By
Satish Chander A
Technical Lead
HCL Technologies.

DLNA Introduction

What is DLNA?

DLNA (Digital Living Network Alliance)

Purpose:

- **DLNA** is a standard used by manufacturers of consumer electronics,mobile device and personal computer to allow entertainment devices within the home to share their content with each other across a home network.

DLNA Introduction

Evolution:

- DLNA was formed in 2003 by 21 companies including Microsoft,Intel, HP, IBM, Sony, Philips, Toshiba, Pioneer, Motorola and Nokia.
- It currently has more than 200 members, including virtually all of the global brands in PC,CE and mobile electronics.
- The latest version of the DLNA Interoperability Guidelines, version 1.5, was published in March 2006 and then expanded in October 2006 .

DLNA Device Models

- The device model used by DLNA is derived from the UPnP Forum fundamental device model.
- UPnP model consists of:
  - **Devices** are network entities that provide services. An example would be a VCR player.
  - **Services** are the basic unit of control. They provide actions, and maintain status.An example would be VCR device which provides tape transport service, a tuner service, and a timing service.
  - **Control Points** are network entities that are capable of discovering and controlling other devices on the network.

DLNA Device Models

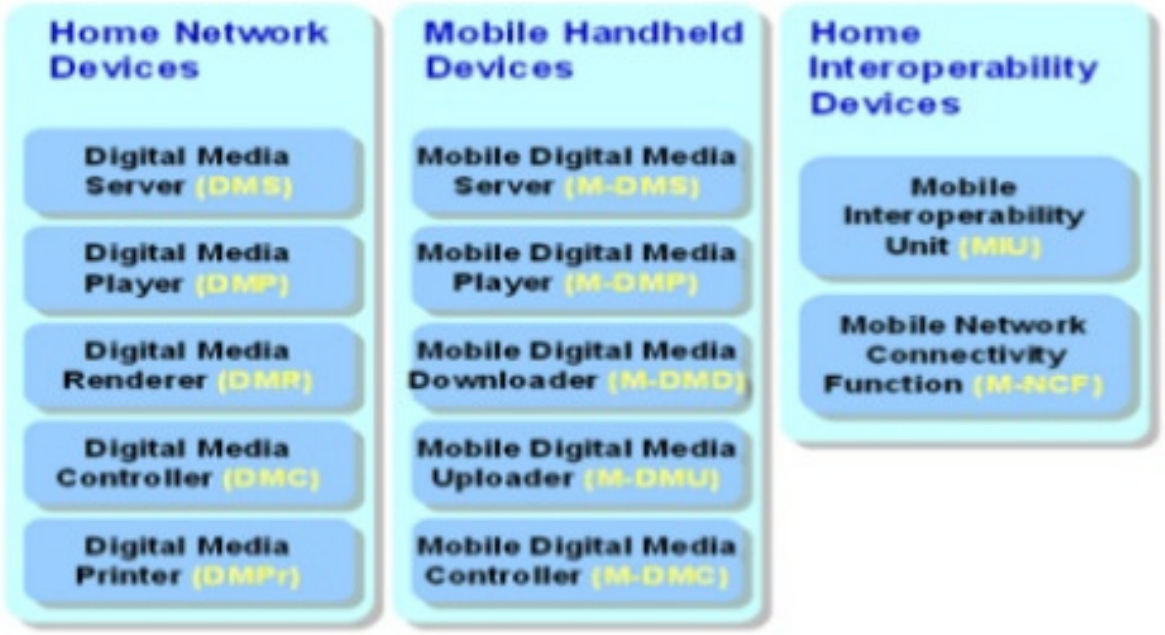
- With the development of DLNA the basic device model was extended so that Devices themselves interact with each other to pass digital data.

- Previously ,Control Point may be managing multiple devices, all interactions occur only between the Control Point and the individual device.

- Now,The Control Point configures the Devices as needed,initiates the flow of content, and gets out of the way.

DLNA Device Models

- In order to better define the characteristics of devices and the services they offer, the DLNA Interoperability Guidelines define twelve Device Classes organized into three Device Categories.



DLNA Device Models

The **Home Network Device (HND)** category is made up of five Device Classes that are in use in the home network, and rely on the same media formats and network connectivity requirements.

- **Digital Media Server (DMS):**Acquires, records, stores, and makes available digital media content, as well as enforcing content protection requirements.E.g.:Advanced Set-top Boxes
- **Digital Media Player (DMP):**Finds content offered by a DMS and provides playback and rendering capabilities.E.g.:Digital TVs

DLNA Device Models

- **Digital Media Renderer (DMR):**Similar to DMPs in that they render or play content they receive from a DMS. Unlike DMPs, they are unable to find content on the network, and must be setup by another network entity , a DMC.

- **Digital Media Controller (DMC):**Finds content offered by a DMS and matches it to the rendering capabilities of a DMR, setting up the connections between the DMS and DMR.E.g. a personal digital assistant or multimedia mobile phone.

- **Digital Media Printer (DMPr):**Provides printing services to the DLNA home network.E.g. networked photo printer.

DLNA Device Models

- The **Mobile Handheld Device (MHD)** category is made up of five Device Classes that share the same usages models as the HND Device Category, but have different requirements for media format and network connectivity.
  - **Mobile Digital Media Server (M-DMS):**Offers and distributes content. A mobile phone and a portable. music player are examples
  - **Mobile Digital Media Player (M-DMP):**Finds content offered by a M-DMS and plays the content locally on the M-DMP. A media tablet designed for viewing multimedia content is an example of a M-DMP device.

DLNA Device Models

- **Mobile Digital Media Controller (M-DMC):**Finds content offered by an M-DMS and match it to the rendering capabilities of a DMR, setting up the connections between the server and renderer. A personal digital assistant and an intelligent remote control are examples of M-DMC devices.

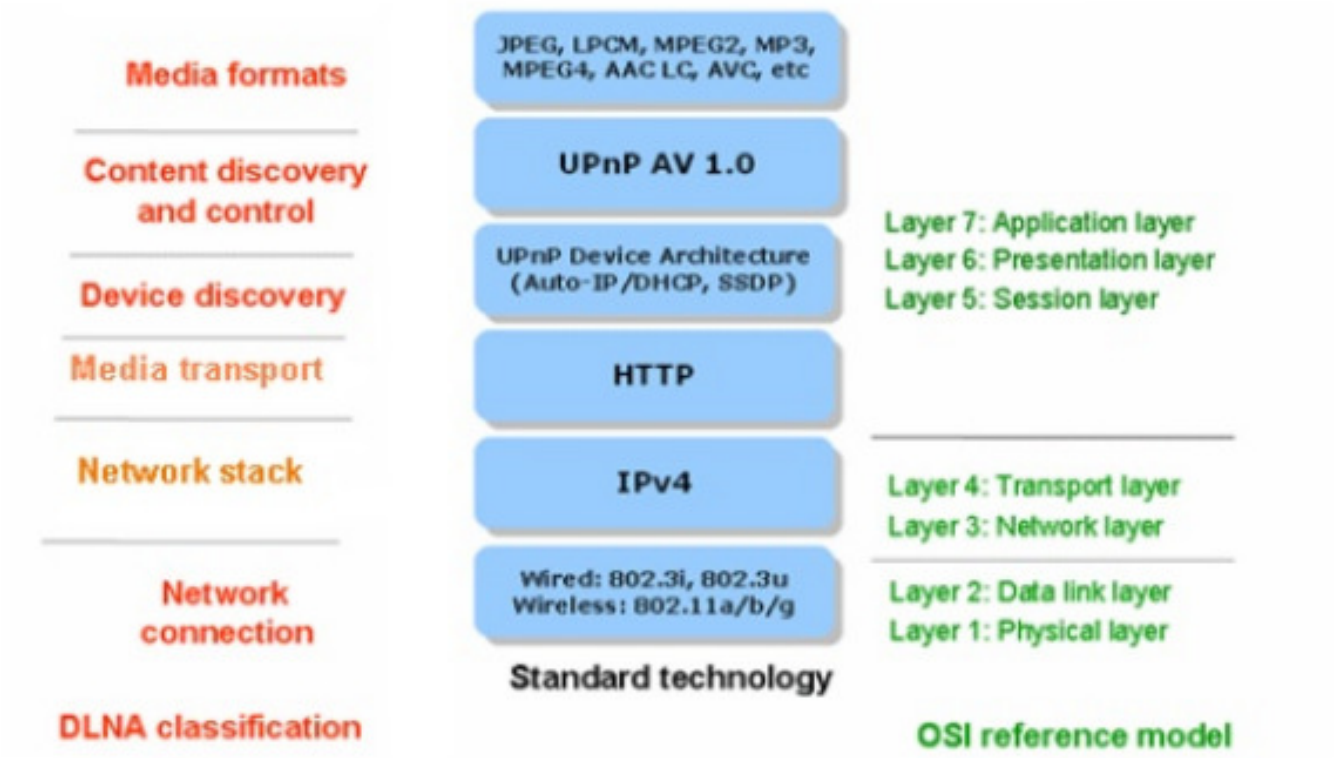
- **Mobile Digital Media Uploader (M-DMU):**Sends content to an M-DMS with upload functionality. A digital camera and a camera phone are examples of M-DMU devices.

- **Mobile Digital Media Downloader (M-DMD):**Finds and downloads content exposed by an M-DMS and plays the content locally on the M-DMD after download. A portable music player is an example of a M-DMD device.

DLNA Device Models

- The **Home Infrastructure Device (HID)** category is made up of two Device Classes. These devices are intended to allow HNDs and MHDs to interoperate.
  - **Mobile Network Connectivity Function (M-NCF):** devices provide a bridging function between the MHD network connectivity and the HND network connectivity.
  - **Media Interoperability Unit (MIU):**devices provide content transformation between required media formats for the HND Device Category and the MHD Device Category.

DLNA Architecture



DLNA Architecture

- **Media Formats.**

  Media Formats describe how digital content is encoded and formatted for image, audio, and AV.

Media Class	**Mandatory Formats**	**Optional Formats**
Image	JPEG	PNG, GIF, TIFF
Audio	LPCM	AC3, AAC, MP3, WMA9, ATRAC3plus
Video	MPEG2	MPEG1, MPEG4, VC1, MPV1

DLNA Architecture

- **Media Transport**

  Media Transport defines how content moves across the network.

Mandatory Transport	**Optional Transport**
HTTP1.1	RTP

DLNA Architecture

- **Media Management**

  Media management enables devices and applications to identify,manage, and distribute digital media content across network devices.

Mandatory Management	**Optional Management**
UPnP Forum AV	None

DLNA Architecture

- **Network Stack**
  - The basis for UPnP Networking (and thus DLNA) is the TCP/IP v4 protocol.
  - UPnP makes extensive use of both the UDP and TCP protocols.
  - Discovery is done via an HTTP Multicast over UDP.
  - Definition, control, and eventing services are delivered via HTTP over TCP
  - Every device must implement a DHCP client, and search for a DHCP server when first connected to the network. If a DHCP server is discovered, the device must use the IP address assigned by the server.If no DHCP server is discovered, the device must use Auto-IP to generate a link-local IP address.

DLNA Architecture

- **Network connectivity**

  Three network connection technologies are incorporated in the DLNA 1.5 Interoperability Guidelines:

  - 10Base-T and 100Base-T Ethernet(802.3i / 802.3u) for wired connections.
  - WiFi (802.11a /802.11b/802.11g) for wireless connections.
  - Bluetooth for wireless connections for mobile handheld devices such as cell phones and PDAs.

  Additional network connections such as 1000Base-T Ethernet (802.3ab) and faster WiFi (802.11n) will be added to the Guidelines in the future.

DLNA Certification

The initial step in gaining certification is

- The vendor device should successfully pass the DLNA's Conformance Test Tool (CTT) test.
- Then schedule a test session with one of the Independent Certification Vendors (ICV) approved by DLNA.
- The ICV will test the submitted product per DLNA's Certification Test Plan (CTP) against 3 reference devices of the appropriate device class.

Note: The CTT is a suite of tests that are run by the vendor against the product, and validate the devices' compliance with DLNA standards.