Section 2

Structure of ISDB-T system

June, 2007

Digital Broadcasting Expert Group (DiBEG)
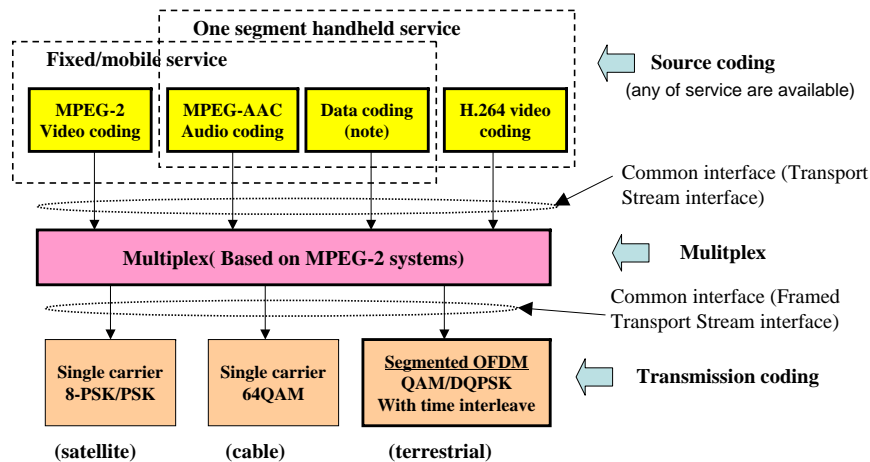
Japan

Yasuo TAKAHASHI

(Toshiba)
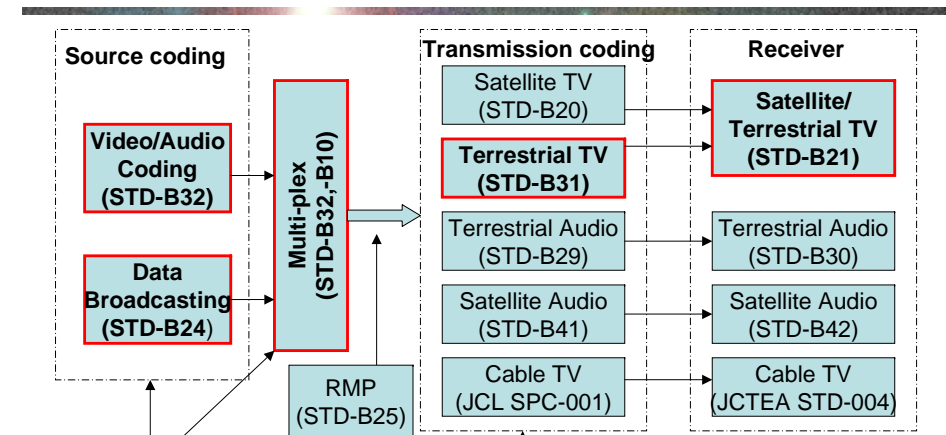
1

DiBEG
Digital Broadcasting Experts Group

A. Structure of ISDB-T Standard in Japan

2

DiBEG
Digital Broadcasting Experts Group

---

1. Structure of Digital Broadcasting

Source coding
(any of service are available)

Common interface (Transport Stream interface)

Mulitplex

Common interface (Framed Transport Stream interface)

Transmission coding

One segment handheld service

Fixed/mobile service

| MPEG-2 Video coding | MPEG-AAC Audio coding | Data coding (note) | H.264 video coding |

Multiplex(Based on MPEG-2 systems)

| Single carrier 8-PSK/PSK | Single carrier 64QAM | Segmented OFDM QAM/DQPSK With time interleave |

(satellite)   (cable)   (terrestrial)

(note) both BML and MHP are available,
But in Japan now BML is only service in.

3

DiBEG
Digital Broadcasting Experts Group

---

2. Digital Broadcasting Standard in Japan

Source coding

Transmission coding

Receiver

| Satellite TV (STD-B20) | |
| Video/Audio Coding (STD-B32) | Satellite/ Terrestrial TV (STD-B21) |

Multi-plex (STD-B32,-B10)

Terrestrial TV (STD-B31)

| Data Broadcasting (STD-B24) | Terrestrial Audio (STD-B29) | Terrestrial Audio (STD-B30) |

RMP (STD-B25)

| Satellite Audio (STD-B41) | Satellite Audio (STD-B42) |
| Cable TV (JCL SPC-001) | Cable TV (JCTEA STD-004) |

Source coding and MUX systems are common for each system

Transmission systems are different

Note: Cable transmission system standards are defined at another consortium

DiBEG
Digital Broadcasting Experts Group

2. Digital Broadcasting Standard in Japan(continued)

	Digital Television		Digital Sound	
	BS / wCS	Terrestrial	Terrestrial	Satellite
System	STD-B20	STD-B31	STD-B29	STD-B41
Multiplex	Coding & Multiplexing	STD-B32		
	Service Information	STD-B10		
Source coding	Coding & Multiplexing	STD-B32		
Data Broadcasting	Presentation Engine (BML)	STD-B24		
	Execution Engine (GEM-based)	STD-B23		
CAS	Conditional Access	STD-B25		
Home servers	System based on Home Servers	STD-B38		
Receivers	STD-B21		STD-B30	STD-B42
Operational Guidelines	TR-B15	TR-B14	TR-B13	TR-B26

5

2. Digital Broadcasting Standard in Japan(continued)

6
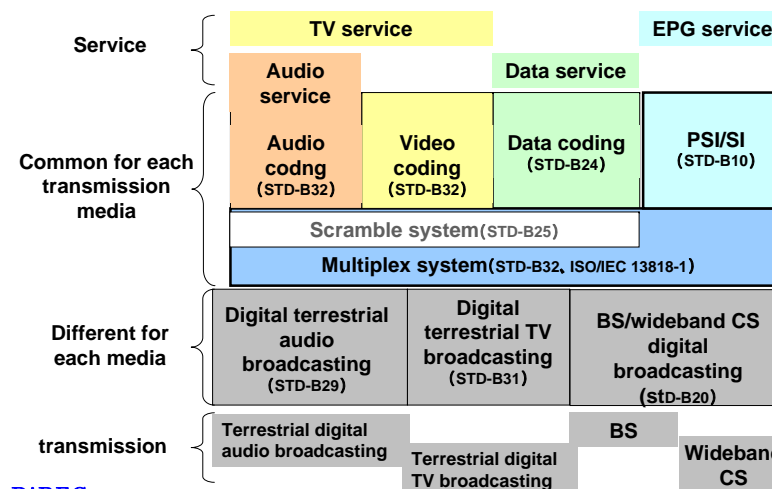
3. Outline of ARIB Standards

Source coding & Multi-plex

Name	Outline	note
Video/Audio coding (STD-B32)	-Based on MPEG-2 video coding -Cover 1080i,720p,480p,480i -Based on MPEG AAC audio coding -Up to 5.1 Stereo audio -Based on MPEG systems multi-plex	
Data Broad-casting (STD-B24)	-Data broadcasting description -Data transmission format -Small size Video coding(MPEG-4,H.264)	
Program line-up information (STD-B10)	-PSI/SI description -EPG description -Necessary for program selection	

7

3. Outlines of Standards (continued)

Transmission coding

Name	Outline	note
Satellite TV (STD-B20)	-Slot structure -Trellis+RS(Concatenated coding) -Single carrier 8 PSK modulation	2 HDTV programs are muliti-plexed into 1 transponder
Terrestrial TV (STD-B31)	-Segment structure -Viterbi+RS (Concatenated coding) -Multi-carrier(OFDM) transmission	1 segment transmission is available
Terrestrial Audio (STD-B29)	-1 and 3 segment transmission -Others are almost same as STD-B31	1 segment system is compatible to 1 segment of TV
Satellite Audio (STD-B42)	-Multiplex 64 CDM channel -Viterbi+RS (Concatenated coding) -CDM-BPSK/QPSK transmission	Adopt "AAC+SBR" 2.6GHz Band

8

3. Outlines of Standards (continued)

What is the operational guideline?

All the technical elements required are written in ARIB STD. But, the details for operation of broadcasting are defined separately, even though based on ARIB STD. These documents are called "Operational Guideline"

Examples

ARIB TR-B13; Terrestrial Audio broadcasting operational guideline

ARIB TR-B14; Terrestrial TV broadcasting operational guideline

ARIB TR-B15; BS/wideband CS broadcasting operational guideline

ARIB TR-B26; Satellite Audio broadcasting operational guideline

9

DiBEG
Digital Broadcasting Experts Group

(Reference only)

The relationship between

ISDB-T(Japan) and SBTVD-T(Brazil)

(note) Brazilian Digital Terrestrial TV standard(SBTVD-T) is now on standardization process.
This presentation is based on Draft version of SBTVD-T, therefore, contents will be changed after SBTVD-T concreted

10

DiBEG
Digital Broadcasting Experts Group

Abstract

As you know, Brazilian DTT standard, named SBTVD-T, is based on Japanese DTT standard, named ISDB-T.

But, Brazil introduces several difference points from ISDB-T because of following reasons,

(1) Adopt new technologies

(2) difference based on culture, regulation ,broadcast service,etc

But, essentially almost same, so these are family standards.

(note) Japanese engineers do not know the details of SBTVD-T. So, it is better that Brazilian relatives should present the details of Brazilian standard including background and concept.

11

DiBEG
Digital Broadcasting Experts Group

Concept of relation between ISDB-T(Japan) and SBTVD-T(Brazil)

Topics; Brazil and Japan agreed as follows in 2nd Joint WG held on 10th -12th ,April 2007.

(1)Use common name as international standard

(2) Brazil and Japan customize their own specifications which are harmonized to broadcasting service of each country within the range of international standard described above.
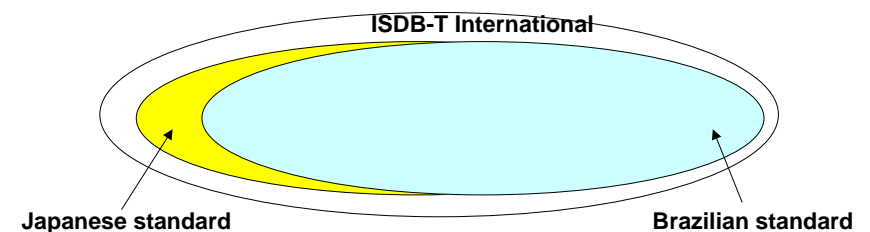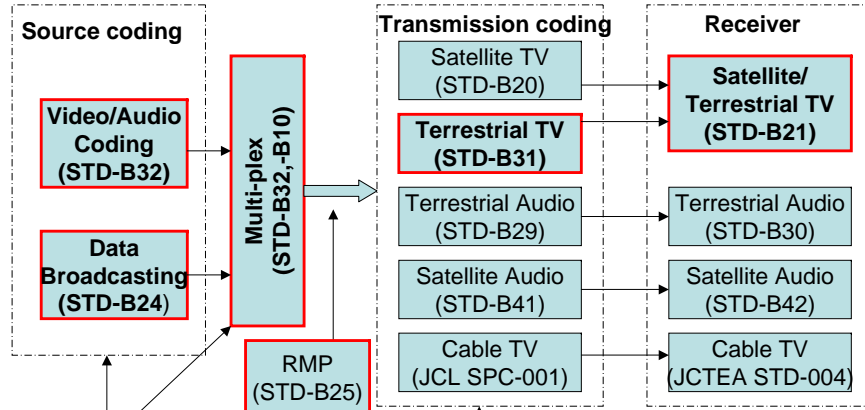

ISDB-T International

Japanese standard

Brazilian standard

12

DiBEG
Digital Broadcasting Experts Group

Figure 1-1 Digital Broadcasting Standard in Japan

Source coding

Video/Audio Coding (STD-B32) → Multi-plex (STD-B32,-B10)

Data Broadcasting (STD-B24) → Multi-plex (STD-B32,-B10)

RMP (STD-B25)

Transmission coding

Satellite TV (STD-B20)
Terrestrial TV (STD-B31)
Terrestrial Audio (STD-B29)
Satellite Audio (STD-B41)
Cable TV (JCL SPC-001)

Receiver

Satellite/ Terrestrial TV (STD-B21)
Terrestrial Audio (STD-B30)
Satellite Audio (STD-B42)
Cable TV (JCTEA STD-004)

Source coding and MUX systems are common for each system

Transmission systems are different

Note: Cable transmission system standards are defined at another consortium
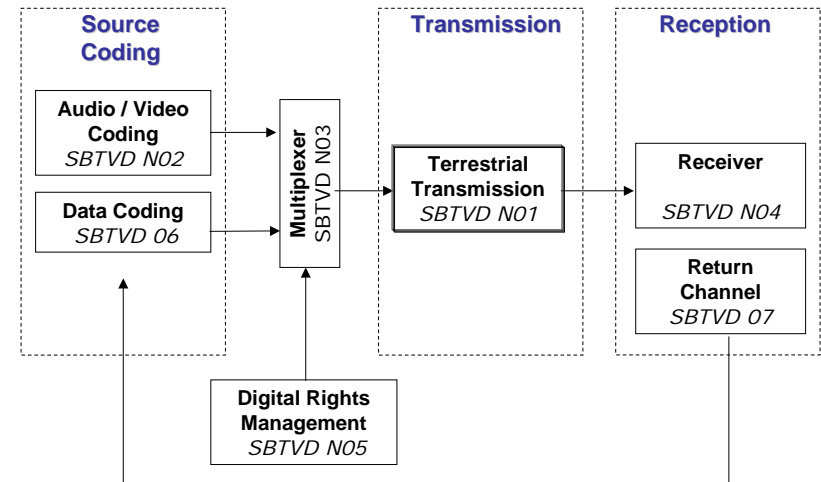
3

Figure 1-2. Structure of SBTVD

Source Coding

Audio / Video Coding SBTVD N02
Data Coding SBTVD 06

Multiplexer SBTVD N03

Digital Rights Management SBTVD N05

Transmission

Terrestrial Transmission SBTVD N01

Reception

Receiver SBTVD N04
Return Channel SBTVD 07

14

Table 1-1 Comparison of ISDB-T and SBTVD-T

Area	ISDB-T	SBTVD-T	note
Terrestrial transmission	ARIB STD-B31	SBTVD No.1	
Audio/Video coding	ARIB STD-B32	SBTVD No.2	(note 1)
Multiplexer	ARIB STD-B10/ STD-B32	SBTVD No.3	(note 2)
Receiver	ARIB STD-B21	SBTVD No.4	
Digital Right Management	ARIB STD-B25	SBTVD No.5	
Data coding	ARIB STD-B24	SBTVD No.6	
Return channel	ARIB TR-B14	SBTVD No.7	

(note 1) Specification of LDTV is defined in ARIB STD-B24(in Japan)

(note 2) parts of signal structure and format are defined in STD-B32, parts of control table/information are defined in STD-B10 (in Japan)

15

---

1. Transmission system

• **The Brazilain standard is essentially adherent to ARIB standard**

That is; (1) segment transmission with Time Interleave

(2) stationary/mobile/portable reception service in one channel

(3) One-seg service is available

(4)SFN is also possible

• **Difference points are;**

(1) Channel; Japan;470-770MHz, Brazil; 174-216MHz & 470-806MHz

(2)IF frequency; Japan; 57MHz, Brazil; 44MHz (same as analog TV)

(3)Spectrum mask of transmission; Brazil specified 3 types

As described above, both Japan and Brazil system have almost same performances

16

2. Video/Audio coding system

(1) Video coding system

  (a) Video compression; Japan; MPEG-2, Brazil;H.264

  (b) Video format; 480i, 480p, 720p and 1080i (same Japan and Brazil)

  (note) <u>Compression system is different, but video format is same, so, both system support SDTV and HDTV</u>

(2) Audio coding system

  (a) Audio compression; MPEG-AAC (same as Japan and Brazil)

  (b) Audio format; Monaural, stereo, multichannel stereo (3/1, 3/2, 3/2+LFE) <u>(same as Japan and Brazil)</u>

(3) Portable service system (note)

  Both Japan and Brazil adopt H.264(MPEG-4 AVC), but for profile/level, Brazil specified up to 30 frame per second (level 1.3)
  This system is used for One-seg service

  (note) the specification of this system is written in STD-B24(Japan)

DiBEG
Digital Broadcasting Experts Group

---

3. Multiplex system

•The Brazilian standard is essentially adherent to ARIB standard

•Difference points are;

  (1) In Brazil system, Age screening is introduced because of regulation

  (2)Program Categoly; Brazilian ssystem is essencially adherent to ISDB table, but adapted to Brazilian cultural practices.

  (3) Other several points are different because of the difference of operation ,culture ,etc

As described above, from technical aspect, Japan and Brazil systems are Same, differences are only based on culture/ operation difference

DiBEG
Digital Broadcasting Experts Group

4.Reciever

•Basically adherent to ARIB standard B-21

•At several points ,differ from Japanese standard because of culture, regulation and service style, not because of technical reasons

•Support 3 types of receiver, fixed/mobile/portable

DiBEG
Digital Broadcasting Experts Group

5.DRM (Digital Rights Management)

•Japanese system uses B-CAS card

•Brazilian system is now on standardization process

DiBEG
Digital Broadcasting Experts Group

6. Data casting

•Japan; 2 types of Data casting are specified

    ARIB STD-B24; Presentation Engine (PE) base.

    ARIB STD-B23; Application execution Engine (AE) base.

But, B23 is not used now, only B24 is service in.

•Brazil; now on standardization process based on GINGA

21

END of Seminar #2

Thank you for your attention

22