Title: UPnP NETWORK SERVER-PROVIDED AGGREGATED VIEW OF NETWORK CONTENT

Abstract: A Universal Plug and Play (UPnP) server (1-1) and a method of providing an aggregated view of the content available on the UPnP network are described. Content data about available content items from a set of devices (1-6, 1-7, 1-8) logically connected to the UPnP network is received, for example, based on each UPnP networked device advertising its own content. Based on the content data received, data representing a device and location independent aggregated view of the available content on the UPnP network is generated and provided for a client device (1-5) logically connected to the UPnP network. The aggregated view may be searchable. The UPnP server may advertise the aggregated view to all of the devices on the network.
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UPnP Network Server-Provided Aggregated View of Network Content

The present invention relates to the fields of network content information display, Universal Plug and Play (UPnP) network server-provided or advertised information, and display of an aggregated view of network content.

With the emergence of home networks and Universal Plug and Play (UPnP) technology, an increasing number of types of devices may be interconnected. In a Universal Plug and Play network devices that store data representing music, audio, video, photographs, text files and other documents, and other kinds of content may all the interconnected. Also, different users may contribute devices and content to the same UPnP network, thereby clouding transparency and accessibility to the information or content available on the UPnP network.

Solutions have been provided in other network-related technologies to facilitate access to content on a network. For example, Clark et al., European Patent No. 1,234,442, discloses a large-scale personalized distributed media on demand system, which provides a searchable server that has metadata for a list of content that may be suitable for a subscriber. However, Clark and the other related art systems, do not provide such a solution for a UPnP network. Further, Clark does not disclose a device and location-independent aggregated view of content that is available on a network.

Provided are a method, system, device, apparatus, and computer-readable medium that embodies or carries out the functions of a UPnP server that provides an aggregated view of the content on the UPnP network. Such a method may include receiving data about content (content data) about available content items from a set of devices logically connected to a Universal Plug and Play (UPnP) network; generating, as data representing an aggregated view, an aggregated view of the available content on the UPnP network, based on the content data received; and transmitting the data representing the aggregated view to a client device logically connected to the UPnP network, the aggregated view being a device independent and location independent consolidated view of the available content on the UPnP network.

Additional features are also provided. For example, the data representing the aggregated view provided to the client device may be searchable for an available content
item. Further, the data representing the aggregated view may be searchable by one of keyword, usage history, content type, and content genre.

The set of devices can include all of the devices logically connected to the UPnP network.

Also, each device of the set of devices can advertise its content to enable the receiving of the content data.

Further, the data representing the aggregated view can be transmitted automatically to each device of the plurality of devices.

Moreover, a UPnP server is described. Such a server can include a content data receiver for receiving content data about available content items from a plurality of devices that are logically connected to a Universal Plug and Play (UPnP) network; an aggregated view generator for generating, as data representing an aggregated view, an aggregated view of the available content on the UPnP network, based on the content data received; and a view provider interface for transmitting the data representing the aggregated view to a client device logically connected to the UPnP network, the aggregated view being a device independent and location independent consolidated view of the available content on the UPnP network.

Such a server can further include a search handler that allows the client device to search the data representing the aggregated view provided for an available content item.

Figure 1 is a schematic view of a UPnP server according to an embodiment of the present invention.

Figure 2 is a flowchart showing an operation of a system according to the present invention.

The following discussion and the foregoing figures describe embodiments of Applicant’s invention as best understood presently by the inventors however, it will be appreciated that numerous modifications of the invention are possible and that the invention may be embodied in other forms and practiced in other ways without departing from the spirit of the invention. Further, features of embodiments described may be omitted, combined selectively or as a whole with other embodiments, or used to replace features of other embodiments, or parts thereof, without departing from the spirit of the invention. The figures and the detailed description are therefore to be considered as an illustrative explanation of aspects of the invention, but should not be construed to limit the scope of the invention.
As shown in Figure 1, the UPnP Server 1-1 includes several modules, which will be described below. Modules of the UPnP Server 1-1, or portions thereof, and/or the retrieval system as a whole, may be comprised of hardware, software, firmware, or a combination of the foregoing, however some modules may be comprised of hardware for example, while other modules may be comprised of software, firmware or a combination thereof. Further, it will be appreciated that modules of the retrieval system need not all be located or integrated with the same device. A distributed architecture is also contemplated for the retrieval system, such that the system or components thereof may “piggy-back” off of suitable modules provided by existing devices.

The following description will refer to a UPnP Server 1-1 that is physically integrated with or connected to a database 1-2 via a wired or wireless connection thereto, or connected via a network 1-9, as shown in Figure 1. The UPnP Server 1-1 and/or the database 1-2 may be embodied as physically integrated with or connected together, and each one, or both together, may be embodied as or be physically integrated with a device such as an MP3 player, a CD minidisk player or other type of media player and/or recorder, a data cartridge player, a home entertainment system, a television, a handheld entertainment device, a personal computer, a laptop/notebook computer, a printer, a scanner, a copier or other peripheral device, a game station, a work station, an intelligent kitchen/home appliance, a personal video recorder, an entertainment system, an electronic organizer, or a personal handheld device.

It will be understood that the database 1-2 may include several storage devices that are connected, such that organization or grouping of content items on two or more of such devices is possible. It will further be understood that the database may be understood to include one or more storage media, such as disks, including CDs, DVDs, zip disks, floppy disks, data cartridges, or the like, which can be loaded onto and retrieved by the database 1-2. However, it will be understood that the UPnP Server 1-1 is also capable of storing content in some other remote storage via a network 1-9, such as a LAN, WAN, the Internet, or the like.

Figure 1 shows a UPnP server 1-1 and the UPnP network 1-9, with connected UPnP devices L-Q (1-6, 1-7, and 1-8 of Fig. 1) and a client device 1-5. Such a UPnP devices L-Q (1-6, 1-7, and 1-8) may be connected to the network 1-9 in a wired or wireless manner, and may be of many different types, including, for example, such devices as an MP3 player, a CD minidisk player or other type of media player and/or recorder, a data
cartridge player, a home entertainment system, a television, a handheld entertainment
device, a personal computer, a laptop/notebook computer, a printer, a scanner, a copier or
other peripheral device, a game station, a work station, an intelligent kitchen/home
appliance, a personal video recorder, an entertainment system, an electronic organizer, a
personal handheld device, or a device with functions that comprise a combination of any of
the foregoing. It will be understood that any number of devices may be connected. The
term UPnP network will sometimes be used herein to describe all the features shown in
Fig. 1, and in such cases, the network 1-9 may be understood as referring to the
connections among the devices and as encompassing other devices not shown.

As shown in Figure 1, the UPnP network includes a client device 1-5 and UPnP
device L, 1-6, UPnP device M, 1-7, and UPnP device Q, 1-8. The UPnP server 1-1
includes a content data receiver 1-11 that receives content data from the UPnP networked
devices, and an aggregated view generator 1-12, which, based on the content data received
from the UPnP networked devices, compiles an aggregated view, which may be
understood as a consolidated view of the content that is available on the UPnP network that
is independent of the device and independent of the location at which the content resides
on the network. Controller 1-15 of the UPnP Server 1-1 may handle overall coordination
of the modules of the UPnP Server 1-1 and may interface with the outside, such as with a
user interface (not shown), and/or with another module of the system with which the UPnP
server 1-1 is integrated.

According to an embodiment of the present invention, the aggregated view may
be provided such that duplicate content items are shown only once, or listed once under a
primary heading, with secondary headings showing the devices where they may be found.
The aggregated view may provide a view of content that includes many different types,
including music or audio content, playlists, video, photographs, text files, spreadsheets,
JPEG files, MPEG (including MPEG-2, MPEG-3, or the like) files, XML data, HTML,
multimedia or other types of files, documents, lists, such as lists of executable or executed
commands, software, device status information, or other types of data. It may also include
metadata, usage history information regarding content items and/or the device itself, or
some combination of the foregoing types of information.

The UPnP server 1-1 also includes a view provider interface 1-13 which
transmits data representing this aggregated view to a client device 1-5, for example,
automatically upon the startup of the client device 1-5 or upon request for such information
by the client device 1-5, and a search handler 1-14, which receives a search argument from
the client device 1-5 based on the aggregated view data provided, and provides to the client
device 1-5 information responsive to the search argument received, and may further
provide to the client device 1-5 a link to the UPnP networked device 1-6, 1-7, or 1-8 or
other access information about where on the UPnP network the determined content resides.

An operation of the UPnP server 1-1 will now be described with reference to
Figures 1 and 2. Typically, in a UPnP network, networked UPnP devices advertise their
stored content. At S1 of Figure 2, content data receiver 1-11 of the UPnP server 1-1 shown
in Figure 1, receives content data from devices connected to the UPnP network, such as
from devices L-Q (1-6, 1-7, and 1-8) which have available content item of the types
identified in the foregoing. The devices of the UPnP network may advertise the content
data that is then received by the UPnP server 1-1. Alternatively, the UPnP and the server
1-1 may query the devices connected to the UPnP network for content items stored on the
devices that are available.

According to an aspect of the present invention, content data receiver 1-11
receives content data for all of the devices that store content items that are connected to the
UPnP network. The client device 1-5 may also provide its content information to the
UPnP server 1-1, and thus the aggregated view may include the content information for the
client device itself. Alternatively, the UPnP server 1-1 may filter the aggregated view
provided to each client to remove content that is available on that client, in order to
eliminate duplication of display and/or user confusion.

According to an aspect of the present invention, using the aggregated view
server, it is also possible to search for content for an “out” device, a device that is currently
not present or is off-line. For example, suppose the aggregated view content is stored on
the aggregated view server, and a mobile UPnP device is present whose content is also
included in the aggregated view. It may then be possible to search for content, but if the
mobile moves out of range, then there may be no way or reaching the content. Further,
according to an aspect of the present invention, a setting of the aggregated view server
could change the behavior in this respect.

Further, according to an aspect of the present invention, to facilitate the
searching of offline devices (not currently present) it helps if the aggregated view server
has a list of devices whose contents it needs to track. Accordingly, if a neighbor enters
with a portable UPnP device, this device may only be visible through the aggregated view as long as the device is within range, but devices of the user could be searchable even if not present.

At S2 of Figure 2, aggregated view generator 1-12 generates an aggregated view of the available content on the devices of the UPnP network, based on the content data received at S1. The aggregated view may be a display of all of the available content on the devices of the network. The aggregated view is displayed in a device-independent and location-independent manner, in order to free a user (not shown) using the client device 1-5 of the need to identify specific networked-devices or locations on the network where content is available.

At S3, data representing the aggregated view is provided to the client device 1-5 by the view provider 1-13 of the UPnP server 1-1. This may be performed upon the startup of the client device 1-5, based upon a request for such information by the client device 1-5, a change in available content data, such as the addition of one or more content items to an existing device on the UPnP network, or the addition of a device connected to the UPnP network, or some other event related to the UPnP network. According to an embodiment of the present invention, such data representing the aggregated view are advertised by the UPnP Server periodically.

It will be appreciated that the format of such an aggregated view may vary, and may depend on the particular application and the capabilities of the client device to which the aggregated view is fed. Thus, several formats of such an aggregated view may be compiled in advance and fed to a client device 1-5 based on the capabilities, parameters, and/or operating system of the client device 1-5. Additionally, the format may be varied to the requirements and settings of the client device 1-5 and the user in real time as needed.

For instance, a screen or viewing display available on a client device 1-5, the operating system of the client device 1-5, and the memory available in the client device 1-5 may determine the format and/or depth of information or granularity of information presented for the aggregated view that is transmitted to the client device 1-5. Further, the aggregated view, while sometimes described herein as being displayed by the client device 1-5, may instead, or additionally, be provided as a printout, a moving image, audio information, other type of output, or a combination of the foregoing.

The format of the aggregated view available on the client device 1-5 may be specified by the client device 1-5 or may be determined with reference to a user profile or
device profile stored in advance for the client device 1-5. For instance, such format of the aggregated view may be a list of available content logically organized by content type, such as content items organized under headings such as photographs, music, film, text files, personal contact information, and the like; may be organized by user, such as aggregated view including content for user 1, aggregated view including content for user 2, et cetera; may be organized alphabetically by content identifier; maybe organized by some combination of the foregoing; or in some other suitable matter to carry out the purposes of this invention.

According to an embodiment of the present invention, the aggregated view is transmitted by the UPnP Server 1-1 to each of the devices connected on the UPnP, for example, the UPnP Server 1-1 may advertise the data representing the aggregated view. Accordingly, each of the devices L-Q (1-6, 1-7, 1-8 of Figure 1), in addition to the client device 1-5 may thus provide an aggregated view to a user, and may therefore be thought of as client devices. Further, a subset of the devices L-Q (1-6, 1-7, 1-8) may be client devices, for example, those for which a setting (a default setting or a user-activated setting) has been set, or those device which are capable of presenting such a view, may receive the data representing the aggregated view.

According to an aspect of the present invention, only one device in the UPnP network is allowed to function as an aggregated view server. For example, a server can find out whether a device (or more than one other devices) on the UPnP network is also advertising content that is not present locally on that device, and if so, the server assumes that the device is an aggregated view server, and will not advertise an aggregated view. Of course more elaborate ways can be conceived to prevent multiple aggregated view servers on a network, such as setting a special metadata flag, or just allowing a user to set a device as an aggregated view server for the UPnP network. Accordingly, a situation in which two aggregated view servers keep updating back and forth by adding content that is already available may be avoided.

According to an aspect of the present invention, as discussed at S4, the search handler 1-14 of the UPnP of the UPnP server 1-1 may receive a search argument for a content item. Such an argument or arguments may include a keyword for a content item, such as a title, or other identifier for the content item, a name of a creator, artist or performer associated with the content item, a genre of the content item, a device or location
where the content item may be stored, a type (such as music file or text file) of the content item, usage information of the content item, such as time/date of last usage, last user, or other metadata for the content item.

Alternatively, the data representing the aggregated view provided to the client device 1-5 may be sufficient by itself or together with other information already available on the client device 1-5 based on the data provided by the UPnP Server 1-1 as part of the data representing the aggregated view, to provide a satisfactory response to the search, and accordingly, resort to the search handler 1-14 may not be necessary. Further, according to an embodiment of the present invention, the client device 1-5 would be able to handle the search and provide a satisfactory response to a search if the search argument presented was straightforward, for example if the aggregated view was presented as a list of content items by content name and the search argument comprised a content item name, but in case of more complex searches or other types of searches would request information from search handler 1-14 of the UPnP Server 1-1.

At S5, the search is conducted based on the search argument or arguments, and at S6, information responsive to the search is provided. For example, such information may include the host device connected to the UPnP network where the requested content item resides, a link to such a host UPnP networked device, and/or other information about the requested item, such as the usage information, artist information, metadata or other types of information about the content item discussed in the foregoing.

At S7, the host device where the content item resides is commanded to play or present the content item found. For example, a photograph stored on device 1-6 may be transmitted to the client device 1-5. This may be performed automatically upon finding the content item, or may be performed upon request perceived by the UPnP server 1-1 from the client device 1-5. It will be appreciated, that the content item may be displayed or played back on the host device instead of or in addition to playback or presentation by the client device 1-5. It will further appreciated that the present S7, like other steps set forth in Fig. 2, such as S4 and S5 for example, is optional, and processing may stop after the preceding step. Processing may be stopped S8, for example, responsive to completion of S7, retrieval or playback of the content item, responsive to completion of the providing of the aggregated view to the content item, or responsive to user command received from the client device 1-5 or from the UPnP in the server 1-1, or from some other device, such as a remote control.
Embodiments of the present invention provided in the foregoing written description are intended merely as illustrative examples. It will be understood however, that the scope of the invention is provided in the claims.
CLAIMS

1. A method of providing content information to a client device, said method comprising:
   receiving (S1) content data about available content items from a plurality of devices logically connected to a Universal Plug and Play (UPnP) network;
   generating (S2), as data representing an aggregated view, an aggregated view of the available content on the UPnP network, based on the content data received; and
   transmitting (S3) the data representing the aggregated view to a client device logically connected to the UPnP network, the aggregated view being a device independent and location independent consolidated view of the available content on the UPnP network.

2. The method of claim 1, wherein the data representing the aggregated view provided to the client device is searchable for an available content item.

3. The method of claim 2, wherein the data representing the aggregated view is searchable by one of keyword, usage history, content type, and content genre.

4. The method of claim 1, wherein the plurality of devices includes all of the devices logically connected to the UPnP network.

5. The method of claim 1, wherein each device of the plurality of devices advertises its content to enable the receiving of the content data.

6. The method of claim 1, wherein the data representing the aggregated view is transmitted automatically to each device of the plurality of devices.

7. The method of claim 1, wherein the UPnP network includes only one device enabled to provide the data representing the aggregated view.

8. The method of claim 1, wherein the aggregated view includes the content of an out device of the plurality of devices, the out device being a device that is presently at least one off-line and out of range.
9. A server (1-1) configured to provide content information to a client device, said server comprising:

   a content data receiver (1-11) configured to receive content data about available content items from a plurality of devices (1-6, 1-7, 1-8) logically connected to a Universal Plug and Play (UPnP) network;

   an aggregated view generator (1-12) configured to generate, as data representing an aggregated view, an aggregated view of the available content on the UPnP network, based on the content data received; and

   a view provider interface (1-13) configured to transmit the data representing the aggregated view to a client device (1-5) logically connected to the UPnP network, the aggregated view being a device independent and location independent consolidated view of the available content on the UPnP network.

10. The server of claim 9, further comprising a search handler (1-14) configured to enable the client device to search the data representing the aggregated view provided for an available content item.

11. The server of claim 9, wherein said search handler is configured to enable the search by one of keyword, usage history, content type, and content genre.

12. The server of claim 9, wherein said content data receiver is configured to receive the content data from the plurality of devices, the plurality of devices including all of the devices logically connected to the UPnP network.

13. The server of claim 9, wherein said content data receiver is configured to receive from the plurality of devices advertised data as the content data.

14. The server of claim 9, wherein each device of the plurality of devices advertises its content to enable the receiving of the content data.

15. The server of claim 9, wherein the data representing the aggregated view is transmitted automatically to each device of the plurality of devices.
16. The server of claim 9, wherein the server has a setting specifying the plurality of devices.

17. The server of claim 9, wherein the aggregated view includes content of an out device of the plurality of devices, the out device being a device that is presently at least one off-line and out of range.