Presentation 1

Digital TV Broadcasting in Japan

13th June – 14th June, 2007
Bangkok, Thailand
Ministry of Internal Affairs and Communications
Japan
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Today’s Topics

➢ Advanced Features of Japan’s Digital Terrestrial TV Broadcasting System (named ISDB-T).

➢ Implementing Schemes for Expanding Digital Terrestrial TV in Japan.

➢ Special Advantages of Japan’s System for Mobile Reception.

➢ Summaries.
Advanced Features of Japan’s Digital Terrestrial TV Broadcasting System (named ISDB-T).
1997  ・Technical Standards for DTTB were established in E.U (DVB-T) and U.S.(ATSC)

1998  ・DTTB started in E.U (DVB-T) and U.S.(ATSC)

1999  ・Technical Standards for DTTB were established in Japan (ISDB-T).
   ・Support center for R&D of DTTB in Japan opened.
      (Shared use of facility, Organization of Communications and Broadcasting)

2000  ・Technical standards for Digital Terrestrial Sound Broadcasting were established in Japan.
   ・Planning of DTTB station channels.

2001  ・Development of institutions for digitization of Terrestrial Television Broadcasting.
      (Revised part of Basic Plan Popularization of Broadcasting and Use of Broadcasting Frequency)

2003  ・DTTB started in Japan (in three metropolitan areas).
   ・Start of trials for practical application of Digital Terrestrial Sound Broadcasting in part of Kanto and Kinki areas.

ISDB-T is the newest DTTB system and as such includes the latest technology
Diffusion of Digital Broadcasting Receivers

Digital Terrestrial Broadcasting Receiver Shipments

21,360,000

Source: Japan Electronics and Information Technology association (JEITA), Japan Cable Laboratory

Access to Digital Broadcasting Satellite

24,740,000

Apr 2007 Source: NHK

| ① CRT      | 720 (± 0) |
| ② LCD     | 10,229 (+518) |
| ③ PDP     | 1,857 (+ 89) |
| ④ Tuner   | 327 (+ 7) |
| ⑤ Digital Recorder | 3,530 (+229) |
| ⑥ Personal Computer | 700 (+ 44) |
| ⑦ CATV STB | 3,994 (+ 99) |

Digital Broadcasting Satellite Receiver Shipments

23,120,000

| CRT         | 1,860 (± 0) |
| PDP & LCD   | 12,610 (+ 60) |
| Tuner (including Digital Recorder) | 4,680 (+ 21) |
| CATV STB    | 3,970 (+ 10) |

Access to Digital Broadcasting Satellite using CATV

1,620,000 households

One-Seg Mobile Phone Shipments

7,370,000

In-car DTTB Receiver Shipments

410,000

Source: Japan Electronics and Information Technology association (JEITA)
ISDB-T is a Suitable System for Next Generation Broadcasting

HDTV, Mobile Reception, and Data (Multimedia) Broadcasting are necessary for Next Generation Broadcasting.

For Large-screen Television
High-Definition Image
High-Quality Sound

At home
In the bus

12 Segments
Compressed by MPEG2

1 Segment
Compressed by H.264

Original Image

10110...

Digital Broadcasting

For Portable Terminals

Anytime
Anywhere

While walking
In the train
Features of ISDB-T

HDTV
- High quality image and sound service

Multi-Channel Service
- Realization of multi-SDTV program service on 1ch bandwidth (6MHz)

Interactive TV
- Communication linked services with TV

Data Broadcasting
- Simple retrieval of program and information at any time

Mobile Reception
- Anytime, Anywhere, TV service to cell-phone
- Stable mobile reception service
Technical Features of ISDB-T ① & ②

① Robustness to Radio Interference by Multi Path. Because of OFDM system is adopted.

OFDM: Orthogonal Frequency Division Multiplex

② Frequency and Time Interleaving

Stability of reception for mobile HDTV reception!
Comparison of Interleaving and No-Interleaving

**TV Station**
- **Interleaving**: Sort data in accordance with set rules
- **No-Interleaving**: Original date

**Transmission Path**
- Errors occur as a result of radio interference
- Interleaving: Reconstruction of data
- No-Interleaving: Difficult to correct continuous errors.

**Receivers**
- Interleaving: Dispersed errors can be corrected.
③ Guard Interval

Broadcast wave from X station (Required)

Broadcast wave from Y station (Not required)

Delay at Reception Point

Realization of Single Frequency Network
Effective Utilization of Radio Frequency
Over 10,000 stations can be set up using 40 Ch in Japan

: Digital Data such as Video and Audio

: Guard Interval

Reference
Multi Frequency Network
Technical Features of ISDB-T

④ Segmented Frequency

The segmented frequency structure is unique system of ISDB-T.

Ex.1 One HDTV and Mobile Reception.

Ex.2 3 SDTV and Mobile Reception.

8 programs or less
## Comparison of Three DTTB Systems

### Results of fair evaluation by a third country (Federative Republic of Brazil)

<table>
<thead>
<tr>
<th>Items</th>
<th>System</th>
<th>Japan (ISDB-T)</th>
<th>EU (DVB-T)</th>
<th>U.S (ATSC)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Robustness to ghost image interference</strong></td>
<td></td>
<td>Effective against ghost image interference using advanced technique.</td>
<td>Effective against ghost image interference.</td>
<td>The same degree of analog TV broadcasting.</td>
</tr>
<tr>
<td><strong>Feasibility of Single Frequency Network (SFN)</strong></td>
<td></td>
<td>A channel plan including SFN has already been prepared.</td>
<td>Some countries such as Germany, Australia, and Singapore, are operating this.</td>
<td>Being tested in the U.S. and Canada. However, no prospect for commercialization has emerged.</td>
</tr>
<tr>
<td><strong>Feasibility of portable reception</strong></td>
<td></td>
<td>One channel can carry portable reception service simultaneously with HDTV service.</td>
<td>DVB-H, another channel is necessary for portable reception.</td>
<td>Portable reception is not available in the current system. Other systems are not being considered.</td>
</tr>
<tr>
<td><strong>Transmission system</strong></td>
<td></td>
<td>It is possible to designate the modulation system of the segment group unit according to the service purpose.</td>
<td>Bandwidths of 6, 7 or 8MHz.</td>
<td>Improved system based on analog TV broadcasting system.</td>
</tr>
</tbody>
</table>

### Transmission System Diagrams

- **Japan (ISDB-T):**
  - Bandwidths: 6, 7 or 8MHz.
  - For fixed reception: Frequency range is shown.
  - For mobile reception: Frequency range is shown.

- **EU (DVB-T):**
  - Bandwidths: 6, 7 or 8MHz.

- **U.S (ATSC):**
  - Improved system based on analog TV broadcasting system.
Implementing Schemes for Expanding DTTV in Japan
## Schedule for Digitalization of Broadcasting in Japan

<table>
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<tbody>
<tr>
<td><strong>Digital Terrestrial Television</strong></td>
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<td></td>
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<td></td>
<td><strong>July 24, 2011</strong></td>
</tr>
</tbody>
</table>
| Started black-and-white TV broadcasting | Started color TV broadcasting | Started digital TV broadcasting in three metropolitan areas (Key Stations) | Start digital broadcasting nationwide | Relay station will be established sequentially | Completion of Digitalization !

**Broadcasters:**
- NHK (General, Education), The University of the Air Foundation, 127 commercial broadcasters

**Subscribers:**
- All households (48 million households)

## Satellite Broadcasting

- 1996
- 2000
- 2011

- Started CS digital broadcasting
- Started BS digital broadcasting
- Completion of Digitalization

## CATV

- 1955
- 1998
- 2011

- Started broadcasting
- Started digital broadcasting in some regions
- Digital terrestrial broadcasting can be received in all subscribed households
Expansion Schedule for DTTV in Japan

- already started by Dec. 2004
- started in Jun. 2005
- started in Dec. 2005
- started in Oct. 2006
- started in Dec. 2006

39.5 million households (84%) have access to DTTV
Implementing Scheme for Expanding Digital Terrestrial Television Nationwide

The National Council for Promotion of Terrestrial Digital Broadcasting (Broadcasters and MIC)
- Studying challenges (both institutional and technical) involved in the transition to digital television broadcasting

The National Conference for Promotion of Terrestrial Digital Broadcasting (broadcasters, manufactures, electrical appliance shops, consumer organizations, local governments, MIC, etc.)
- Updating/revising “Action Plan for Promotion of Digital Broadcasting,” describing items to be implemented by its members and the schedule thereof
- Developing/updating and publicizing “Roadmap of Construction of Broadcasting Stations” with the cooperation of the above mentioned Council
- Driving forward the activities for promoting digital broadcasting by announcing December 1st as “Digital Broadcasting Day”

The Association for Promotion of Digital Broadcasting (Dpa) (broadcasters, manufactures, etc.)
- Publicizing broadcasting areas
- Responding to questions and inquiries from viewers
All parties concerned work together based on this action plan. “National Conference on Promoting Terrestrial Digital Broadcasting” (Established in May 2003) promotes this plan. The Conference finalized the “Seventh Action Plan for Promotion of Digital Broadcasting” on December 2006.

**Specific efforts by concerned organizations**

- **Terrestrial TV Broadcasters**
  - Development of a road map for DTTB Stations.
    ① This road map indicates a schedule for the construction of as many DTTB stations as possible, including small scale stations. This road map shows when access becomes possible and in which areas.
    ② TV broadcasters make sure they can meet this schedule
  - Diffusion and promotion of the unique DTTB service
    ① TV Broadcasters try to increase the ratio of HDTV programs.
    ② Clarification of plans to provide enhanced services, such as a DTTB service for mobile reception.

- **Receiver Manufactures and Shops ..etc**
  - Promotion of development and diffusion of cheaper, more varied DTTB receivers.
  - Response to enhanced services such as DTTB for mobile reception and server-type broadcasting.
  - Promotion of development of easy-to-use DTTB receivers for all users.
  - Training for shop clerks ..etc

- **Government**
  - Clarification and publication of specific policy to ensure realization of the road map for DTTB Station and establishment of technical standards that enable swift and easy building of broadcasting stations.
  - Publication of accurate information and schedule about DTTB in a way ordinary people can easily understand.
Official Supports for Broadcasters

Support by the “Extraordinary Law for Measures to Promote the Construction of Advanced TV Broadcasting Facilities” etc.

- Preference for the national tax (corporate tax)
- Preference for the local tax (fixed property tax, real-estate acquisition tax)
- Supply of low- or super-low-interest funds by the Development Bank of Japan

Financial support for the implementation of broadcasting stations in disadvantaged areas
Special Advantages of Japan’s System for Mobile Reception
Importance of mobile reception is recognized worldwide. Europe and U.S.A developed additional system for mobile reception. Broadcasters need additional investment for mobile TV reception except in the case of Japan’s system.

**EUROPE**
- Mobile Reception: DVB-H
  - DVB-H was established for mobile reception as series of DVB, European DTTB system.
  - Trial Services have been provided in some countries, such as Finland, France, Spain, and Denmark.
  - ※ MPEG-4 AVC/ITU-T H.264 will be adopted for video encoding.
- Fixed Reception: DVB-T
  - T-DMB based on European Digital Audio Broadcasting (DAB) was adopted for mobile reception systems unlike fixed reception.
  - Launched in Dec. 2005
  - ※ MPEG-4 AVC/ITU-T H.264 was adopted for video encoding.

**JAPAN**
- Mobile Reception: ISDB-T
  - MPEG-4 AVC/ITU-T H.264 was adopted for video encoding.
  - Launched on 1 April 2006.
  - Federative Republic of Brazil also adopted Japan’s system on Jun 2006.
- Fixed Reception: ISDB-T

**KOREA**
- Mobile Reception: T-DMB
  - T-DMB based on European Digital Audio Broadcasting (DAB) was adopted for mobile reception systems unlike fixed reception.
  - Launched in Dec. 2005
  - ※ MPEG-4 AVC/ITU-T H.264 was adopted for video encoding.
- Fixed Reception: ATSC

**U.S.A**
- Mobile Reception: Under Consideration
- Fixed Reception: ATSC
  - Stream distribution services using mobile networks instead of terrestrial broadcasting have been started.
  - In addition to DVB-H, new technologies such as Media-FLO are being considered.
In the case of ISDB-T, broadcasters don’t need additional investment for mobile TV reception. Because One-Seg service can be provided using same investment for fixed TV reception.

ISDB-T can provide over 10 TV programs for mobile reception service using one TV Channel!
- One-Seg Mobile Phone Shipments have been expanded and reached 500,000 for the first time in Dec 2006.
- Estimate of one in 30 mobile phones became One-Seg mobile phones in Japan.

(Unit: thousand)

7.4 million One-Seg Mobile Phones were Shipped (by the end of Apr. 2007).
One-Seg Broadcasting Receivers Introduced to the Market (1/3)

Mobile Phones

KDDI

W33SA (Dec 2005)
W33SA II (Jun 2006)
W41H (Feb 2006)
W43H (Sep 2006)
W43SA (Oct 2006)
W44S (Dec 2006) Usable also as digital radio
W43H II (Jan 2007)

MEDIA SKIN (Jan 2007)
W51CA (Jan 2007)
W51K (Jan 2007)
W51SA (Jan 2007)
W51SH (Jan 2007) Usable also as digital radio
W51T (Jan 2007) Usable also as digital radio
W52T (Jan 2007) Usable also as digital radio

NTTDoCoMo

P901iTV (Mar 2006)
D903iTV (Jun 2007)
D903iTV (2007)
P903iTV (2007)
SH903iTV (2007)

SoftBank

905SH (May 2006)
911SH (Nov 2006)

Each company's press released merchandise in Japan
Each company's press released merchandise in Japan
One-Seg Broadcasting Receivers Introduced to the Market (3/3)

Portable DVD Players
- DVD-LX97 (Mar 2006) Panasonic
- ROSSINI RPD7100SN-SV (Nov 2006) NAGASE
- SD-P90DT (Dec 2006) TOSHIBA
- SD-P50DT (Dec 2006) TOSHIBA
- axion AXN6709TD (Dec 2006) NAGASE

Electronic Dictionary
- SD-PDT1 (Jul 2006) TOSHIBA
- DVF-DTV100 (Aug 2006) SANYO
- Papyrus PW-TC900 (Dec 2006) SHARP
- Nintendo DS (scheduled in 2006) Nintendo

Digital Audio Player
- gigabeat V30T (Jul 2006)
- gigabeat V30E & V60E (Nov 2006) TOSHIBA

Exclusive Terminals, etc.
- BTV-400K (Feb 2007) BLUEDOT
- One-segment unit Produced by Wilcom (Dec 2006) PIXERA
- Prodia (Sep 2006) TOSHIBA

Game Terminal
- Nintendo DS (scheduled in 2006) Nintendo

Others
- Super One-seg TV Watch (campaign prize) Asahi Beer
- Original One-seg TV (G I Challenge campaign prize) Georgia

※ One-Seg tuner only for portable DVD player

Each company's press released merchandise in Japan 24
1. Realization of non-congested communication even in times of disaster.
2. Ensure conveying information by automatic activation even in times of disaster and/or in emergency.
3. Able to convey information according to area and objectives.

Possibility of xxx river flooding has increased. Residents in the surrounding areas should evacuate. Areas affected are as follows.

Evacuate from this area!

Activation control signal
&
Text and Image

Activate!

Both in and outside the home.

Translate to Broadcasting Markup Language

Master Room (on-air button)

Activation Control by Broadcasting
Non-congested communication
Power-saving feature is necessary

(Cell Base Station)
## Comparison of Mobile Reception Systems

<table>
<thead>
<tr>
<th></th>
<th>Japan</th>
<th>Other Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission system</strong></td>
<td>ISDB-T (One-segment)</td>
<td>- T-DMB (KOR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- DVB-H (EU)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Media-FLO (U.S.A)</td>
</tr>
<tr>
<td><strong>Service application</strong></td>
<td>Video/Audio/Data</td>
<td>Video/Audio/Data</td>
</tr>
<tr>
<td><strong>Assignment of new frequency bandwidth</strong></td>
<td>Unnecessary</td>
<td>Necessary</td>
</tr>
<tr>
<td><strong>Additional license</strong></td>
<td>Unnecessary</td>
<td>Necessary</td>
</tr>
<tr>
<td><strong>Service provider</strong></td>
<td>Broadcaster (Free Service)</td>
<td>Broadcaster/Carrier/Other company (Pay Service)</td>
</tr>
<tr>
<td><strong>Emergency Warning Broadcasting System</strong></td>
<td>Implementable</td>
<td>Cannot implement</td>
</tr>
<tr>
<td><strong>Thrifty Power Consumption</strong></td>
<td>Excellent</td>
<td>Depends on systems</td>
</tr>
</tbody>
</table>

The above data indicates that ISDB-T is an excellent system for mobile reception.
Summaries
Adaptability of ISDB-T

- In Japan, the 6MHz bandwidth is assigned to one Digital TV channel.
- Of course, ISDB-T technologically adapts the 8MHz bandwidth.
  → If a market is established, then LSI encoder which is a key component to come into practical use to enable TV reception to adapt the 8MHz will be supplied.

Technical Cooperation

- Dispatch a mission and implementation of demonstration with regard to broadcasting for mobile reception.
- Fostering of broadcasting technical experts.
  → Cooperation to establish channel planning based on Japan’s know-how.
Digitizing broadcasting consists of not only upgrading existing analog TV systems but also achieving attractive broadcasting service is the key to expand digital terrestrial TV for viewers.

ISDB-T makes it possible to receive SDTV or HDTV while moving and provides the chance for enjoying new broadcasting service to users.

ISDB-T can provide a “free” mobile TV reception service like ordinary TV broadcasting.

→ ISDB-T can be the most suitable system for expanding digital terrestrial TV.
Ministry of Internal Affairs and Communications (MIC):

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