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INVENTOR(S)/APPLICANT(S)			
Last Name	First Name	Middle Initial	Residence (City and either State or Foreign Country)
Palm	Stephen		Sunnyvale, California
TITLE OF THE INVENTION (280 Characters Maximum)			
Networked Audio Player Transport Protocol and Architecture			
CORRESPONDENCE ADDRESS (including country if not United States)			
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C. 1100 New York Ave., NW, Suite 600			
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

- No
 Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

Signature:
 Typed or Printed Name: Robert Sokohl

Date: 1/6/00
 Registration No. 36,013

- Additional inventors are being named on separately numbered sheets attached hereto. *(if appropriate)*

NETWORKED AUDIO PLAYER TRANSPORT PROTOCOL AND ARCHITECTURE

1 Inventor

Stephen Palm
870 West Maude Ave., Sunnyvale, California 94086, USA

2 Field of the Invention

The present invention is directed to a communications device and system, and a method for deploying home-networking based multimedia delivery solutions. Specifically, the instant invention focuses on solutions for multimedia content delivery from a centralized repository, via the home-networking infrastructure, to IP based multimedia devices, which are connected to that same network.

3 Background

The recent proliferation of high speed home networking technologies (e.g. phone wire based, wireless, power-line, etc) combined with the deployment of broadband internet access (e.g. xDSL, cable modems, satellite, wireless, etc) encourages and provides a foundation for consumers to listen to and view digital multimedia content. On one hand, users of computers have been able to play digital media content on their computer, but it has required detailed knowledge of operating systems and application programs. On the other hand, devices such as televisions and radios have extremely simple and user friendly interfaces but are generally limited to receiving non-interactive broadcast programming. From the consumer user perspective, what is needed are receiving devices (players) with relatively simple to operate user interfaces in which they can interactively select content stored on media servers that is delivered via their home network.

From the system design perspective, protocols and interfaces are needed to provide communication between the user player and media server so that the user may navigate and select the particular media items to be played. Once the user has made their selection, a format for describing the pieces of content, the ordering of play, and other information must also be communicated between the server and the player before the transmission of the actual media. In the process of making selections, user will desire many different ways of indicating their preferences such as selection from a hierarchical list, searches, both interactive and submitted, content provider suggestions, etc.

4 Definitions

Definitions and abbreviation include the following:

SDMI	Secure Digital Music Initiative
WAP	Wireless Access Protocol
WML	Wireless Markup Language

5 References

The present disclosure also refers to the following Recommendations, Standards, drafts and contributions, the subject matter of which is expressly incorporated herein by reference in their entirety:

- [SSDP] Y. Goland, T. Cai, P. Leach., Y. Gu, S. Albright, "DRAFT Simple Service Discovery Protocol/1.0", <http://www.ietf.org/internet-drafts/draft-cai-ssdp-v1-03.txt>
- [DHC] R. Troll, "DRAFT Automatically Choosing an IP Address in an Ad-Hoc IPv4 Network", <http://www.ietf.org/internet-drafts/draft-ietf-dhc-ipv4-autoconfig-04.txt>
- [HTTPUDP] Y. Y. Goland. Multicast and Unicast UDP HTTP Requests. Internet Draft - a work in progress, draft-goland-http-udp-00.txt.

- [RFC2365] D. Meyer. Administratively Scoped IP Multicast. RFC 2365, July 1998.
- [RFC2396] T. Berners-Lee, R. Fielding and L. Masinter. Uniform Resource Identifiers (URI): Generic Syntax. RFC 2396, August 1998.
- [HTTP] R. Fielding, J. Gettys, J. C. Mogul, H. Frystyk, L. Masinter, P. Leach and T. Berners-Lee. Hypertext Transfer Protocol - HTTP/1.1. RFC 2616, November 1998.
- [ASX] <http://msdn.microsoft.com/workshop/imedia/windowsmedia/crcontent/asx.asp>
- [SDMI] <http://www.sdmi.org>

6 Summary of the Invention

The present invention contains a communications system consisting of a networked multimedia device (also referred to as a multimedia player) and a media server that may be located within the home network or an external network. Further it contains a method for selecting and delivering multimedia. Specifically, the instant invention focuses on solutions for multimedia content delivery from a centralized repository, via the home-networking infrastructure, to IP based multimedia devices, which are connected to that same network. The present invention utilizes HTML and WML to optimize for playlists and media headers.

Usable home network media include, but are not limited to, phone wire based, wireless, power-line, etc. Usable broadband Internet access media include. xDSL, cable modems, satellite, wireless, etc. The invention provides consumer user receiving devices (multimedia devices or players) with relatively simple to operate user interfaces in which they can interactively select content stored on media servers that is delivered via their home network.

The present invention provides protocols and interfaces for communication between the multimedia devices and media server so that the user may navigate and select a particular media item to be played. The invention also allows communication either with at least one of a local media server (content repository) and media servers on the Internet. Users are provided the ability to type a few letters and see the possible completions after each letter is typed since a unique match may be reached without typing the full letters of the keyword. This is especially important since the present invention contemplates multimedia devices that do not have a full size keyboard.

One feature of the invention is that once the user has made their selection, it provides a format for describing the pieces of content, the ordering of play, and other information that must be communicated between the server and the player before the transmission of the actual media.

Another feature of the invention, is that it provides a method to allow the user many different ways of indicating their preferences such as, but not limited to selection from a hierarchical list, searches, both interactive and submitted, content provider suggestions, etc

An advantage of the instant invention is that it provides an interactive search by processing of a database of track, album, playlist, etc., information.

7 Detailed Description

7.1 System Requirements

7.1.1 Player Device Requirements

The proposed framework for multimedia delivery over home networks is accomplished by implementing some or all of the following capabilities in the Multimedia devices connected to the network:

1. Automatic configuration of the device on the network using a method such as DHCP as determined by the Universal Plug-and-Play organization as described in the article "Automatically Choosing an IP Address in an Ad-Hoc IPv4 Network" [DHC].
2. Each multimedia device will be able to issue HTTP requests (GET, POST) [HTTP] and receive HTTP responses containing MIME classified objects.
3. Each multimedia device will be capable of at least displaying Wireless Markup Language compatible (WML) or HTML content.
4. Each Multimedia device will be capable of being able to parse a play list, containing URLs of specific clips, in XML format.
5. Each multimedia device will be able to resolve a host name using DNS call
6. Each multimedia device shall be capable of connecting either directly to a local media server (content repository) or media servers on the Internet.
7. Each multimedia device shall be capable of supporting interactive search by processing of a database of track/album/playlist information.
8. Each multimedia device shall be capable of mixing remote (song title, total length, advertisements, etc) content and local (elapsed time, eye candy (spectral analyzer, etc) content.
9. Each Multimedia device shall be capable of receiving "channels" designated by number. This functionality is equivalent to television or radio where the user selects a channel number and receives a broadcast if available. Since this implies multipoint (non-interactive) reception, the receiver must be capable of starting playback in mid stream (ie no header information describing the contents) (e.g. MS Netshow .nsc file)

A preferred embodiment includes all the items described above. Another embodiment only includes items 1-4 and 8. However, it is contemplated that other embodiments may include any subset of these items. The present invention is described with reference to audio. However, it is contemplated that graphics and video will be accessed as well.

7.1.2 Functionality

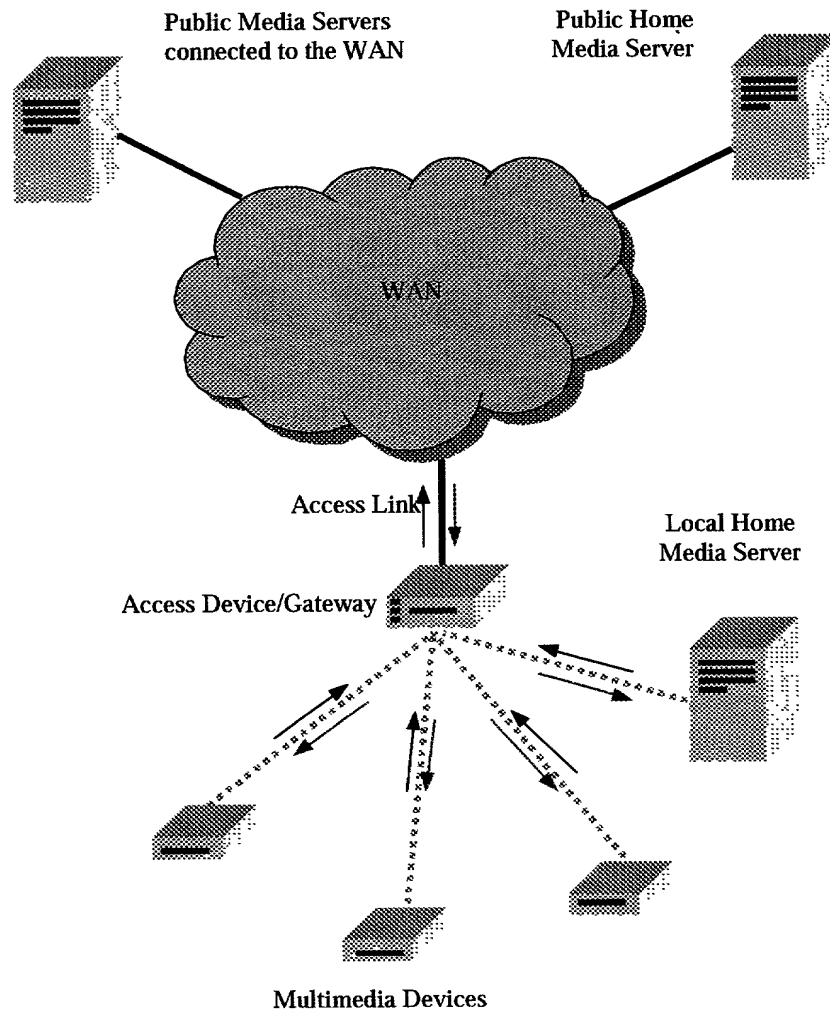
The introduction of the above capabilities for a home networking multimedia device will allow the device to perform the following sample functions against a centralized repository connected inside, or outside the home network:

1. Navigate through the content repository's logical hierarchy of media categories
2. Request and display play lists
3. Passive Search for specific titles using keywords (in title, artist, playlist name, etc) (Optional)
 - Request a specific title for playback

- Request scheduled or non-scheduled interruptions for the purpose of aborting the current media title (if any), to switch to another.
4. Interactive Search for specific titles using keywords (in title, artist, playlist name, etc) (Optional)
- The interactive search may function on the first word of a text string or all words in a text string. For example, if the user is interactively searching by artist, typing the letters "P" "R" may match with "PRince", "The PRetenders", "Elvis PResley" and "Bruce SPRingsteen"?

7.2 Typical network Configuration

Following is a sample configuration of a home-networking based multimedia delivery network:



Inside the home network, Multimedia devices are connected via the home networking link to a unique **Home Media Server**, which is capable of accepting requests over HTTP (and WAP or equivalent for broadband wireless) for content catalog browsing as well as media streaming. The Media Server may respond to each request with response, which complies with the WML standard, in which case the

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