

Standards, technology, and services of data broadcasting in ISDB



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Contents



- Outline of ISDB and data services
- Technical standards and technologies of Data Broadcasting
- Future prospect and next generation services
- Conclusions

ISDB (Integrated Services Digital Broadcasting)

■ History

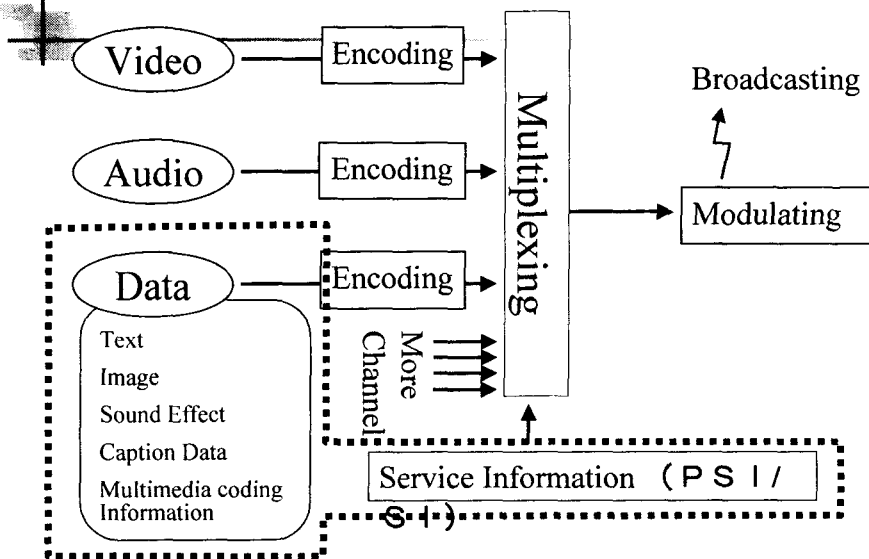
Development was started in 1983

■ Concept

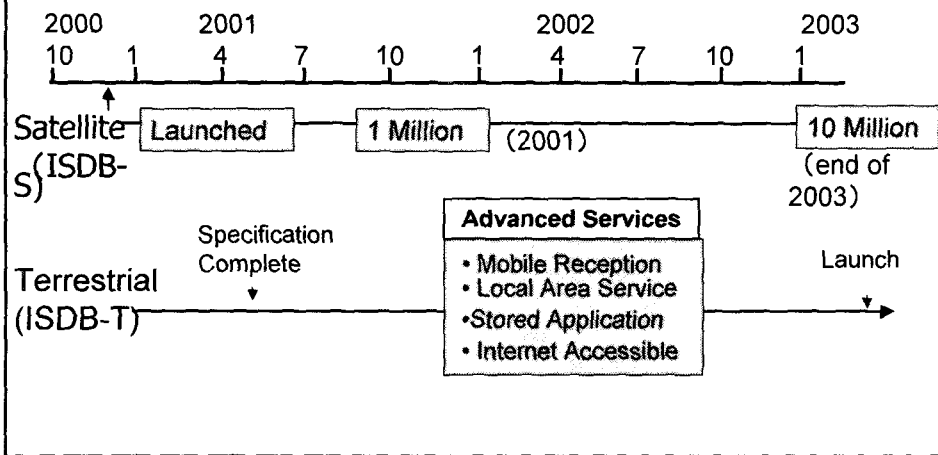
Flexibility, commonality, expandability

- ISDB-S (Satellite)
- ISDB-T (Terrestrial)
- ISDB-C (Cable)

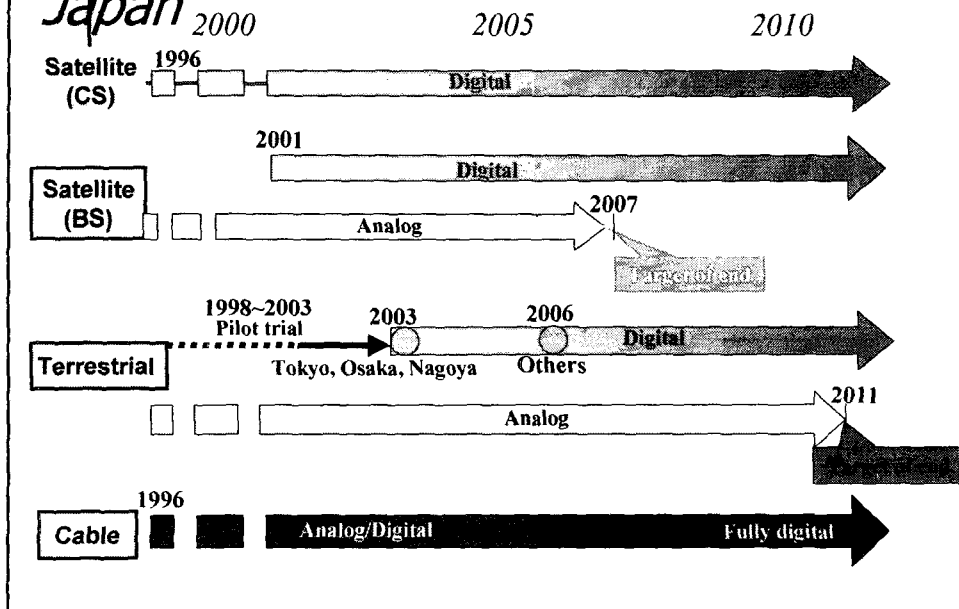
System of digital Broadcasting



Launch Schedule of Digital Broadcasting in Japan



Schedule of Digital Broadcasting in Japan



Progress of ISDB in Japan

BS (Broadcast Satellite)

Dec. 2000 ~

HDTV, Data services, EPG

More than 1,000,000 receivers

Broadband CS (Communication Satellite)

April 2002 ~

Services for home-server receivers

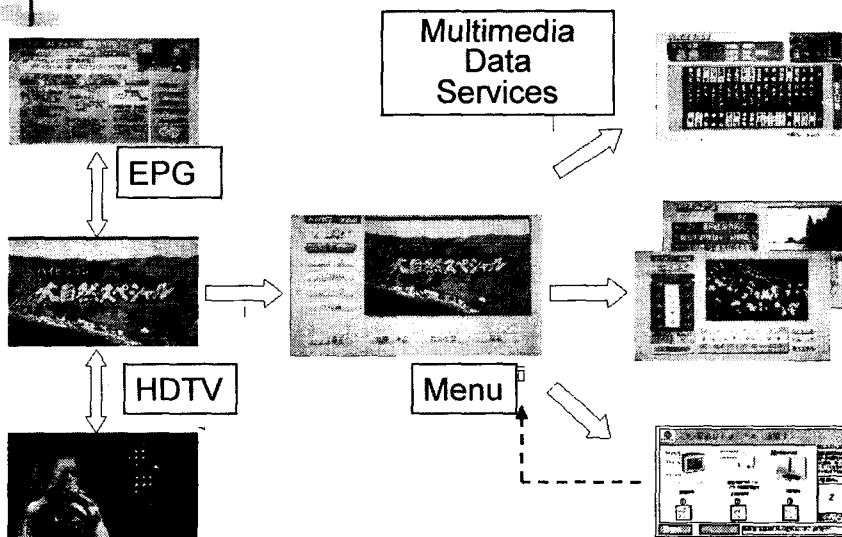
Terrestrial

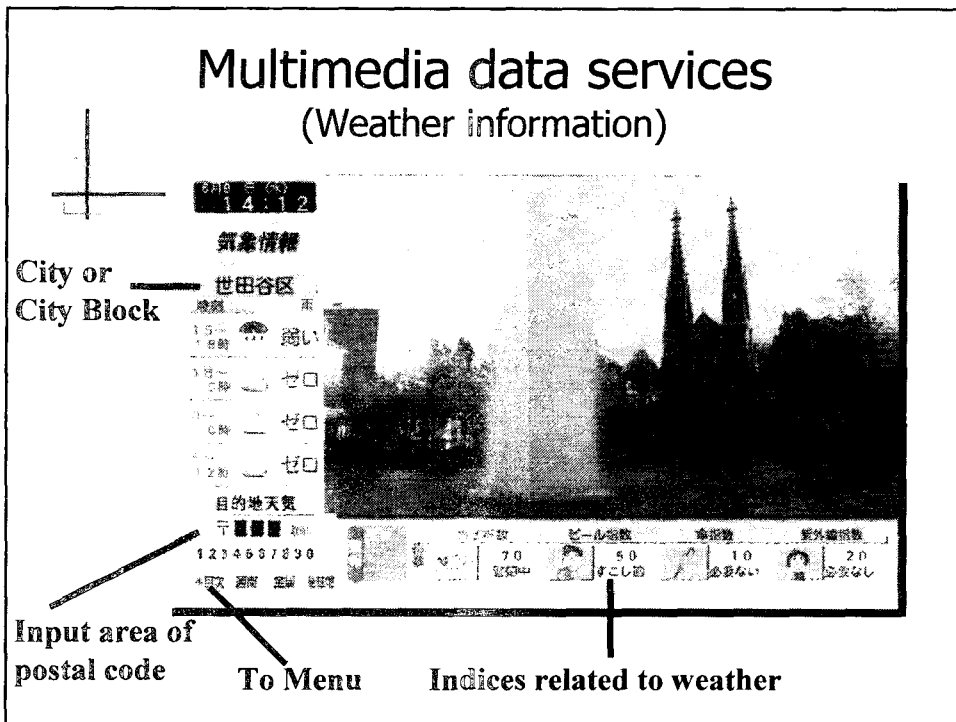
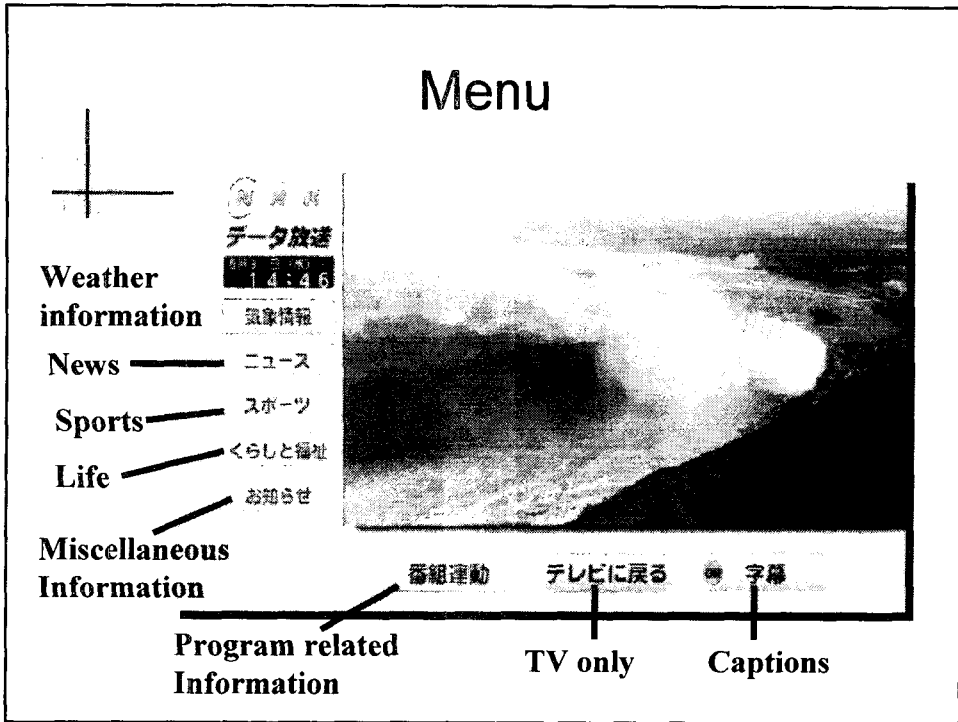
2003 ~

Broadcasting services for local area

Mobile / Portable broadcasting reception

Services in Satellite Digital Broadcasting





Standardization organization for broadcasting technology in Japan

- **TTC** (Telecommunication Technology council)
Secretary: MPT(Ministry of Post and Telecommunication)
- ↓ After re-organization (in 2001)
- **TC** (Telecommunication council)
MPHPT(Ministry of Public management, Home affairs, Post and Telecommunication)

- **ARIB** (Association of Radio Industries and Businesses)
 - Non-governmental organization
 - Member: broadcasters, radio and TV manufacturers, telecom operator, etc.

ARIB Technical specifications for data broadcasting

- **ARIB STD-B24** "Data coding and transmission specification for digital broadcasting"
 - Volume 1 Data coding
(reference model, coding scheme of monomedia and caption)
 - Volume 2 XML-based multimedia coding scheme (BML)
 - Volume 3 Data transmission specification

- **ARIB TR-B15** (technical report) "Operational guideline for digital satellite broadcasting services"

- **ARIB TR-B14** (technical report) "Operational guideline for digital terrestrial television broadcasting"

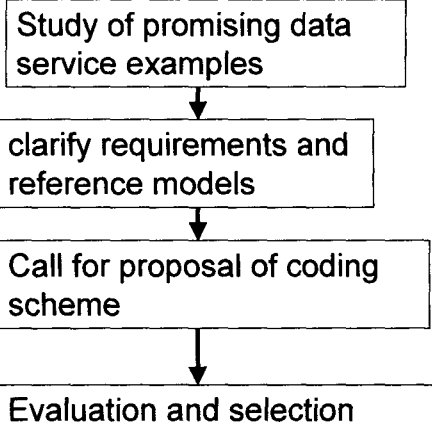
ARIB Technical specifications for digital broadcasting (1/2)

- ARIB STD-B32
 - Video coding, audio coding and multiplexing specifications for digital broadcasting
- ARIB STD-B10
 - Service Information for Digital Broadcasting System
- ARIB STD-B21 (Desirable Specification)
 - Reference receiver, Software downloading
- ARIB STD-B25
 - Conditional Access System
 - Low-speed CA interface using IC card

ARIB Technical specifications for digital broadcasting (2/2)

- ARIB STD-B20
 - Transmission and Operational Condition(for satellite)
 - modulation scheme
- ARIB STD-B31
 - Transmission system for digital terrestrial television broadcasting

Example of standardization process for data coding



Requirements for multimedia data broadcasting(1)

In general

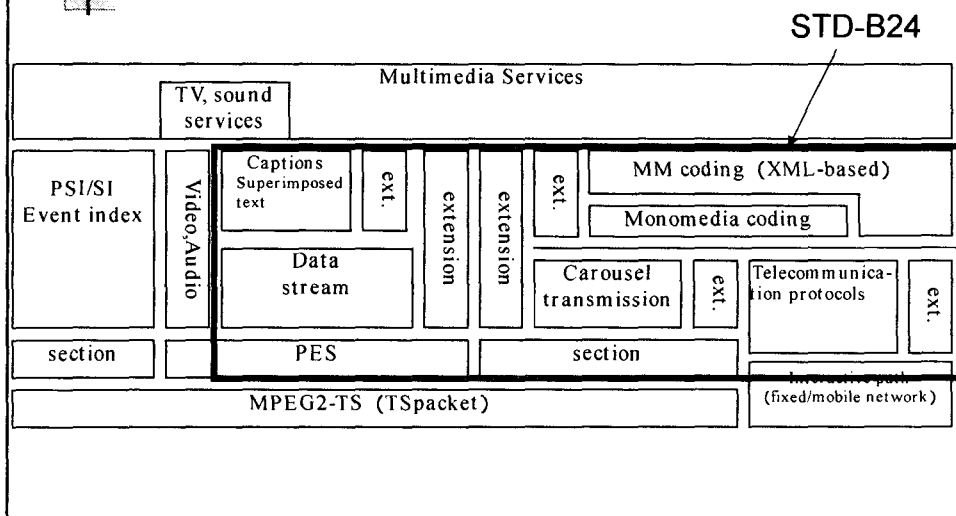
- Handling of monomedia and hyperlinks
- Temporal and spatial position control with flexibility
- Interactivity
- Return channel
- Interoperability

Requirements for multimedia data broadcasting(2)

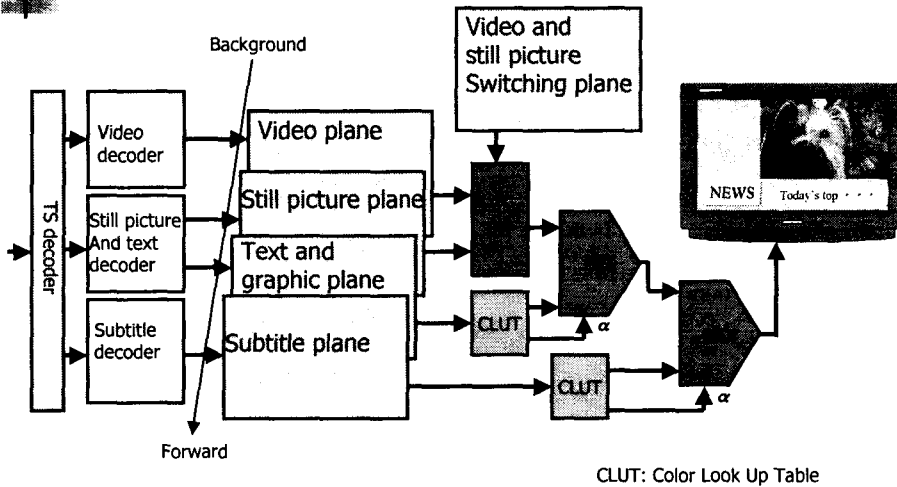
Dedicated for broadcasting use

- Real time (AV synchronization)
- Identical representation
- Usability (operated by various viewers)
- Peripheral device control (particularly consumer AV devices)

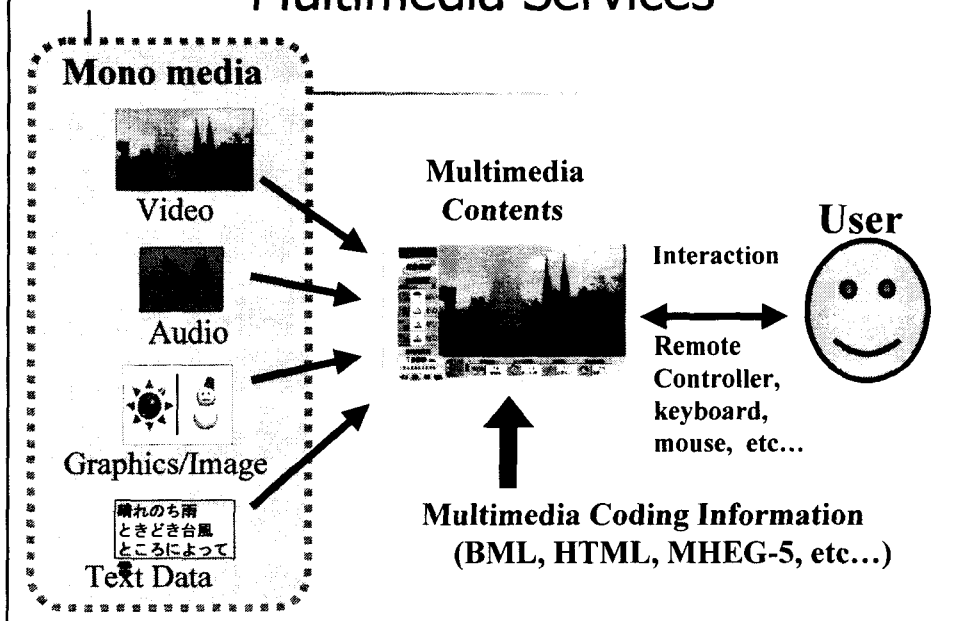
Protocol stacks of ISDB data services (ARIB specification)



Planes and switching in model receiver



Multimedia Services



Mono media coding

- Monomedia specified in ARIB STD B-24
 - Moving image : **MPEG1**, **MPEG2**, MPEG4
 - Audio : **MPEG2-AAC**, MPEG2-BC, **AIFF-C(PCM)**, MPEG4
 - Still image : **JPEG**, MPEG2-I
 - Graphics : **PNG**, **MNG**, PDI(Picture description Instruction)
 - Text : **8 bit character code** , **EUC-JP**
Unicode2.1 (ISO10646-1)

blue : used for BS digital broadcasting in 2000

Multimedia coding

BML (Broadcast Markup Language)

- Developed by ARIB, June. 2000
 - ARIB STD-B24 Ver. 1.2
 - “**Data Coding and Transmission Specification for Digital Broadcasting**”
Volume 2
 - “**XML-based Multimedia Coding Scheme**”
- BML
 - Available on BS Digital Basic Receiver from 2000
- B-XML
 - for advanced services(with XSLT,DTD parsing)

Specifications for BML

- Tagging rule: XML 1.0
- Tag sets: XHTML 1.0
 - Reformulating HTML 4.0 by XML 1.0
- Presentation style: CSS level1/2
 - Presentation style
- Object models: DOM level1/2
 - API for XML document
- Scripting language: ECMAScript
 - Transition by user operation, etc.

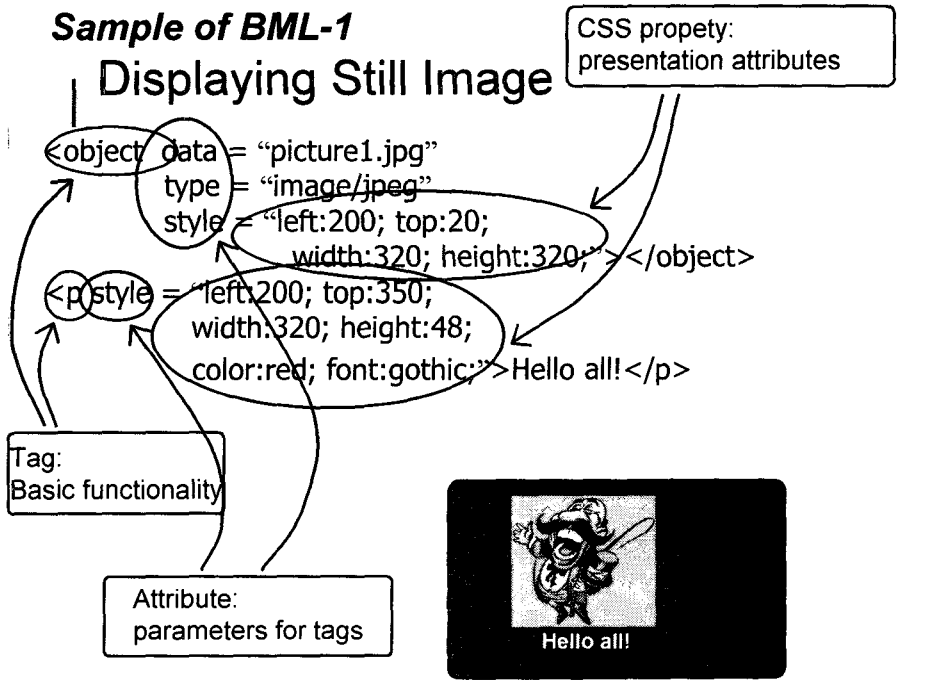
Extensions for Broadcast Use

- Tags
 - Interruption, event message handling
- Attributes of tags
 - Stream control, remain attribute
- CSS properties
 - Color space: 256 color index, YPbPr
 - Remote control pad operation: “nav-index”
- ECMAScript API
 - EPG access, binary/CSV table access

An example of basic structure of BML document

```
<?xml ...?> # XML declaration : version info. etc.
<bml> # beginning of BML document
  <head> # header information
    <style> # style description </style>
    <script> # script description </script>
    <title></title>
  </head>
  <body> # document body
    <div style="width:640; height:480;">text information</div>
    <object style="...." data="back.png" type="image/png" />
    ....
  </body>
</bml> # end of BML document
```

Sample of BML-1 Displaying Still Image



Sample of BML-2

Changing Still Image

DOM API:
value of data attribute
changed here

```
<script>  
function changePic()  
  document.getElementById( "pic" ).data = "picture2.jpg"  
}  
</script>  
.....  
<object onclick = "changePic()"  
  id = "pic"  
  data = "picture.jpg" type = "image/jpeg"  
  style="...">  
</object>
```

onclick attribute:
indicates function
when selected

SCRIPT Tag:
Definition for
functions used

Click on image...



Then image changes



Sample of BML-3

broadcast event handling

" type " Attribution

" onoccur " Attribution

```
</bevent>
```

When Program will be end soon ...

Displaying Next Week Info

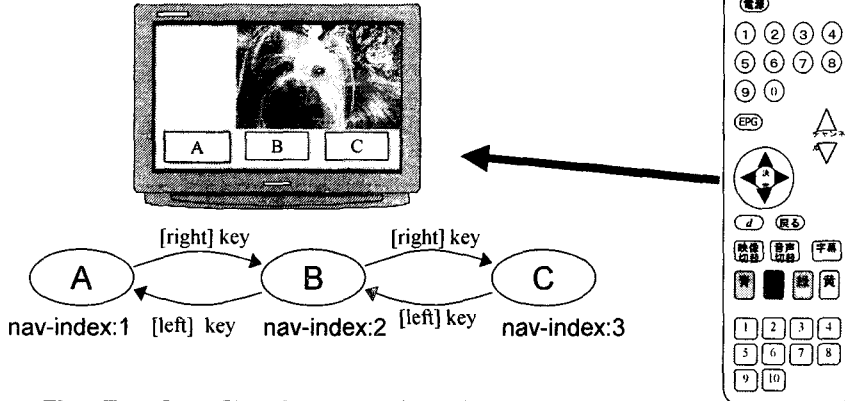
" bevent " Tag,
" beitem " Tag



Sample of BML-4

Focus navigation description

- `<object id="A" style="nav-index:1; nav-right:2;" ... />`
- `<object id="B" style="nav-index:2; nav-left:1; nav-right:3;" ... />`
- `<object id="C" style="nav-index:3; nav-left:2;" ... />`



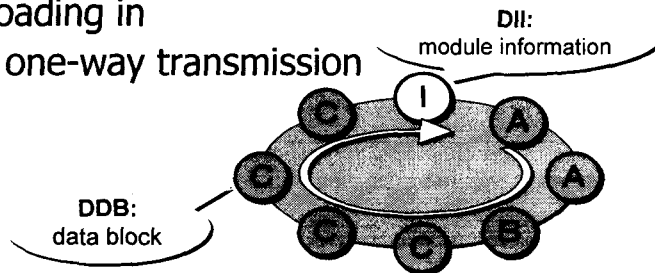
Data transmission Protocol (ARIB STD-B24 volume 3)

- **Data stream**
 - Caption/subtitle
- **Data Carousel**
 - BML and mono media files
- **Event message**
 - Real time message for BML contents

Transmission of BML contents

Data Carousel (MPEG2 part6, DSM-CC)

- Transmission by module
- Multiple resources (files) per module
 - Multipart
- Modules send out sequentially and repeatedly
- File downloading in broadcast one-way transmission



Future prospect

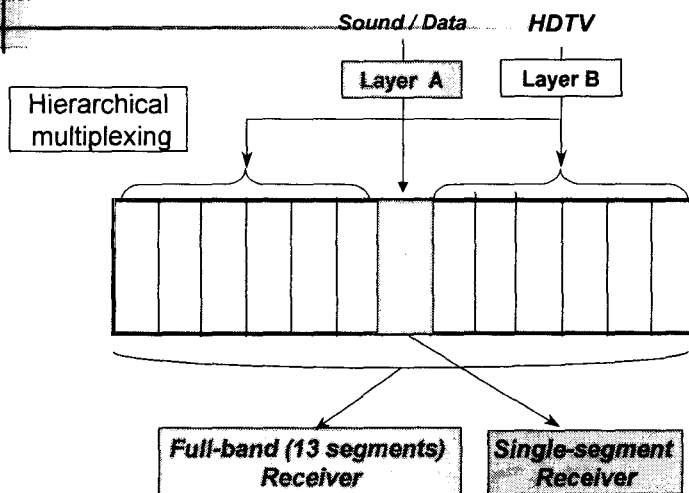
Advanced data services and others-

- Advanced data services for ISDB-T
 - Location-linked data services
 - Scalable presentation for different types of receivers
- Data Services for external equipments
- Execution engine

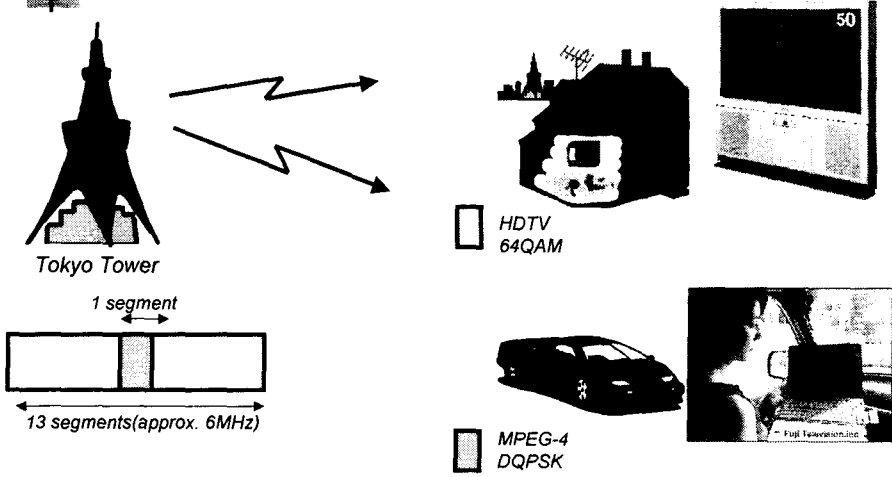
Technical Features of ISDB-T

- OFDM
 - Robustness, SFN
- Segmented structure
 - Extensible, partial reception
- Time-domain interleaving
 - Mobile reception
- TMCC (Transmission and Multiplexing Configuration Control)
 - Flexible, versatile

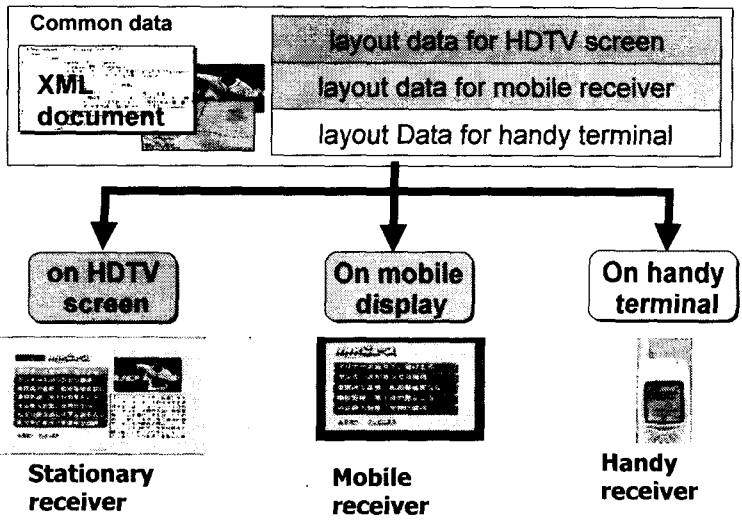
Segmented Structure



HDTV and MPEG-4 Broadcasting



Scalable presentation for various types of receivers



Data services for external equipments

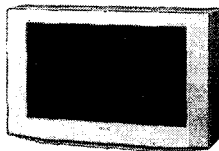
Contents

Non A/V Presentation

(Control command, Motion Capture)

Interaction between Home Equipments

Home Network



Conclusions

- ISDB-S was started successfully in Japan.
- Attractive Contents, low cost receiver and proper receiver functions under optimized technical specifications, are key to success.

- Advanced data services for ISDB-T
 - location-link data services
 - External equipment-link data services
 - Scalable presentation services
- Next generation services with
 - Execution engine, etc.

References

- ARIB STD-B24 version 1.2, “Data coding and transmission specification for digital broadcasting” (in Japanese/English)
- <http://www.arib.or.jp>
- <http://www.nhk.or.jp/strl/index-e.html>