Study Session 10
- Multimedia cyber technology

TR outline updated

at SS 10

on 15 May, 2017

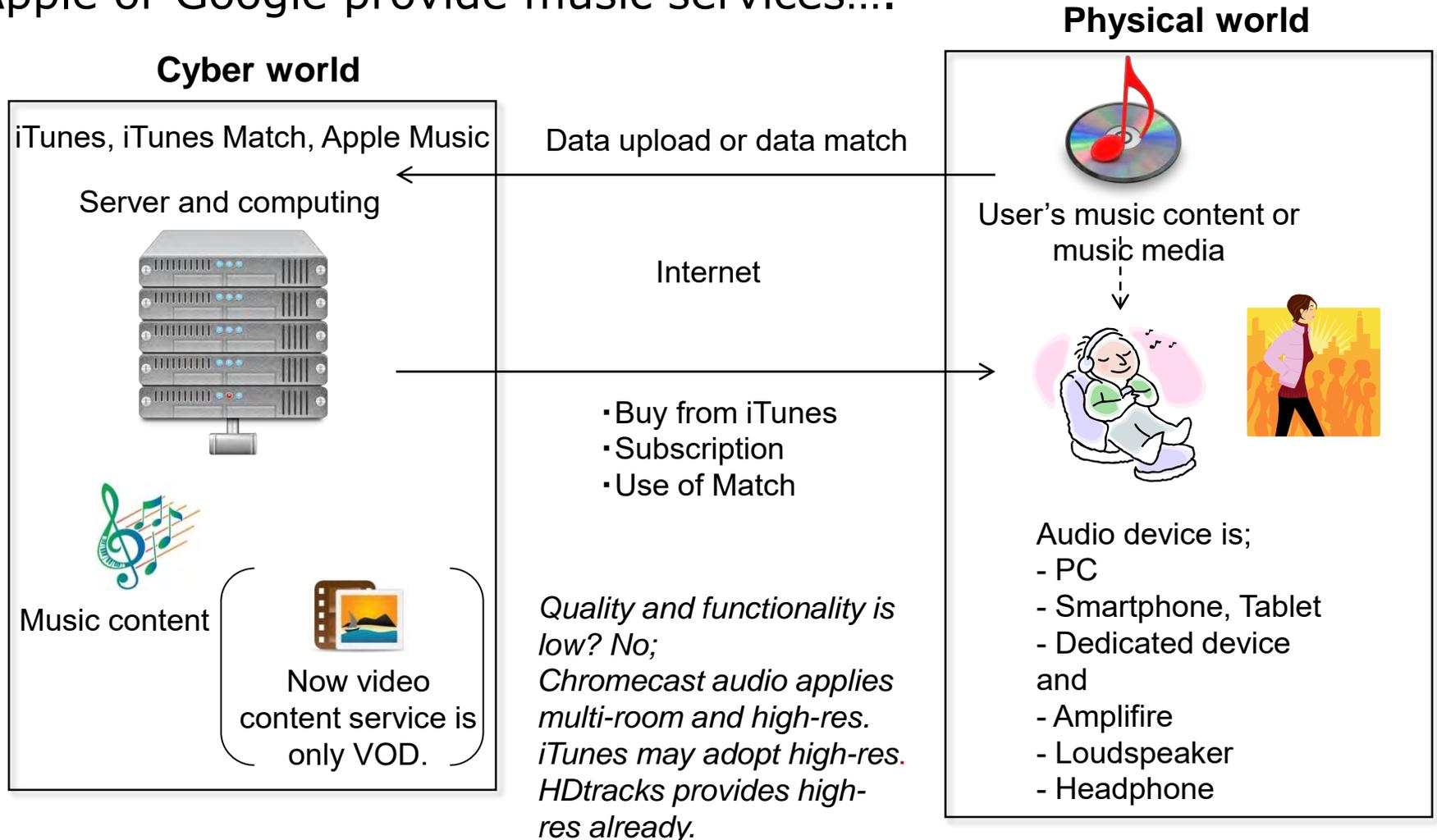in Singapore
IEC-APRC Room

by Junichi Yoshio

Introduction
Current situation of IoT/CPS in TC 100 area

❖ Mainly smartphones or PC and their services provide IoT/CPS as AV&IT multimedia applications.

- Netflix, iTunes provide VOD.
- Apple TV, Google Chromecast provide Smart TV, Connected TV.
- Apple Music, Google Play Music provide MOD and Music Locker.
- Apple, Google and others provide many Internet services.
- eBook service provider provides cloud service.
- Smartphone application provides various IoT services such as **location based application, user's data based services.**

❖ Not so soon, the primary client of AV&IT multimedia will become only the following components;
smart phone, smart watch, PC and AV amplifier, loudspeaker or headphone, monitor device, microphone, camera and other interface devices.
There will be no player, receiver, STB.

❖ The entity of content and service is located in cyber system such as cloud or server.

- Physical system is disadvantage in any cost aspect of developing, manufacturing and maintenance.
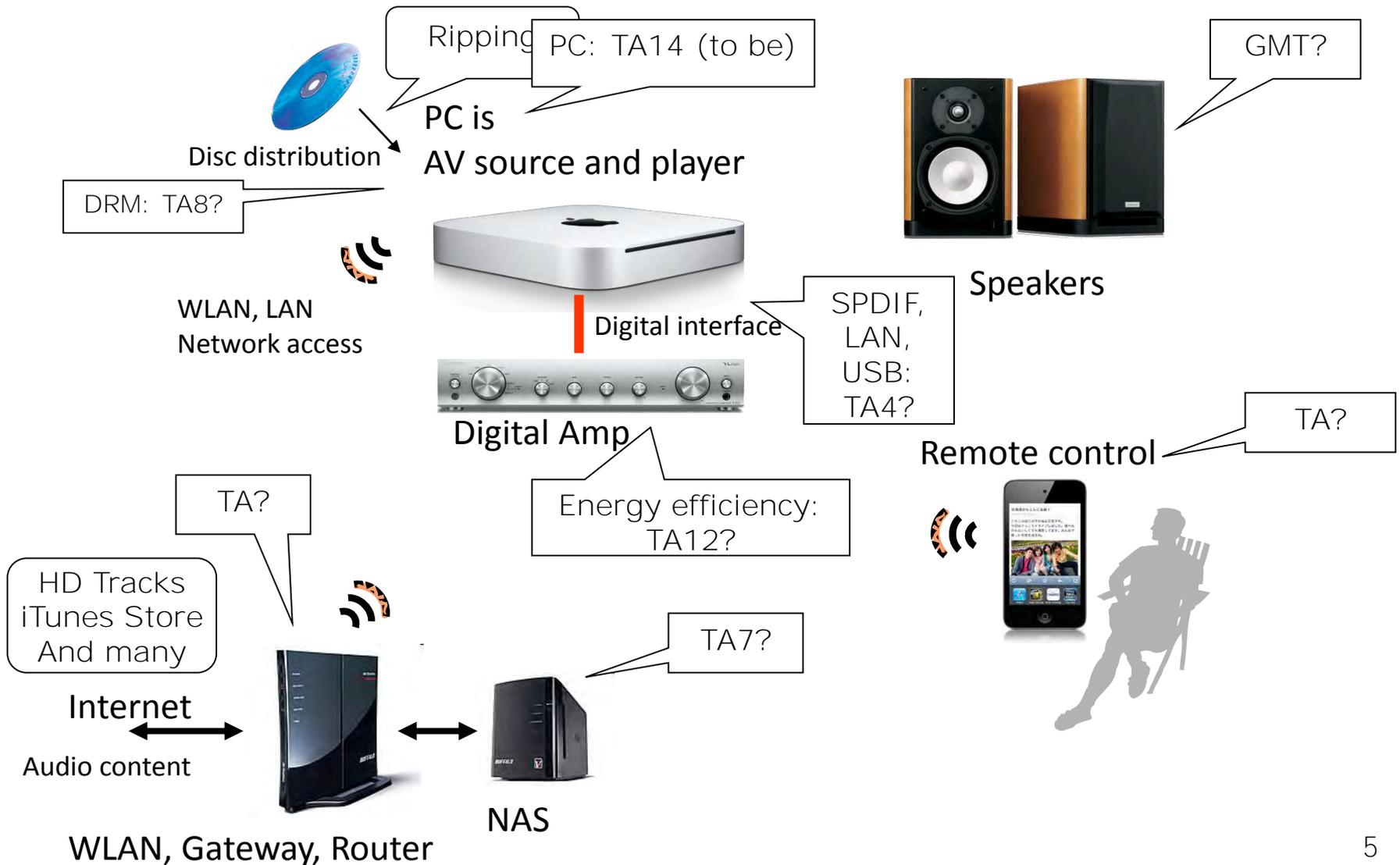- Only a small part of high-end system will be exist in physical.

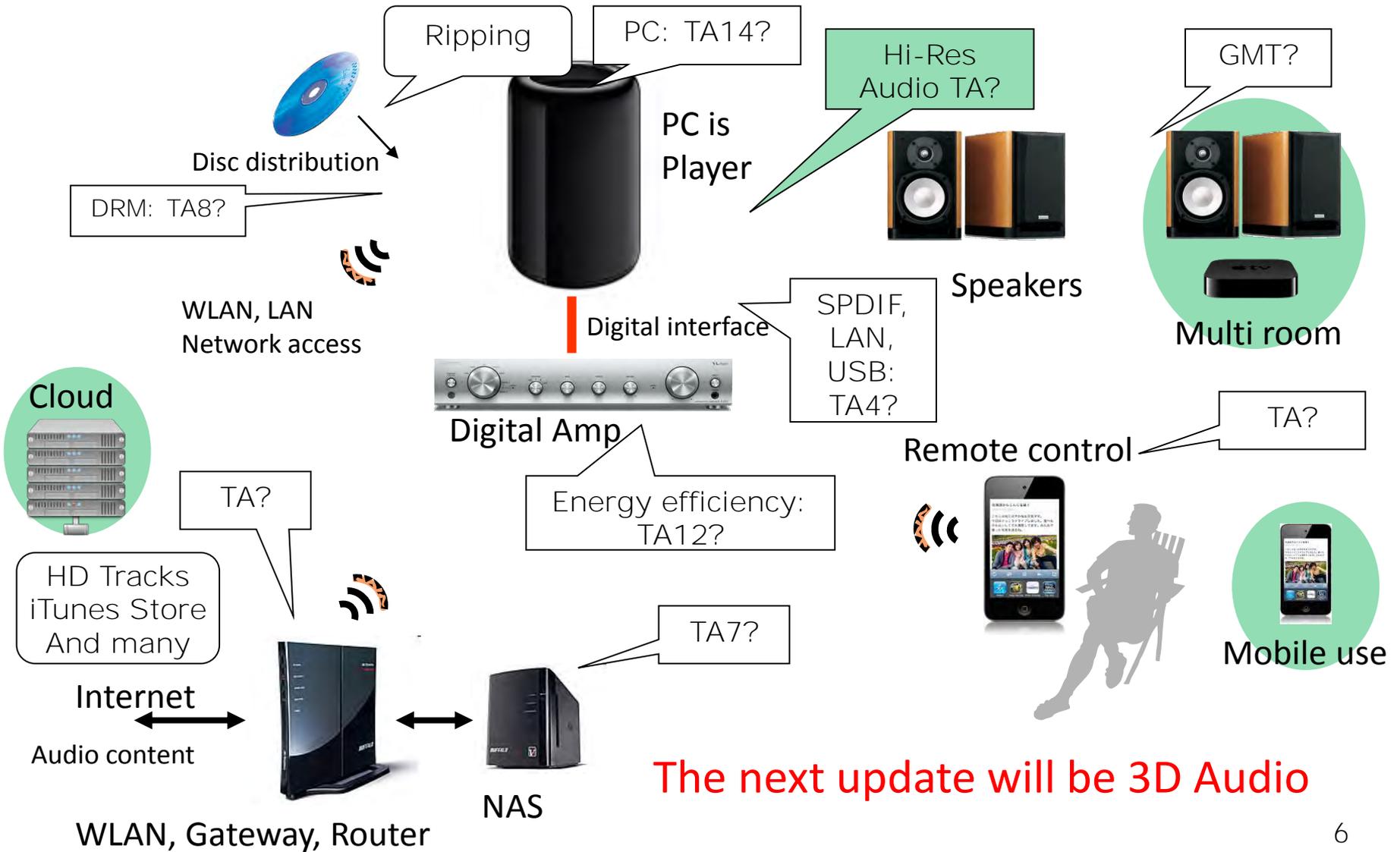# Example: Music services

Apple or Google provide music services….

Physical world

Cyber world

iTunes, iTunes Match, Apple Music

Data upload or data match

Server and computing

User's music content or music media

Internet

・Buy from iTunes
・Subscription
・Use of Match

Music content

Now video content service is only VOD.

*Quality and functionality is low? No;
Chromecast audio applies multi-room and high-res.
iTunes may adopt high-res.
HDtracks provides high-res already.*

Audio device is;
- PC
- Smartphone, Tablet
- Dedicated device
and
- Amplifire
- Loudspeaker
- Headphone

Example: Audio system
(from a presentation in 2010 October)

Ripping

PC: TA14 (to be)

PC is
AV source and player

Disc distribution

DRM: TA8?

WLAN, LAN
Network access

GMT?

Speakers

Digital interface

SPDIF,
LAN,
USB:
TA4?

Digital Amp

TA?

Remote control

Energy efficiency:
TA12?

TA?

HD Tracks
iTunes Store
And many

TA7?

Internet

Audio content

NAS

WLAN, Gateway, Router

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Example: Audio system
(Updated in 2017)

Ripping

PC: TA14?

Hi-Res Audio TA?

GMT?

Disc distribution

DRM: TA8?

PC is Player

Speakers

Multi room

WLAN, LAN Network access

SPDIF, LAN, USB: TA4?

Digital interface

Cloud

TA?

Digital Amp

Energy efficiency: TA12?

Remote control

TA?

HD Tracks iTunes Store And many

TA7?

Mobile use

Internet

Audio content

NAS

The next update will be 3D Audio

WLAN, Gateway, Router

Example: In car

❖ Car main AV device + Smartphone (Apple CarPlay, Google Android Auto) increase its market
  - Many types of this kind of systems;
  - Basic AppRadio type + Smartphone = Music Player
  - Advanced AppRario type + Smartphone = Music, Mail, Navigation and more
  - AV receiver type + Smartphone + Wi-Fi transmission (Miracast, etc.) = Video, Audio Player

❖ This system provides not only AV but also navigation and many services of Internet.

❖ This system makes consumer disk media and player disappeared.

❖ Also user may not need to keep physical media of music and video in home.

- ❖ Most of content will exist in cyber system.
- ❖ **User's client device will be such as PC/Tablet and** Smartphone or the device based on PC and Smartphone architecture.
- ❖ Player and STB will be disappeared, but the reproduction key device such as DAC, digital amplifier, monitor, loudspeaker will exist.

- ❖ Further more, AV content editing or modification will be done in cyber system.
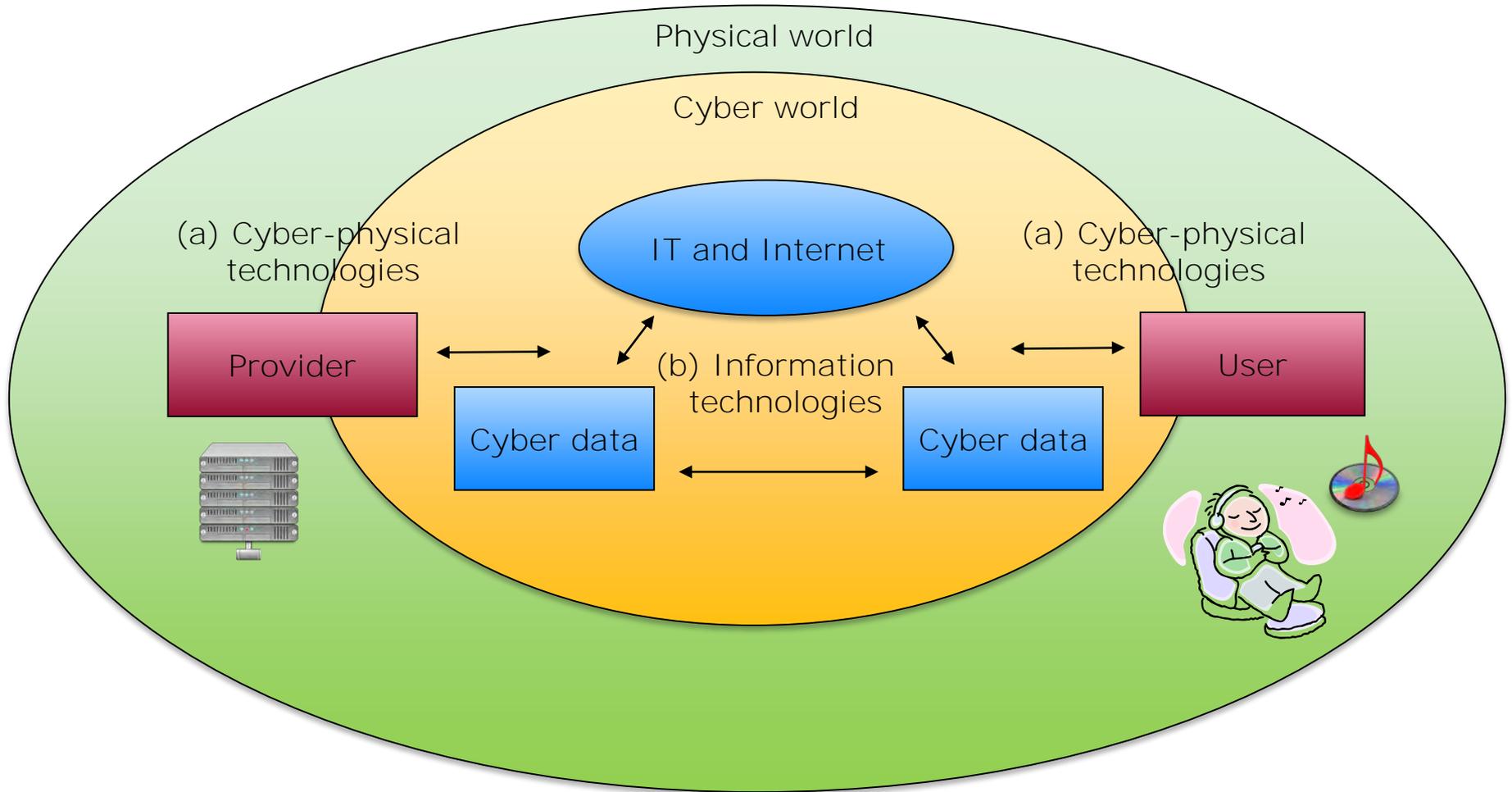
Added value CPS services

- ❖ Audio system
  - Currently service is content only, other information service is quite limited.
    - Jacket picture is provided but no liner notes, related information
    - Some information, for instance a link to YouTube is provided
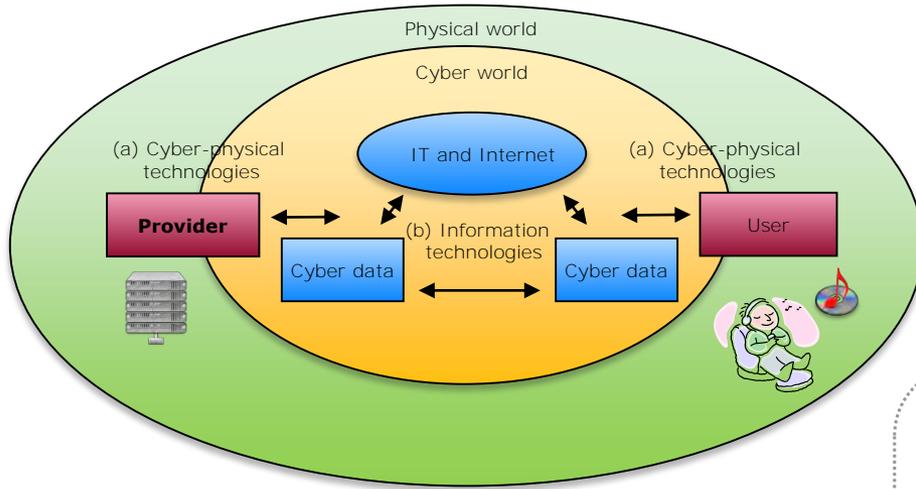 - No 3D audio yet
    - Need format, interface

- ❖ Car system
  - Many CPS service are on the way
    - Smartphone base audio service becomes popular
    - HUD+AR will be launched soon
    - Digital signage service is still limited
    - Surround view monitor is standardized by TA 17, there will be more additional value services
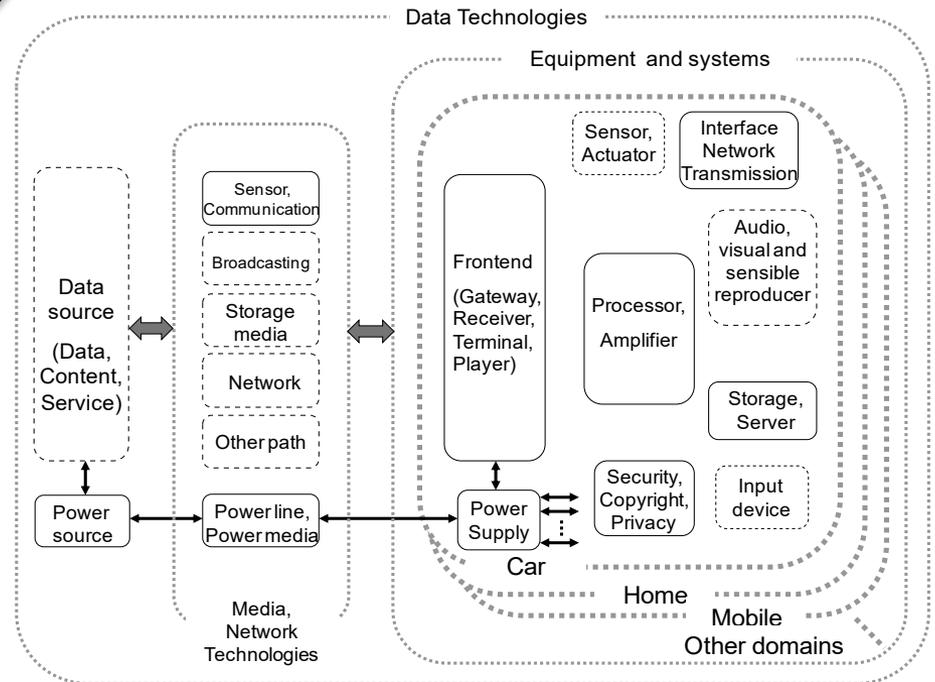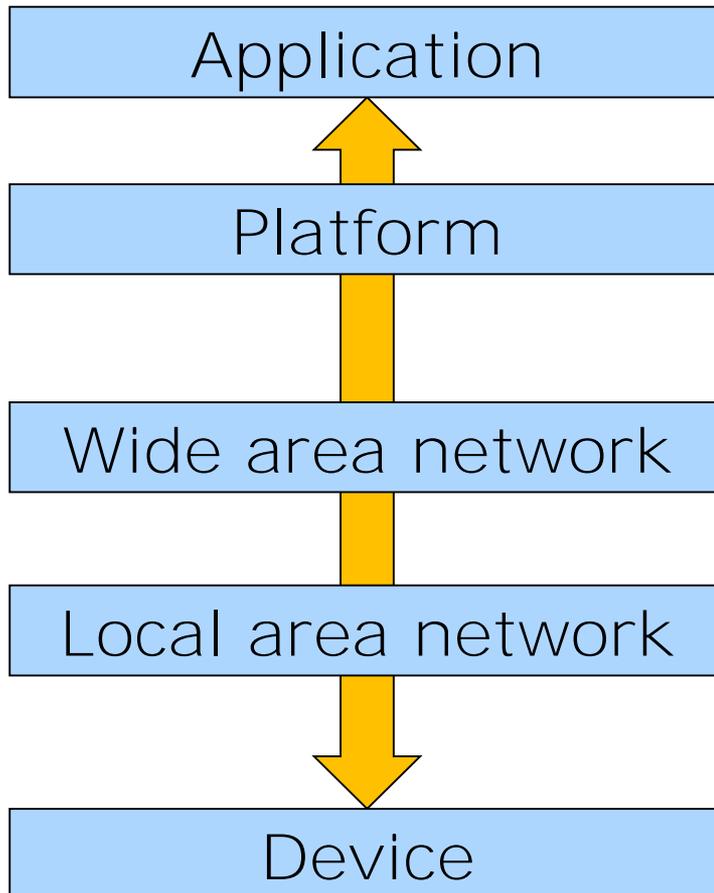   - Drive monitor + CPS starts in some application

System model

Physical world

Cyber world

(a) Cyber-physical technologies

IT and Internet

(a) Cyber-physical technologies

Provider

User

(b) Information technologies

Cyber data

Cyber data

・The TC 100 model from IEC 61998, describes whole system, it includes cyber-physical system.

TC 100 model from IEC61998 Ed.2

Data Technologies

Equipment and systems

Sensor, Actuator

Interface Network Transmission

Sensor, Communication

Audio, visual and sensible reproducer

Data source

(Data, Content, Service)

Broadcasting

Frontend
(Gateway, Receiver, Terminal, Player)

Processor, Amplifier

Storage media

Network

Storage, Server

Other path

Power source

Power line, Power media

Power Supply

Security, Copyright, Privacy

Input device

Car

Home

Media, Network Technologies

Mobile

Other domains

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Device to CPS system	IEC TC 100 standardization
Application	Not yet
Platform	From Industry 4.0 ?
Wide area network	Not for TC 100?
Local area network	TA 8, ECHONET, Network configurator
Device	Each TA

New area other than existing audio and video services

❖ Connected car, connected device (i.e. Wearable device) will need data process (big data) to provide users new services such as concierge and infotainment.

- Video data through cameras installed in car will be processed to be used as a service or information.
- Data from wearable device will be used for a service or information.

❖ Content/data recognition or categorization including deep leaning and AI

- For example, to provide automatic content arrangement service, or to provide recommended content.

Use case

- ❖ Methodology of computing AV data to provide well quality reproduction
  - QoS of network and AV requirement
  - Cyber system processes of AV data with network
    - E.g. Format conversion, modification of AV data
- ❖ Measurement method for the minimum client devices and systems
  - For UI, IF, transmission, file format, and for device such as monitor, loudspeaker.
- ❖ Management method for devices and systems in network
- ❖ Unified management method for content
  - Minimum unification of data format
   - Enhance network configuration (IEC 62608) and DRPC (IEC 62227) to manage content data

- ❖ Content management with network
  - ▪ File structure (format) (e.g. Huge capacity UDF＋Network capability)
  - ▪ Meta data (e.g. permission code)
  - ▪ Content semantics analysis and data structure (for search, manage, and application usage)
- ❖ AV signal processing schemes
  - ▪ Digital data processing in cyber world
- ❖ QoS issues
  - ▪ Latency, Delay
  - ▪ Network management
  - ▪ Quality

- ❖ **(Big) data processing (with deep leaning or AI)**
  - Date from wearable, health or car device is processed to provide a new service or information.
  - Music and video service can recognize what content is used, how used, where it was used, etc. that is information for providing a new services.
- ❖ **Content/data recognition or categorization including deep leaning and AI**
  - For example, to provide automatic content arrangement service, or to provide recommended content.

❖ Distributed system with IoT
  - IoT with IPv6 provides distributed system of AV content.
    ▪ Distributed file
  - Also it provides distributed AV & IT system and equipment.

Content provider

Content arrangement service

Local NAS
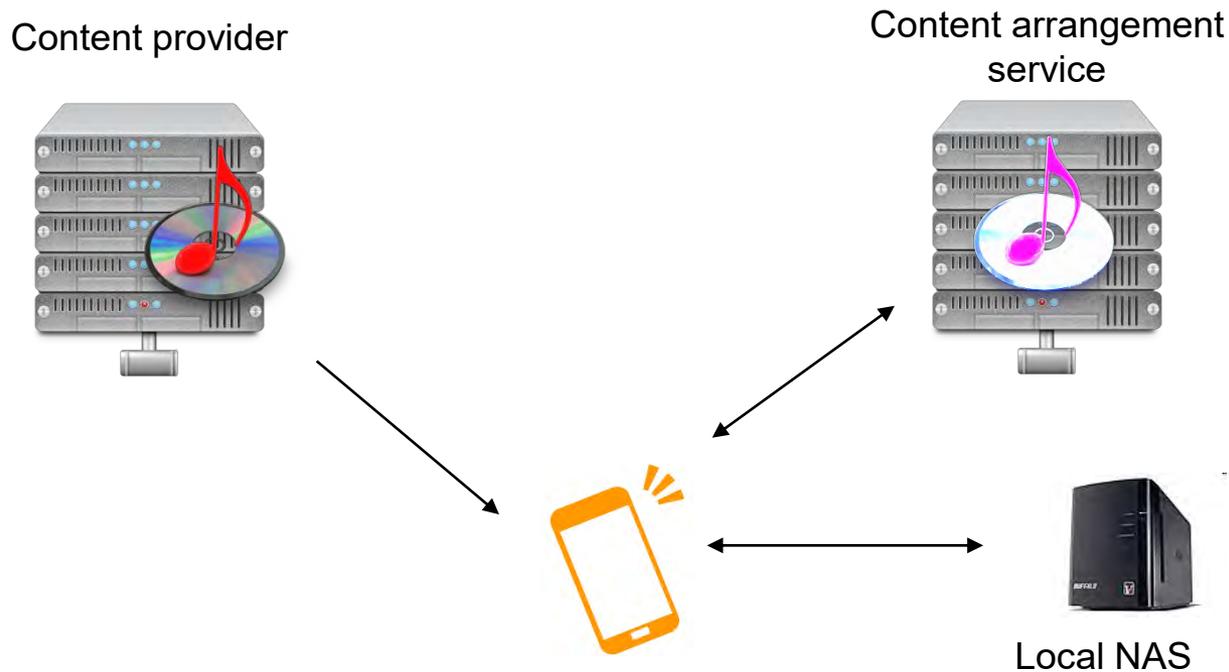
❖ AI assisted information services

- Like Siri, OK Google, Cortana, Amazon Echo/Alexa, voice input – voice output or functional action becomes popular.

- This requires a hardware of microphone-earphone(or loudspeaker) and smartphone or its like devices. This is good system as wearable smart device, it is so-called concierge service or personal assistance.

From Apple

From SONY

- ❖ AAL area
  - Audio information assistance area
    - Personal assistance service
    - Assistive listening functionality in CPS
  - Visual information assistance area
    - Not yet but eye wear type device is expected for XR
  - Cognitive assistance area
    - Watch service with TC 100 devices
    - Wearable and TC 100 devices based assistance service