홈 네트워크 기술개발 동향

- AV 기기를 중심으로 -
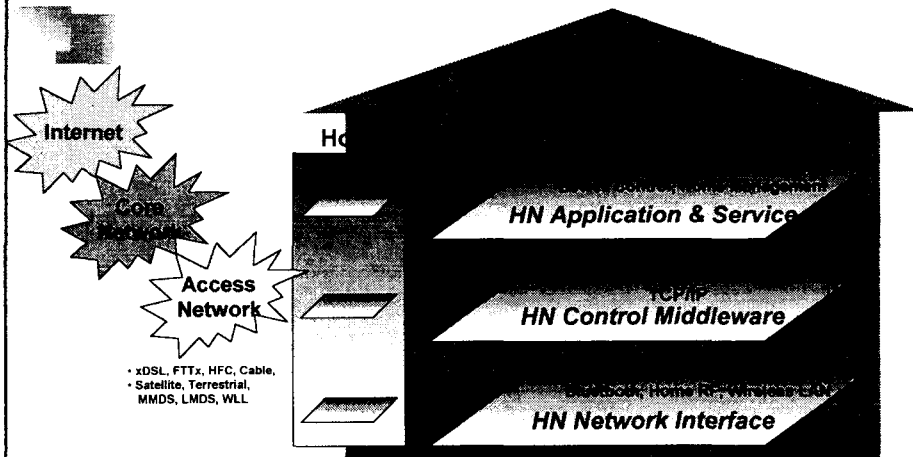
2001. 11. 22

Home Platform Group / DM(연) / 삼성전자

목차

□ **Part 1: Home Network Interface Technology**
  - Wired Solutions　　　　　: IEEE1394
  - Wireless Solutions

□ **Part 2: Home Network Control Middleware**
  - Object based Solutions　　: HAVi
  - Protocol based Solutions　: UPnP

□ **Part 3: Home Network Applications and Services**
  - Not covered today

Home Network Overview

Network Interface Technology

Interface Technology	Specification		Key Features		
	Version / Edition	Date	Media	Speed	Frequency
IEEE1394	IEEE1394-1995	1995	STP	400Mbps(STP)	-
	IEEE1394a	2000	STP	400Mbps(STP)	-
	P1394b	~	UTP, POF, HPCF, MMF, STP	100Mbps(UTP), 200Mbps(POF, HPCF) 1.6Gbps(MMF, STP)	-
	Wireless 1394	~	Wireless	54Mbps	5GHz
ECHONET	Ver 0.8	1999.7	Power line, LP-Wireless	9.6Kbps	400MHz (LP-Wless)
	Ver 1.0B	2000.2			
Home PNA	Ver 1.0	1998. F	Phone line	1Mbps	5.5M~9.5MHz
	Ver 2.0	1999.12		10Mbps(4~32)	2M~30MHz
	Ver 3.0	~		100Mbps	
Home RF	Ver 1.0	1999.1	Wireless	1M, 2Mbps	2.4GHz
	Ver 1.1	1999.6			5GHz
	Ver 1.2	1999.10			2.4GHz
Wireless LAN	IEEE802.11	1993	Wireless	1M, 2Mbps	
	IEEE802.11a	1999.11		6, 12, 24, 54Mbps	5GHz
	IEEE802.11b	1999.11		5.5M, 11Mbps	2.4GHz
Bluetooth	Ver 1.0A	1999.7	Wireless		
	Ver 1.0B	1999.12			

- ❏ **AV Devices**
  - ⟋ DTV, STB, DVHS, DVC, DVD Player, AV-HDD,
  - ⟋ IEEE1394, USB, Bluetooth,
- ❏ **PC & Peripherals**
  - ⟋ PC, Printer, Scanner, CD-ROM/R/RW, DVD-ROM/R/RW,
  - ⟋ USB2.0, IEEE1394, Wireless LAN, Bluetooth
- ❏ **Home Appliances**
  - ⟋ Refrigerator, A/C, Microwave Oven,
  - ⟋ PLC, Bluetooth, IEEE1394, USB
- ❏ **Network Equipments**
  - ⟋ Gateway, Router, Cable Modem, xDSL Modem
  - ⟋ Ethernet, Wireless LAN, USB, PLC , IEEE1394,
- ❏ **Mobile Devices**
  - ⟋ Phone, PDA, NotePC, Watch, Web Pad,
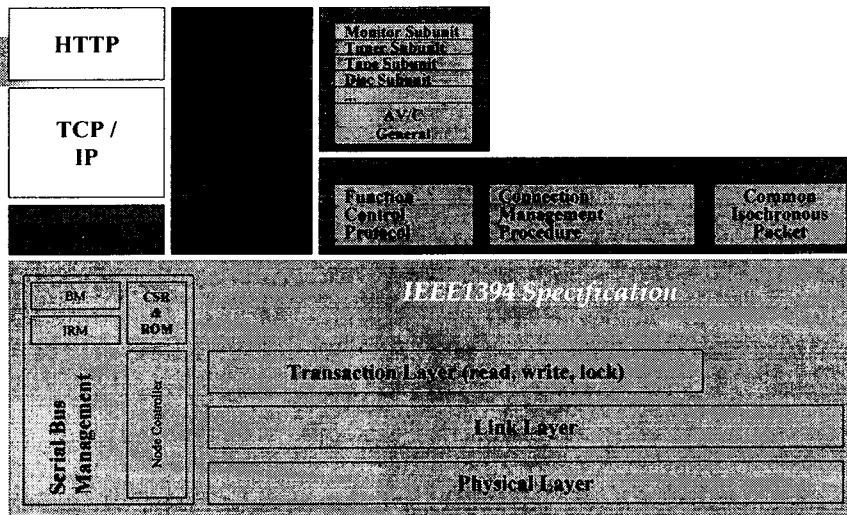 - ⟋ Bluetooth, Wireless LAN, USB,

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- ❏ **Overview**
  - ⟋ Specification is complete
  - ⟋ Suitable for digital AV devices

- ❏ **Key Features**
  - ⟋ **Real Time Transmission of AV data(MPEG, DV...)**
    - ▫ Isochronous vs Asynchronous
  - ⟋ **High Speed**
    - ▫ 100, 200, 400 Mbps (1394-1995, 1394a)
    - ▫ 800, 1600, 3200 Mbps(1394b)
  - ⟋ **Auto Configuration (Plug and Play, Hot Plugging)**
    - ▫ Bus Reset Process
    - ▫ Configuration ROM and CSR (from IEEE1212)
  - ⟋ **Serial Bus**
    - ▫ Small 6 pin, 4 pin connector

Protocol Stack of IEEE1394

P1394b

□ **Overview**
  - Full backward compatibility with 1394-1995 and 1394a
  - Draft 1.31(2001.10.15) is available now

□ **Key Features**
  - **Long Distance and High Speed**
    - ~ 50M, 100M
    - ~ 800 and 1600Mbps (3200Mbps architectural support)
  - **New Encoding Scheme**
    - Beta Mode: 8B/10B(New),   // New Connector required
    - DS Mode: (1394-1995 and 1394a)
    - Bi-lingual port: supports beta mode and DS mode simultaneously
  - **New Arbitration Scheme**
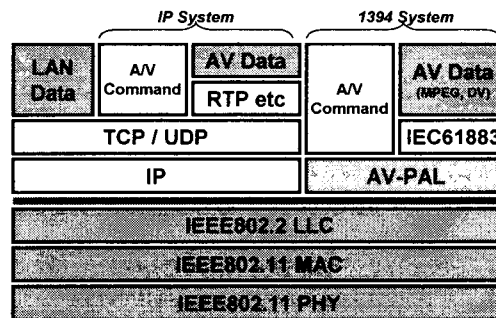   - BOSS(Bus Owner/Supervisor/Selector)

Wireless 1394 and AV-Data

- ❑ **Overview**
  - ⁃ 1394 Frame over Wireless Media
  - ⁃ IEEE802.11a, 802.11e (QoS extension, MAC)

- ❑ **Key Specifications**
  - ⁃ Protocol Adaptation Layer(PAL)
  - ⁃ Wireless Common Architecture Specification (WCAS)

IP System			1394 System	
LAN Data	A/V Command	AV Data	A/V Command	AV Data (MPEG, DV)
		RTP etc		
TCP / UDP			IEC61883	
IP			AV-PAL	
IEEE802.2 LLC				
IEEE802.11 MAC				
IEEE802.11 PHY				

홈 네트워크 제어 미들웨어

- ❑ **Home Network Control Middleware**
  - ⁃ Provides common computing platform for development of home network applications and services

- ❑ **Types of Home Network Control Middleware**
  - ⁃ Protocol based
    - ◦ UPnP
    - ◦ VESA Home Network
  - ⁃ Object based
    - ◦ HAVi(Home AV Interoperability)
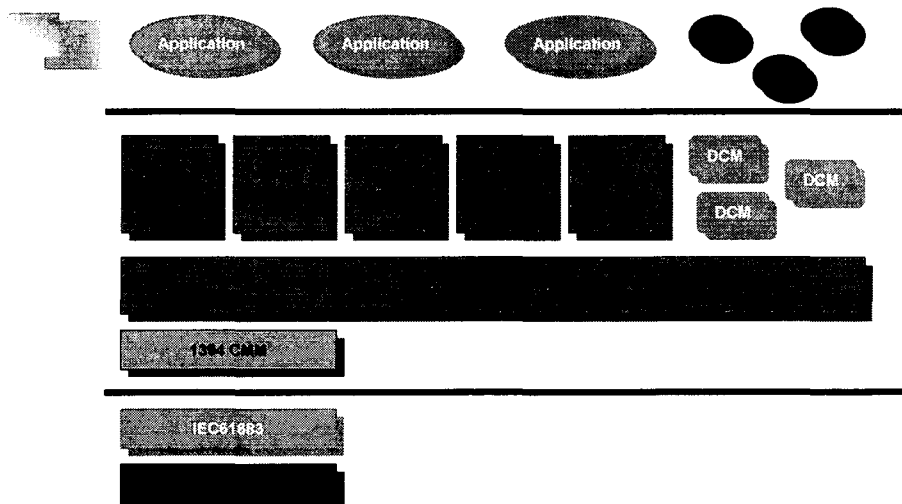   - ◦ Jini

HAVi

□ **Overview**
- HAVi = Home Audio and Video Inter-Operability
- Specifications
  - 1999. Version 1.0
    - Proposed by 8 companies from Japan and Europe
    - Sony, MEI, Philips, Thomson, Hitachi, Toshiba, Sharp, Grundig
  - 2001. Version 1.1
- Products
  - 2001. Two models will be introduced to the US market by 2 Japanese companies
- Features
  - IEEE1394-based Control Middleware
  - Well fitted to AV consumer device

HAVi Architecture

□ **HAVi System Components(Software Elements)**
- CMM1394
  - ∋ allows other Software Elements to perform asynchronous and isochronous communication over IEEE1394
- Messaging System
  - ∋ is responsible for passing messages between software elements
- Registry
  - ∋ serves as a directory service, allows any object to locate another object on the home network
- Event Manager
  - ∋ serves as an event delivery service. An event is the state change in object or home network
- Stream Manager
  - ∋ is responsible for managing real-time transfer of AV and other media between functional components
- Resource Manager
  - ∋ facilitates sharing of resources and scheduling of actions
- Device Control Module
  - ∋ is a software element used to control a device.
- DCM Manager
  - ∋ is responsible for installing and removing DCM code units on FAV & IAV devices
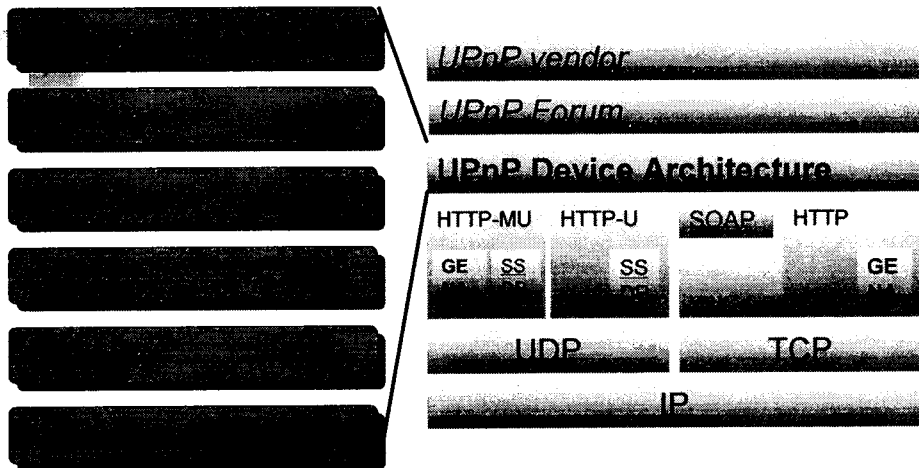

□ **Overview**
- UPnP History
  - ∋ 1999.6: UPnP Forum was founded
  - ∋ 2000.6: Device Architecture Spec 1.0
- UPnP Forum Working Committees
  - ∋ Home Appliances
  - ∋ Home Automation
  - ∋ Gateway
  - ∋ AV, Camera, EPF
  - ∋ Imaging and Printing
  - ∋ Security
  - ∋ Mobile
- Products
  - ∋ Windows ME and XP

UPnP Protocol Stack

UPnP vendor

UPnP Forum

UPnP Device Architecture

| HTTP-MU | HTTP-U | SOAP | HTTP |
| GE | SS | SS | | GE |

UDP | TCP

IP

UPnP Device Architecture

□ **Step 0: Addressing**
- Allocating IP address (Auto IP or DHCP server)

□ **Step 1: Discovery**
- Finding devices and services on home network (Advertisement & Search)

□ **Step 2: Description**
- Reading XML description of device and service information

□ **Step 3: Control**
- Controlling device functions by sending SOAP message

□ **Step 4: Eventing**
- Notifying service events to the subscriber(control point) by GENA

□ **Step 5: Presentation**
- Web Model

- **Device**
  - Media Server (version 0.4)
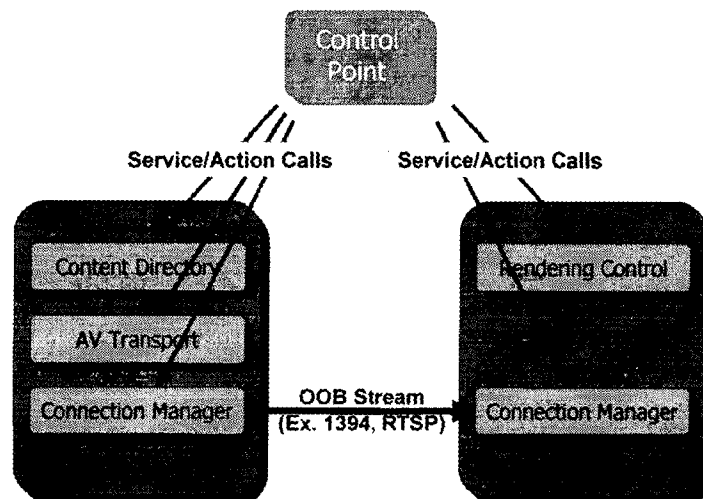 - Media Renderer (version 0.4)
- **Service**
  - Content Directory (version 0.69)
    - Provides a look-up service that allows clients(ex. UI devices) to locate (and possibly store) individual content items(ex. song, movie) that the MediaServer device is capable of providing
  - Connection Manager (version 0.931)
    - Performs capability matching between source(server) device and sink(renderer) device
    - Find information about currently ongoing transfers in the network
    - Setup and teardown connections between devices
    - Retrieve information on physical wiring between devices
  - AV Transport (version 0.75)
    - Enables control over the transport of audio and video streams
    - Is abstract enough to cover all media types(disc, tape, tuner ...)
  - Rendering Control (version 0.4)
    - Enables CP to retrieve/change/restore the rendering attribute of MediaRenderer

97

마치면서

□ **Home Network Interface Technology**
- Co-existence of various technologies
  - IEEE1394 for AV devices
  - Wireless LAN & Home PNA for PC and Peripherals
  - others

□ **Home Network Control Middleware**
- about to be introduced to the market
- UPnP
  - Supported by PC and Network makers
- HAVi
  - Supported by AV makers

□ **Home Network Application and Service**
- IT services first ?
- A/V later ?