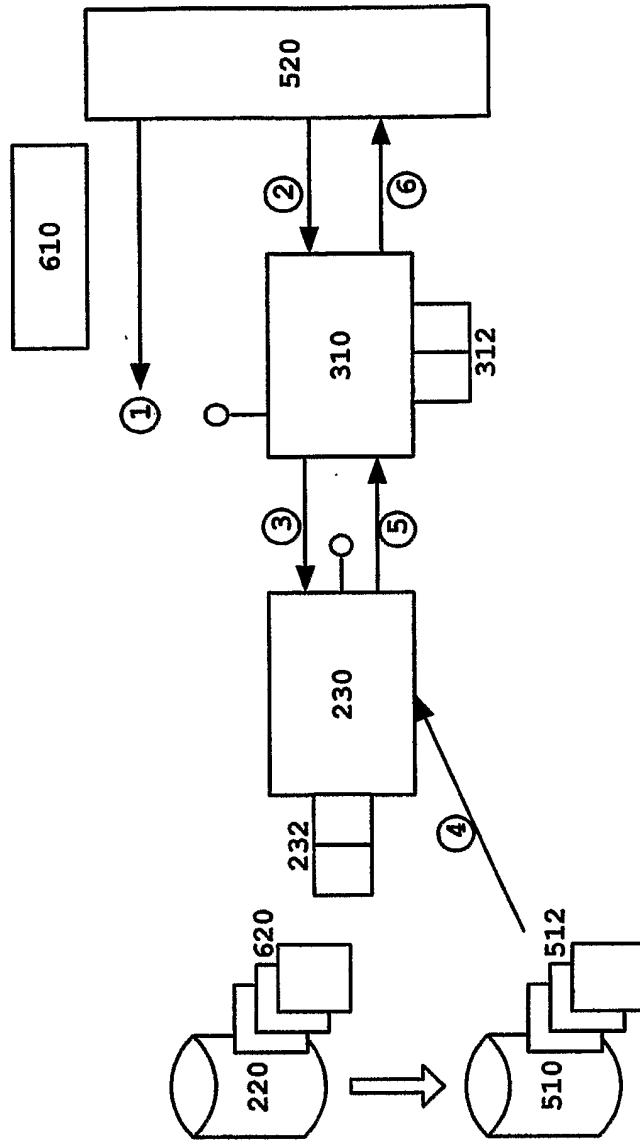
DB

3000

Request
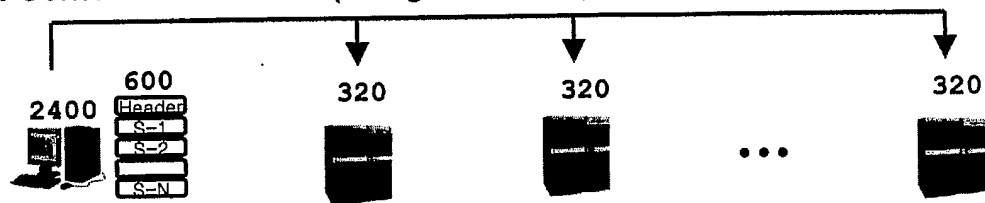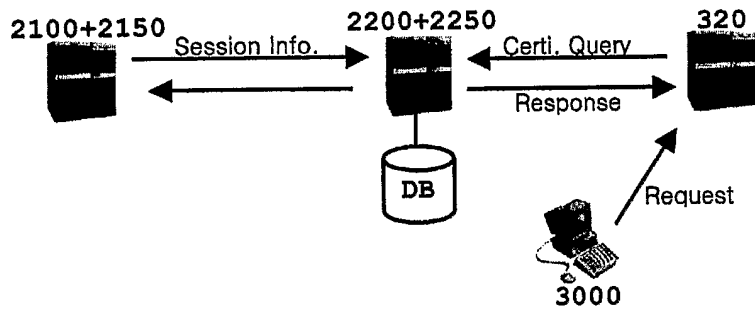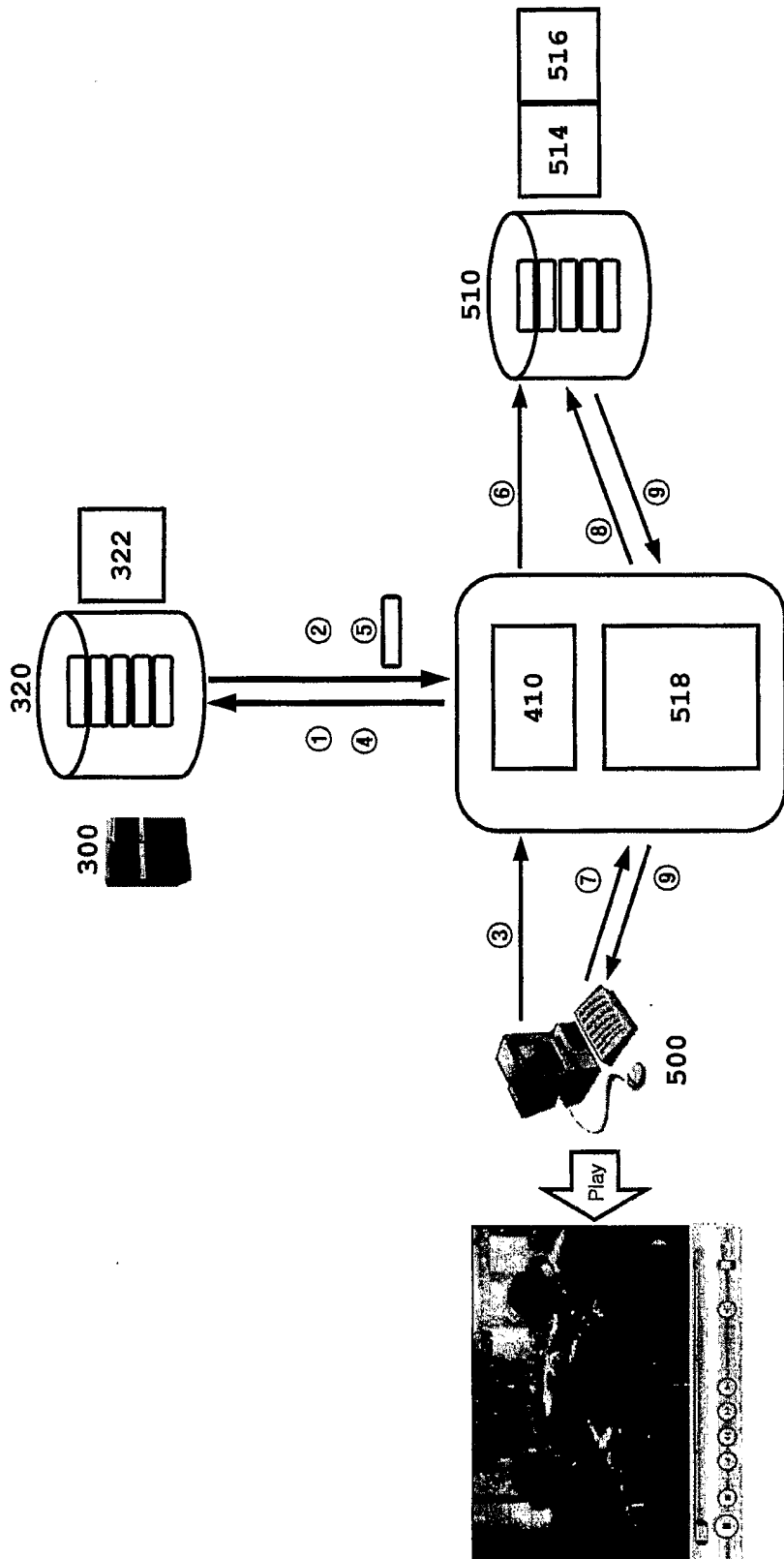
FIGURE 3

FIGURE 4

FIGURE 5

FIGURE 6

FIGURE 7

FIGURE 8

FIGURE 9

FIGURE 10

Header Information
(0,30)
(30,2090)
(2090,2106)
(2106,2114)
(28798033,28798133)

FIGURE 11

Summarized Header Information
>(0,2114) >(28798033,28798133) Finalized Header Information is as follow.

FIGURE 12

Finalizing File Fragmentation
>> (0,2114) >> (28798033,28798133) >> (2114,10487874) >> (10487874,20973634) >> (20973634,28798033) >> (28798133,28804137)

FIGURE 13

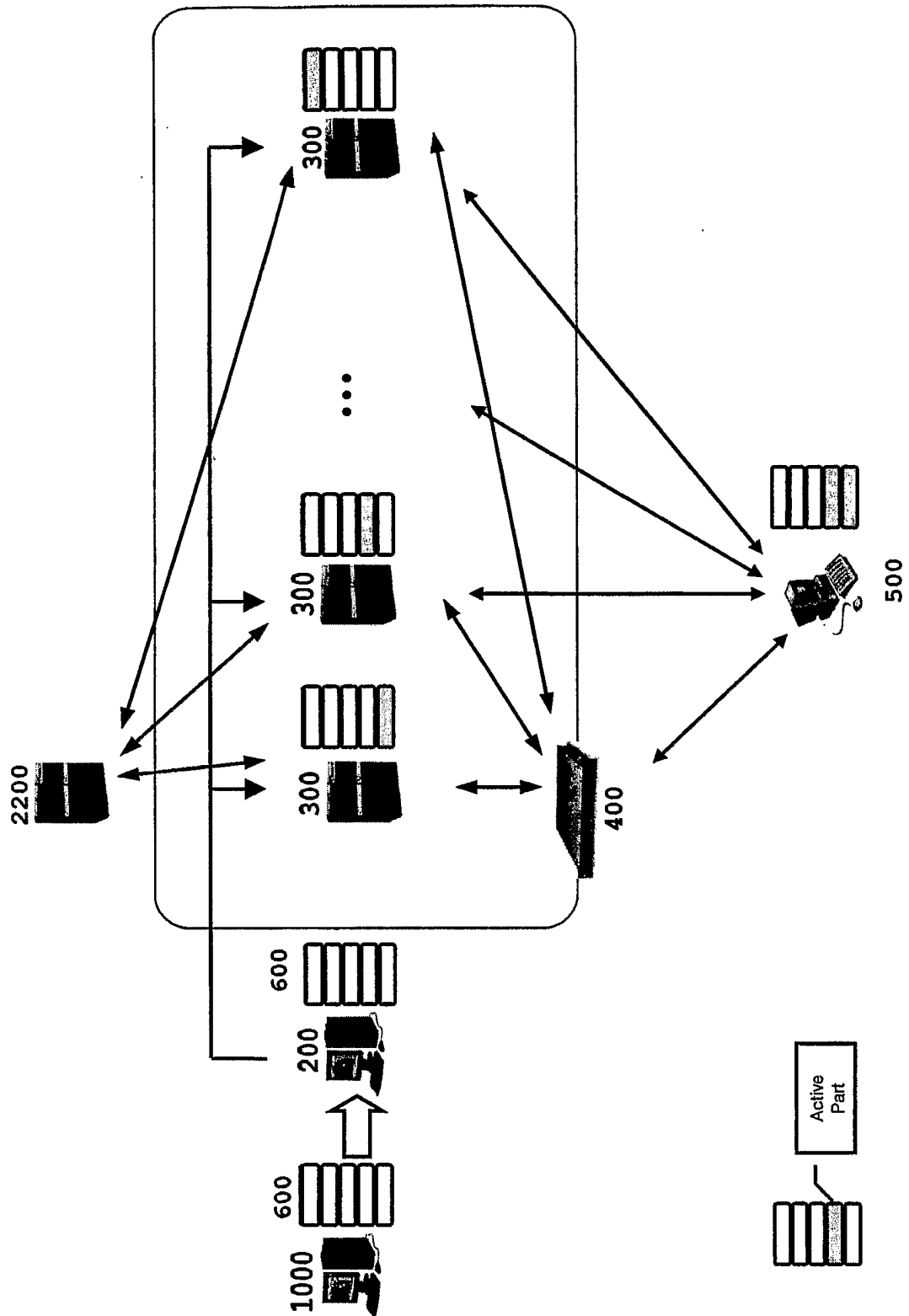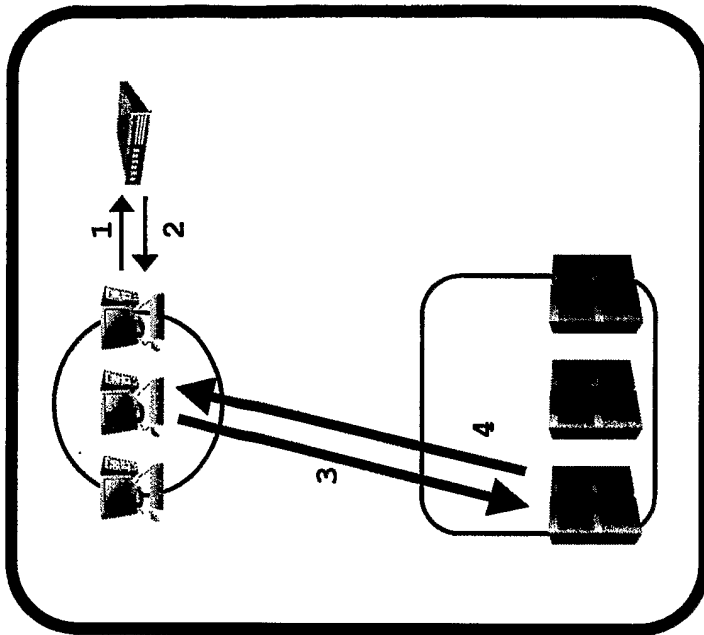| Starting File Fragmentation |
|---|
| => #1/6, {917BDBE6-CDB1-4252-87CC-1D736594B105}
=> #2/6, {192FA617-DF17-43C8-8433-0C15C8313127}
=> #3/6, {9F3AA9F6-333A-41C8-B9DC-60C77A410F37}
=> #4/6, {91776087-5414-498C-A595-934D69652256B}
=> #5/6, {B1326BE7-5966-44FD-9605-DC9117BD8928}
=> #6/6, {3C8EA3F8-4877-42C0-8659-C6EE7E957950}
 Finalizing File Fragmentation
 Header File has been copied. |

FIGURE 14

Exclusive Player

URL:Protocol (HKEY_CLASSES_ROOT\xxx\shell\open\command)
c:\enpia_player "server.enpia.net/content.asp?title=YYY.header"

Network Manager
Download header file into temp dir by using HTTP
Download split file

Player

Click

Web + ActiveX Control

Transfer header url to New Page
Parameter of ocx
<param name=headerloc value="http://xxx.enpia.net/..>

Network Manager
Download header by using Http
Download split file

Embeded ocx

New Window open

Click
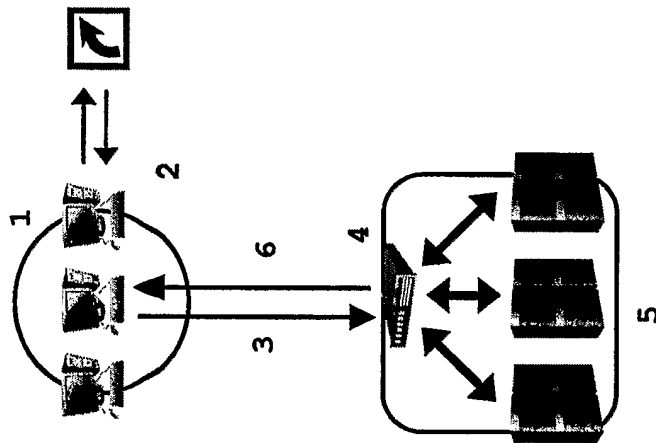
FIGURE 15

FIGURE 16

FIGURE 17

File Format	Split File List			PLAY POLICY
0 → MPEG 1 → AVI 2 → WMV 3 → ETC ..	917BDDBE6- CDBF-42332- ID203	917BDDBE6- CDBF-42332- ID204	— — — — —	917BDDBE6- CDBF-42332- ID20N	(EXAMPLE) Seek Enable Delete File

FIGURE 18

———— General path

················· Alternative path
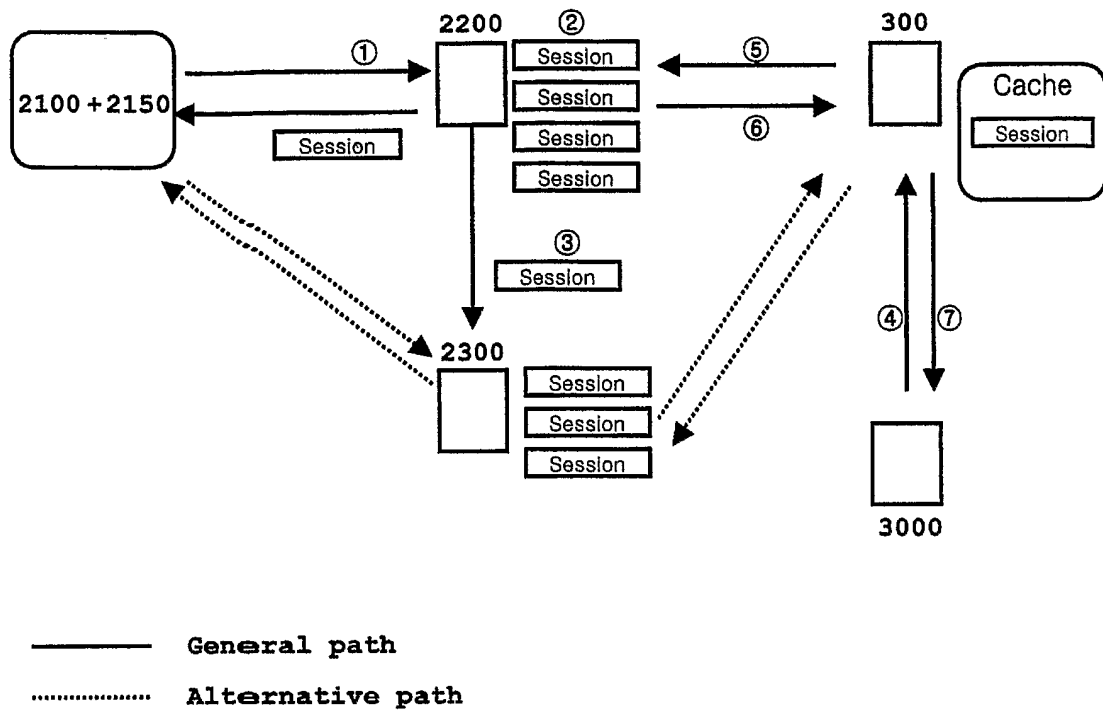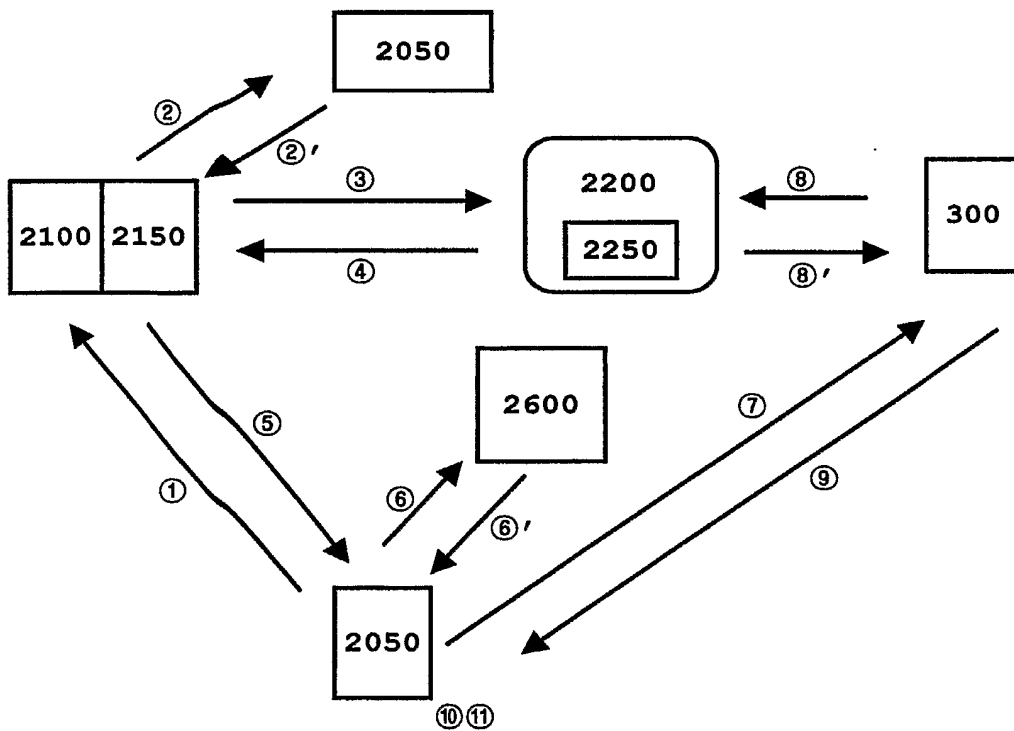
FIGURE 19

FIGURE 20
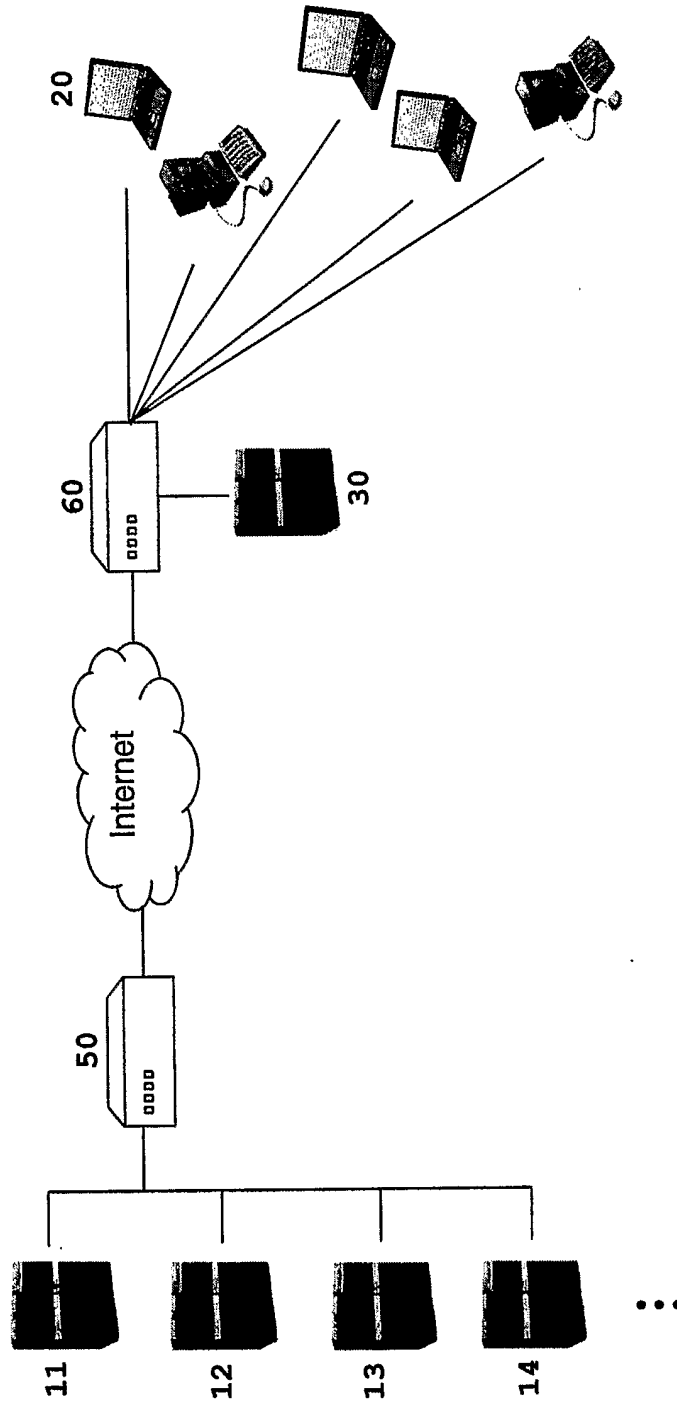
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G06F 17/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC7 G06F13/00, G06F15/16, H04L12/24, G06F17/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
KR, JP : IPC as above

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2002-32282 A (FUJITSU CO. LTD.) 31.JAN.2002 See the whole document	1-17
A	EP 1134922 A (LUCENT TECHNOLOGY CO. LTD.) 19.SEP.2001 See the whole document	1-17
A	KR 10-2001-68478 A (THREEAL CO.LTD.) 23.JULY.2001 See the whole document	1-17
A	KR 10-2002-29441 A (HIGHCHIPS CO. LTD.) 19.APRIL.2002 See the whole document	1-17

☐ Further documents are listed in the continuation of Box C.	☐ See patent family annex.

*   Special categories of cited documents:
"A"   document defining the general state of the art which is not considered to be of particular relevance
"E"   earlier application or patent but published on or after the international filing date
"L"   document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O"   document referring to an oral disclosure, use, exhibition or other means
"P"   document published prior to the international filing date but later than the priority date claimed

"T"   later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X"   document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y"   document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&"   document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 DECEMBER 2004 (07.12.2004)	**07 DECEMBER 2004 (07.12.2004)**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	SONG, Dae Jong Telephone No. 82-42-481-5992