Seminar #6

**Brief Presentation for
Video/Audio/ data casting system
in Japan**

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Digital Broadcasting Expert Group (DiBEG)

Japan

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Preface

As you know, Brazilian source coding and middleware are not same as Japanese system.

Therefore, in this section, only explain the outline of Japanese system.

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Contents

1. Video Coding System

2. Audio Coding System

3. Data Casting

4. H.264 for One-segment transmission

5. Interactive service (ARIB TR B-14)

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1. Video Coding System

In Japan, HDTV had been developed since 1980's, and analog HDTV trial service, named MUSE, has already started. Because of this situation, video coding system for DTV should support many video format and has capability of video format change according to display aspect ratio.

because of above reasons, specifications of video coding should have following features

(1) Video coding system; adopt most popular system MPEG2

(2) Support many types of video format; 480i/480p/1080i/720p

(3) Specify the relationship of video source and display aspect ratio

Video coding system is specified in ARIB STD-B32 Part 1(note)

(note) Video coding system for LDTV is specified in ARIB STD-B24 separately

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Video compression, coding block diagram
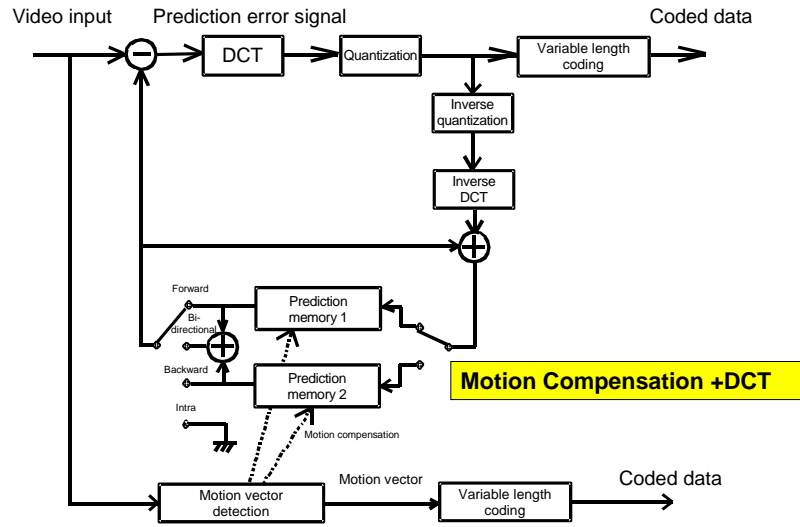
(ARIB STD-B32 Part 1, chapter 4.1)

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Video signal parameters

Number of lines		525	525	750	1125
Number of active lines		483	483	720	1080
Scanning system		Interlaced	Progressive	Progressive	Interlaced
Frame frequency		30/1.001 Hz	60/1.001 Hz	60/1.001 Hz	30/1.001 Hz
Field frequency		60/1.001 Hz			60/1.001 Hz
Aspect ratio		16 : 9 or 4 : 3	16 : 9	16:9	16 : 9
Line frequency f_H		15.750/ 1.001kHz	31.500/ 1.001 kHz	45.000/ 1.001 kHz	33.750/ 1.001 kHz
Sampling frequency	Luminance signal	13.5 MHz	27 MHz	74.25/1.001MHz	74.25/1.001MHz
	Color-difference signals	6.75 MHz	13.5 MHz	37.125/ 1.001MHz	37.125/ 1.001MHz
Numbers of samples per line	Luminance signal	858	858	1650	2200
	Color-difference signals	429	429	825	1100
Number of samples per active line	Luminance signal	720	720	1280	1920
	Color-difference signals	360	360	640	960
Filter characteristics		See Fig. 1	See Fig. 2	See Fig. 3	
Line synchronizing signal		See Fig. 4		See Fig. 5	See Fig. 6
Field synchronizing signal		See Fig. 7	See Fig. 8	See Fig. 9	See Fig. 10

(ARIB STD-B32 Part 1, chapter 2.4)

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(a) Outline of video coding

(1)Compression system; MPEG2(MP@HL)

(2) Video format

No. of line	No. of pixel	quality
1080i	1920*1080	HDTV (interlace)
720p	1440*720	HDTV (progressive)
480p	720*480	SDTV (progressive)
480i	720*480	SDTV (interlace)

D terminal: D1:480i, D2:480p, D3:1080i, D4:720p
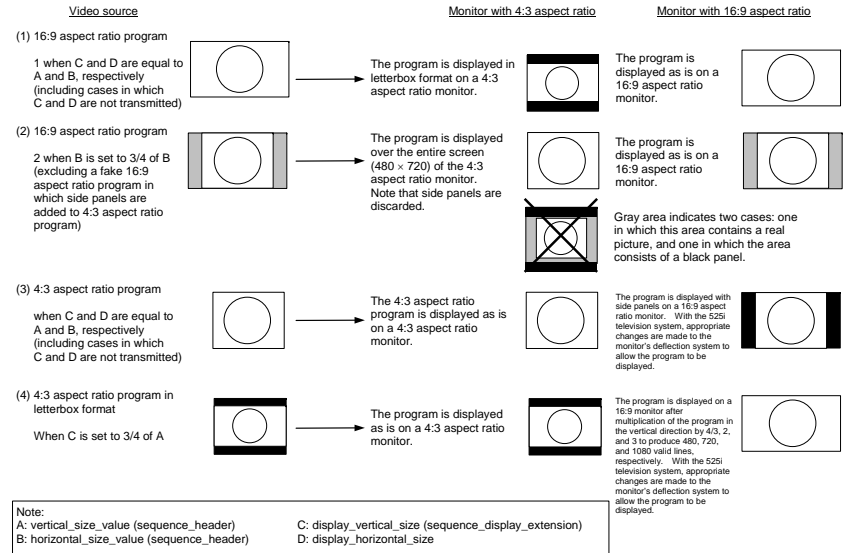
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(b)Actual video bit rate

No. of line	profile	actual bit rate
1080i	MP@HL	BS:12-24Mbps DTTB:8-20Mbps
720p	MP@H-14	
480p	MP@H-14	BS:4-24Mbps DTTB:4-20Mbps
480i	720*480	1.5-15Mbps
240p	720*480	0.2-4Mbps

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Video decoding processing in TV receiver

Decode HL, H14, ML, LL of MPEG-2 main profile. The output format is either of 1125i, 750p, 525p, 525i format.

source		4:3 monitor		16:9 monitor
16:9	→	Letter box		Same as left
16:9 side panel	→	Delete side panel		Add side panel
4:3	→	Same as left		Add side panel or extend horizontal axis
Letter box	→	Letter box		Expand upper and lower

2.3 Desirable display formats on 4:3 and 16:9 aspect ratio monitors

Video source	Monitor with 4:3 aspect ratio	Monitor with 16:9 aspect ratio
(1) 16:9 aspect ratio program 1 when C and D are equal to A and B, respectively (including cases in which C and D are not transmitted)	The program is displayed in letterbox format on a 4:3 aspect ratio monitor.	The program is displayed as is on a 16:9 aspect ratio monitor.
(2) 16:9 aspect ratio program 2 when B is set to 3/4 of B (excluding a fake 16:9 aspect ratio program in which side panels are added to 4:3 aspect ratio program)	The program is displayed over the entire screen (480 × 720) of the 4:3 aspect ratio monitor. Note that side panels are discarded.	The program is displayed as is on a 16:9 aspect ratio monitor. Gray area indicates two cases: one in which this area contains a real picture, and one in which the area consists of a black panel.
(3) 4:3 aspect ratio program when C and D are equal to A and B, respectively (including cases in which C and D are not transmitted)	The 4:3 aspect ratio program is displayed as is on a 4:3 aspect ratio monitor.	The program is displayed with side panels on a 16:9 aspect ratio monitor. With the 525i television system, appropriate changes are made to the monitor's deflection system to allow the program to be displayed.
(4) 4:3 aspect ratio program in letterbox format When C is set to 3/4 of A	The program is displayed as is on a 4:3 aspect ratio monitor.	The program is displayed on a 16:9 monitor after multiplication of the program in the vertical direction by 4/3, 2, and 3 to produce 480, 720, and 1080 valid lines, respectively. With the 525i television system, appropriate changes are made to the monitor's deflection system to allow the program to be displayed.

Note:
A: vertical_size_value (sequence_header)   C: display_vertical_size (sequence_display_extension)
B: horizontal_size_value (sequence_header)   D: display_horizontal_size

ARIB STD-B32 Part 1, chapter 5.1

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2. Audio Coding System

(a) Audio Input Format

Parameter	Restriction
Audio mode Possible audio modes	Monaural, stereo, multichannel stereo (3/0, 2/1, 3/1, 2/2, 3/2, 3/2+LFE) (Note 1), 2-audio signals (dual monaural), multi-audio (3 or more audio signals) and combinations of the above
Recommended audio mode	Monaural, stereo, multichannel stereo (3/1, 3/2, 3/2+LFE) (Note 2), 2-audio signals (dual monaural)
Emphasis	None

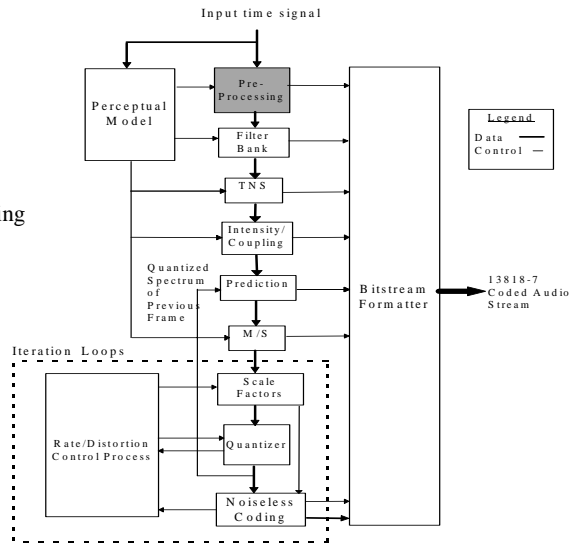|	
(Note 1) Number of channels to front/rear speakers:	Example:3/1 = 3 front + 1 rear 3/2 = 3 front and 2 rear
(Note 2) LFE = Low frequency enhancement channel	

ARIB STD-B32 part 2 Chapter 5.1

(b) Main parameters of audio coding

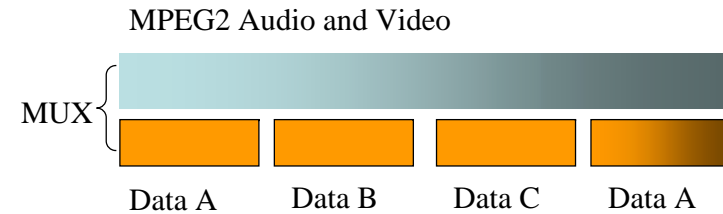| Parameter	Restriction
Bit stream format	AAC Audio Data Transport Stream (ADTS)
Profile	Low Complexity (LC) profile
Max. number of coded channels	5.1 channels(Note) max. per ADTS
Max. bit rate	As per ISO/IEC 13818-7

(Note)   5 channels + LFE channel

ARIB STD-B32 part 2 Chapter 5.2

AAC encoder Block Diagram

Input time signal

AAC: advanced audio coding

Perceptual Model

Pre-Processing

Filter Bank

TNS

Intensity/ Coupling

Quantized Spectrum of Previous Frame

Prediction

M/S

Iteration Loops

Scale Factors

Rate/Distortion Control Process

Quantizer

Noiseless Coding

Bitstream Formatter

13818-7 Coded Audio Stream

Legend
Data ———
Control —

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3. Data casting

Data Composition

MPEG2 Audio and Video

MUX

Data A   Data B   Data C   Data A

Each data broadcast as module repeatedly.
Same module will appear in some period.
(MPEG / DSM-CC Data Carousel)

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Local content A

File   File   File

Local Content B

File   File   File

a BML application

Modularize

Module 0a
Module 1a

Module 0b
Module 1b

Make DDB Section

Making Carousel

DII Data exaction

Generate Data event

DII: download information indicator

Carousel A

Carousel B

DDB: download data block

Data event A   Data Event B

One TV Program

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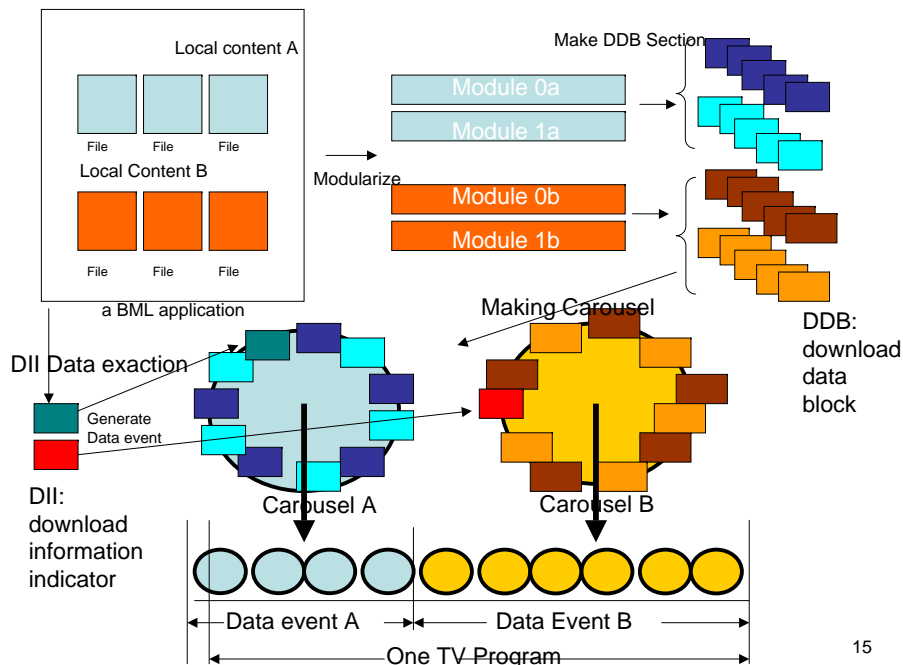
Data Broadcasting

All DTTB Broadcasters and BS Broadcasters providing
Data broadcasting (datacast) now

Program related information	Anytime news
Weather information	Report of sports game etc,

Currently the description language is BML format

Based on

XHTML

BML

Functions for Broadcasting

XHTML

Features
Easy creation of contents

Facilitate convergence of internet

Additional capability

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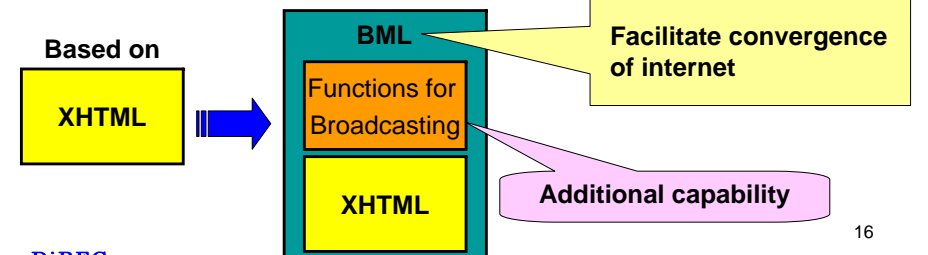
Example for Datacasting(1)

Top menu

Example for Datacasting(2)

Weather news

Example for Datacasting(3)

Program related data

Remote Controller for Datacasting

- Colour key and Arrow Key (four directional)
- Datacasting Trigger Button
- Back key (fo

for EPG

Datacasting
Button

Four Colour key

channel selection

Media
selection
(BS/CS/
Analog/
Digital)
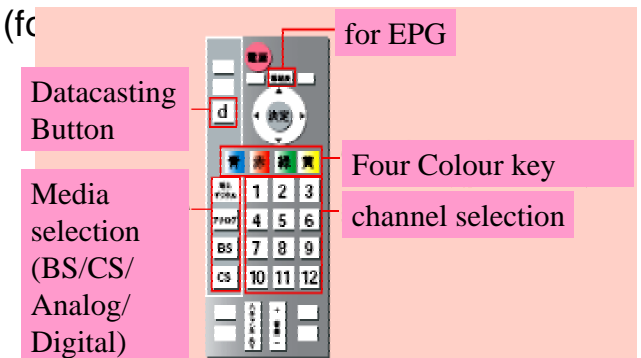
ARIB STD-B24

- B24 consist of three volumes (four books)
  - Volume 1: Mono media
  - Volume 2 (book1/book2): BML
  - Volume 3: Transmission

- Volume 2 consist of six parts
  - Main context (Standard)
  - Appendix 1 (Supplement of standard)
  - Appendix 2 (Basic profile)
  - Appendix 3 (Advanced profile)
  - Appendix 4 (Profile for Mobile phone)
  - Appendix 5 (Profile for Vehicle)

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Overview of datacasting services

See STD B24 Vol.1 Informative explanation 1

- Example of services
  - EPG：TV Program selection
  - Index: Choice of TV program, contents
  - Subtitle: Synopsis subtitle, multi-language
  - Commentary audio: for vision-impaired
  - Program supplemental information: Additional information of TV Program (ex. brief)
  - Multi-view television (Multi angle)
  - User interaction program: Shopping, Questionnaire

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BML

- Multimedia data representation coding scheme for Digital broadcasting
  - Specified in XML
  - Textual notation
  - Extension for broadcasting feature
- XHTML1.0 + ECMAScript + CSS1/2 + DOM1+ Broadcast Extension
  - All component defined by W3C, which is main stream for the internet content specification.
  - difference between broadcast content and internet content
    - bi-directional communication
    - hardware platform (CE vs PC)

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Difference between BML and HTML

	BML	HTML
Sample	Suitable operation for TV	
Feature	• Few hyperlinks per one screen • Intuitive providing information by using bitmap and video • Scroll is optional • Update latest information automatically • Synchronize between TV and Radio program	• Many hyperlinks in one screen • Text centric information providing by small letter presentation • Suppose to scroll functionality • Need to push "reload" button for retrieving latest information generally

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Difference between BML and HTML (cont.)

	BML	HTML
Use case	• **Viewing distance：1～3m** • **Focus display：Focus of Hotspot** • **Input device：Remote controller with colour key**	• **Viewing distance：30～50cm** • **Focus display：Free cursor** • **Input device：Wheel mouse + keyboard or Touch panel + keyboard**

Functionality	• Synchronization with TV program (bevent)
	• Accessibility of Set top box (Script API)
	   • NVRAM, Tuner, device ID, etc.
	• Absolute positioning with CSS
	   • Fix display place at reading BML doc
	• Multiple plane model including blending between planes
		• No Sync. Mechanism (cf. SMIL)
		• Accessibility of STB by plug-in module
		• Relative positioning by brawser
		   • Display place may change by context
		   • position can change dynamically
		• Single plane model basis, no transparent colour

Difference between BML and HTML (cont.)

BML	HTML

Datacasting screen

Bom dia !

Bom dia !

Seja bem-vindo à Tokyo!

Only absolute positioning is permitted.

Layout are decided by browser dynamically

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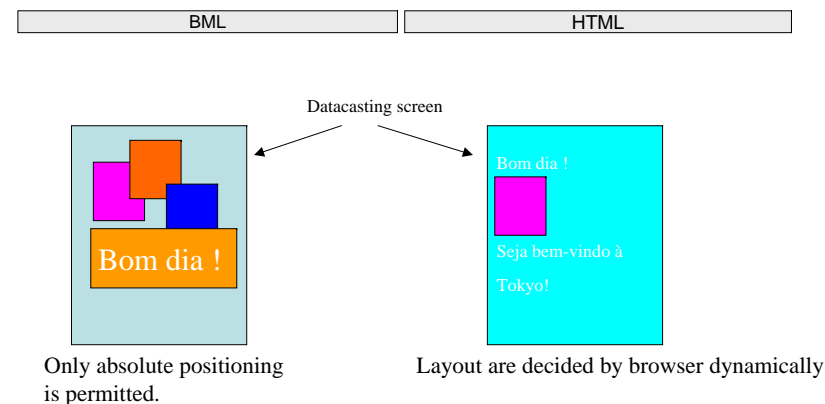
4. Video Coding for "One-seg" Service

• Video coding system; H.264/AVC(ITU-T Rec. H264|ISO/IEC 14496-10)

• Specified in ARIB-STD-B24, as one of Mono-media coding system

• Specified in Operational Guideline(TR-B14), as Video coding system for "One Seg" service

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EXAMPLE

Recommended Operational Guideline for Baseline Profile **(ARIB STD-B24 ANNEX G)**

• Associated service requirement

(1) **Bitrate ; 64 – 384 Kbps**

(2) **Video format; SQVGA, 525QSIF, QCIF, QVGA, 525SIF, CIF**

(3) **Frame rate; 5,10, 12, 15, 24, 30 Hz (*1000/1001), no limitation for frame skip**

(4) **Aspect ratio of picture; 4:3, 16:9**

• **Operation level; any of level 1, 1.1, 1.2**

Parameter set of One-Seg broadcasting service

One Seg Service video coding parameter set

parameter	Specification
Coding system	**H264/AVC**
Profile/level	**Baseline profile, level 1.2**
Video format	**•320 Pixel * 240 line, or 320 pixel * 180 line** **•Aspect ration of pixel; 1:1** **•Minimum frame period; 1/15 second (video source; 30fps, or 24 fps)**
others	**Compatible to ARIB STD-B24**

Video

Data

(specified in ARIB TR-B14)

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Provisions

for Interactive Service Operations

ARIB

TR-B14

Vol.6

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ARIB TR-B14 Vol.6

- Interactive services
- ・ARIB TR-B14 Vol.6 provides "Digital terrestrial broadcasting interactive channel provisions " in the sense of return channel.
- Scope
- ・These provisions apply to interactive data broadcast services in digital terrestrial television broadcasting intended for fixed receiver units (install-type television, STB, and portable televisions, etc.).
- ・The installation of fixed receiver units compatible with interactive data broadcast services is required as a necessary function in Provision A of this volume.
- ・Provision B is an optional standard. For portable receiver units (portable terminals, etc.), the bi-directional function itself is in Provision B (optional) and is not provided here.

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# Interactive data broadcast service system conceptual diagram

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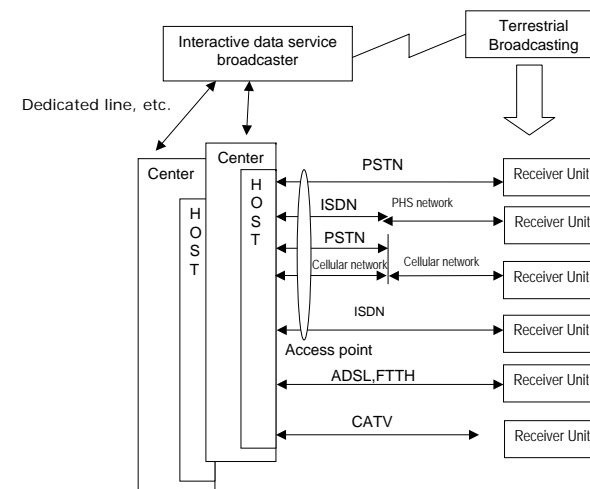
Direct link-up

☐Receiver units are linked directly with the center by using public networks etc.
☐Advantages
・If the protocol is appropriately selected, installation of the receiver units may be easier.
☐Disadvantages
・The center needs to secure the access point.　An arbitrary center is linked directly to the receiver units and each application by using public networks, etc.

Center   Receiver unit
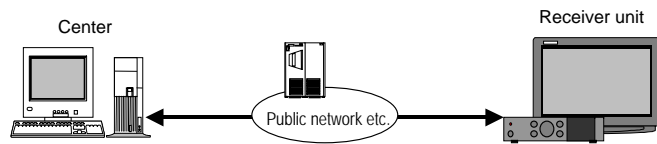
Public network etc.

Direct link-up using host numbers

☐An arbitrary center is linked directly to the receiver units and each application by using public networks, etc.
☐Advantages
・If the protocol is appropriately selected, installation of the receiver units may be easier.
・Each center can share the access points.
☐Disadvantages
・Since multiple centers use a shared access point, it can be assumed that there are cases where scheduling of the access point is necessary.

Host A   Collection network

Host number A   Receiver Unit

Host B

Host number B

Center
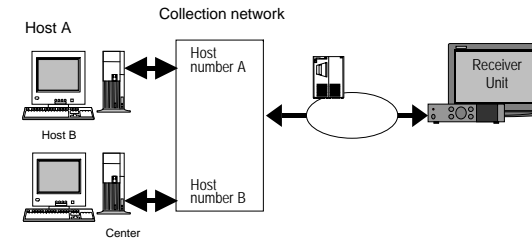
Network service link-up

☐There is a mass calling service as a network service associated with broadcasting.
☐Mass calls reception services in this service, the number of calls is tabulated and processed with the receiver unit call switchboard, and the total result is sequentially notified to the center.
☐Advantages
・Installation of the receiver unit is easier. The processing of the total data for the center, etc. is easier.
☐Disadvantages
・Some services require contracts with the communications carrier beforehand.

Center   Receiver unit

Public network etc.
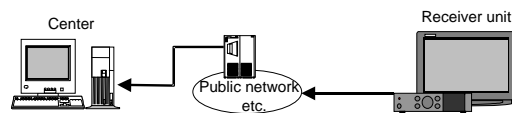
Broadcasting waves and network link-up

☐Among interactive channels, requests such as uplink signals, etc. are delivered by public lines and the responses to the requests are delivered by broadcasting waves.
☐Advantages
・When terrestrial broadcast waves are used in the delivery of large amounts of shared data, services can be provided at a low price. A wide array of new applications never seen before in broadcasting and communication is imaginable.
・Since each receiver unit will use the uplink/downlink, and the common center, communication between receiver units is also possible.
☐Disadvantages
・The system is complex. When protocols that can link ascending public lines with descending terrestrial waves are necessary, large-scale development will be required.

Terrestrial waves

Center   Receiver unit
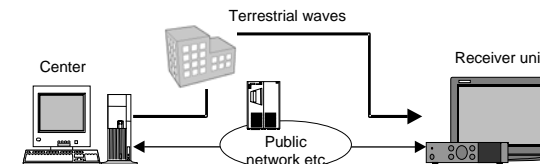
Public network etc.

Internet link-up

□The receiver unit is linked to the access point of the Internet Service Provider (ISP) via a public network, etc.

・In addition, it is connected from the ISP to the ISP for the center via the Internet, and is connected with the center with a dedicated line, etc.

□Advantages

・Existing access points throughout the entire country can be used.

□Disadvantages

・It is necessary to install TCP/IP, PPP with the ISP connection protocol in the receiver units. In order to receive service from the center, the viewer should join an ISP.

Internet Service Provider

Receiver unit

Public network etc.

Internet

Center

Dedicated line etc.

Internet Service Provider
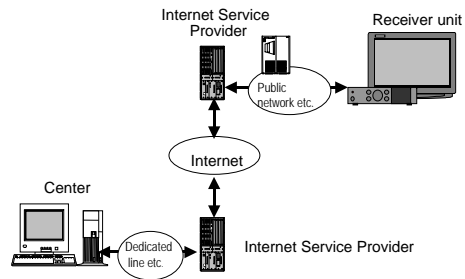
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END of Seminar #6

Thank you for your attention

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