Datacasting

Sony corporation
Home Electronics Network Company
DTV Platform Engineering Department
Yoshiharu Dewa

Mar. 28/29 2005
What is Datacasting?

Typical service image of data broadcasting (datacasting)
Example for Datacasting(1)

Top menu
Example for Datacasting(2)

Weather news
Example for Datacasting(2)

Program related data
Remote Controller for Datacasting

- Colour key and Arrow Key (four directional)
- Datacasting Trigger Button
- Back key (for interactive application)
Brief Information of the receiver

※ Receiver model
  – Detail of the receiver structure will be available later (Section #7)
  – Here are for understanding datacasting format.
    ※ Existence of text graphic plane, still picture plain, video plane, etc..
    ※ Alpha blending between each plane
Plain concept of the receiver

* Plain model

See STD B24 Vol.1 Chapter 7
Plain concept of the receiver (cont.)

See STD B24 Vol.1 Chapter 7

Plain format

- Video ・・・1920x1080x16 YCbCr(422) 8bit
- Still picture ・・・ Same as video plane
- Video and still picture switching ・・・1920x1080x1 1bit
- Text and graphic ・・・1920x1080x24 YCbCr(444) 256 steps alpha blending
- Subtitle・・・1920x1080x8 8bit colour map address and 256 steps alpha blending
Plain concept of the receiver (cont.)

Switching control

Video plane

Still picture plane

Masking

Video

Still picture

Video and still picture switching plain

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Standardization of Datacasting

- ARIB standardization
  - ARIB Digital Satellite broadcasting development council (established September 1996) found XML working group in February 1999.
  - the XML WG consist of Basic XML Task Group, Advanced XML TG and Service TG.
  - Each TG makes standard and then WG compile into one standard, known as ARIB STD-B24.
Standardizing organization

ARIB Standardizing activity

- The Purpose of Basic XML-TG
  - First target is Digital Satellite broadcasting service in 2000.
    - Formulate BML tag set specification
    - Formulate Script language specification
    - Formulate transmitting format for datacasting specification
  - Be designed to datacasting format for across all media
    - Bring CS110, Terrestrial, Satellite Audio channel, Terrestrial audio channel into view
ARIB Standards

* STD-B10
  - Service information and descriptor specification
* STD-B20
  - Transmission System for Digital Satellite Broadcasting
* STD-B24
  - Datacasting specification (Reference Model, Mono-media coding, Captioning, Multi-media coding and transmission specification)
* STD-B25
  - Conditional Access System Specifications
* TR-B13/14/15/26
  - Operational Guidelines
ARIB Standards (cont.)

* STD-B1
  - Desirable Receiver Specification (CS)
* STD-B29
  - Transmission of Terrestrial digital audio broadcasting
* STD-B30
  - Receiver specification of Terrestrial digital audio broadcasting
* STD-B32
  - Audio and video coding specification extension from B20 (especially MPEG2-AAC)
ARIB STD-B24

- B24 consist of three volumes (four books)
  - Volume 1: Mono media
  - 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)
Definition of Datacasting Service

- Integrated subtitle, graphics, audio, data with Television screen with user interaction
- Also known as Multimedia services

See STD B24 Vol.1 Informative explanation 1
What is Multimedia service?

Multimedia services mean the service by use of media, which enables to view integrated multiple presentation media interactively utilizing digitizing features.

- “Presentation media” is derived from MHEG (ISO/IEC 13522)

See STD B24 Vol.1 Informative explanation 1
Overview of datacasting services

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

See STD B24 Vol.1 Informative explanation 1
Requirements

1. Harmonization with Internet Web content
   - Interoperability between Internet Web content and BML. It is desirable to convert from Internet Web content to BML or vice versa without any significant change of the content.

2. Extensibility
   - It is desirable to extend BML without drastic change of the fundamental standard in accordance with the progress of the receivers, broadcast media and service in the future.

3. Rich content expression
   - Not only simple image presentation but sophisticated control of the images in the various conditions.

4. Unique presentation
   - Unique presentation exactly as content creators produced independent from different BML browsers to avoid different presentation from what creators designed, which sometimes happened in the Web content.

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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 Extention
  - 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)
What is XML?

- The language for making the language using tag (Mark up language)
- XML itself cannot represent meaning, the language which is using XML is actual language
- Such a language is known as “meta language”

cf.

SGML <-> XML Meta language

HTML <-> XHTML Mark up language
Feature of XML

- The language using XML has consistency because they have same syntax and rule
  - XML resource easy to combine each other
    - Combination of multiple XML resource makes various purpose languages
  - Easy validation for language specification because language specification also defined by meta languages such as XML Schema, Relax, DTD.
    - Specification which is described in XML can publish as internet resource.
Various XML resource
  - all language can combine each other.

<table>
<thead>
<tr>
<th>Financial Data (OFX)</th>
<th>Metadata Description (RDF)</th>
<th>Software Distribution (OSD)</th>
<th>Web page Description (XHTML)</th>
<th>Push technology Description (CDF)</th>
</tr>
</thead>
</table>

XML Syntax
XML adaptation to datacasting

- BML - Data coding scheme for broadcasting
  - Adaptation to broadcasting system
    - As metadata, which is represented context of content or segmentation play back, etc.
    - As content representation which is defined display positioning or content dynamic behavior control
      - Latter is first priority for defining
  - Unique presentation
    - Same appearance for all manufacture products
      - PC CANNOT realize this issue!
  - Functionally extension for broadcasting
Structure of BML

- XHTML1.0 + ECMAScript + CSS1/2 + DOM1+
  Broadcast extension

- Basic profile for the service in 2000 (BS Digital) at first, however currently this profile is the basis for all profiles
Structure of Language

- **XHTML Part**
  - Description of document structure, Definition of page element

- **CSS Part**
  - Provide style to each elements, specify the position

- **ECMAScript Part**
  - Affect elements each other, rewrite the nodes
MVC Model

Model

XHTML

CSS Selector

DOM

CSS

View

DOM

Control

ECMAScript
**XHTML1.0**

- Next generation internet content description language is specified by W3C (WorldWideWeb Consortium)
  - http://www.w3.org/TR/xhtml1
  - Rewrite HTML4.0 specification in XML syntax
  - Modularization
    - Available only need functionality
    - Possible to add/delete the module partly
CSS

The language which is for description of style such as layout, defined by W3C

- http://www.w3.org/TR/REC-CSS2
- CSS level 1
  - Basic presentation control
  - Simple selector function
- CSS level 2
  - More complex presentation control
  - Representation of depth
  - Visibility control
  - Aural and speech
ECMAScript

- The standard by ECMA, European industrial standard body
  - There are two de-facto standards for script language at first
    - JavaScript by Netscape
    - Jscript by MSFT
    - Extracting common item from these languages and deleting the window specific function make pure script language. This is the ECMAScript.
  - Presentation process can’t describe by ECMAScript only
  - http://www.ecma.ch/ecma1/STAND/ECMA-262.HTM
**DOM**

- Specification for accessing XML document structure by W3C
  - Known as Document Object Model
  - Specify document structure
  - Specify how to access the document structure by script

```xml
<bml>
<head>
  <title>A study of DOM</title>
  <link id="ID1" rel="stylesheet" type="text/css">
</head>
<body>
  ... document body...
</body>
</bml>
```
## Difference between BML and HTML

<table>
<thead>
<tr>
<th>Feature</th>
<th>BML</th>
<th>HTML</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td><img src="image1.png" alt="BML Sample" /></td>
<td><img src="image2.png" alt="HTML Sample" /></td>
</tr>
<tr>
<td>Suitable operation for TV</td>
<td><img src="image1.png" alt="BML Sample" /></td>
<td><img src="image2.png" alt="HTML Sample" /></td>
</tr>
<tr>
<td>Feature</td>
<td>Few hyperlinks per one screen</td>
<td>Many hyperlinks in one screen</td>
</tr>
<tr>
<td></td>
<td>Intuitive providing information by using bitmap and video</td>
<td>Text centric information providing by small letter presentation</td>
</tr>
<tr>
<td></td>
<td>Scroll is optional</td>
<td>Suppose to scroll functionality</td>
</tr>
<tr>
<td></td>
<td>Update latest information automatically</td>
<td>Need to push “reload” button for retrieving latest information generally</td>
</tr>
<tr>
<td></td>
<td>Synchronize between TV and Radio program</td>
<td></td>
</tr>
</tbody>
</table>
## Difference between BML and HTML (cont.)

<table>
<thead>
<tr>
<th>Use case</th>
<th>BML</th>
<th>HTML</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viewing distance</td>
<td>1~3m</td>
<td>30~50cm</td>
</tr>
<tr>
<td>Focus display</td>
<td>Focus of Hotspot</td>
<td>Free cursor</td>
</tr>
<tr>
<td>Input device</td>
<td>Remote controller with colour key</td>
<td>Wheel mouse + keyboard or Touch panel + keyboard</td>
</tr>
</tbody>
</table>

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

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Difference between BML and HTML (cont.)

<table>
<thead>
<tr>
<th>BML</th>
<th>HTML</th>
</tr>
</thead>
</table>

Only absolute positioning is permitted.

Datacasting screen

Bom dia!

Seja bem-vindo à Tokyo!

Layout are decided by browser dynamically.
BML Extension

* Event synchronization
  <bevent>
  <beitem>

* Color space extension
  - Adapt to receiver model
  - Necessity of alpha blending

* Navigation
  - Introduce remote controller control mechanism
  - Harmonize ATSC/DASE PE specification
Event Synchronization

What is event synchronization?
- The functionality of synchronous control between main audio and video stream (i.e. TV Program) and BML application
  - Display a recipe along the progress of the cooking program
  - Display a merchandise picture along the progress of the shopping program
  - Display a questionnaire 5 minutes before the end of the program
  - etc.
- Difference from SMIL concept
  - SMIL defined by W3C is similar to this functionality. However...
  - SMIL is quite static representation scheme. It is ready for preprogrammed timing, not real-time. It is inconvenient for live program.
Event Synchronization (cont.)

∗ beitem element
  − id attribute
  − type attribute
    EventMessageFired, ModuleUpdated, ModuleLocked, TimerFired,
    MediaStopped, DataButtonPressed, DataEventChanged,
    CCStatusChanged, MainAudioStreamChanged, NPTReffered
  − subscribe attribute
  − onoccur attribute

See STD B24 Vol.2 5.3.20.1
Event Synchronization (cont.)

<bevent>
<beitem type="EventMessageFired" onoccur=f();/>
</bevent>

<script>
function f(){
 ....
}
</script>

Invoke

Script execution
Color space extension

- clut
  - Specify the colour palette (URL)
- color-index
  - Specify the index color with alpha channel
- background-color-index
- grayscale-color-index, etc.

See STD B24 Vol.2 5.4.13
Realize smooth rendering of character by specifying several colours (between foreground and background)

In this case, foreground colour is black and background colour is white. This property set two colours, light gray and dark gray.
Navigation

* Specify user navigation control by remote controller
* nav-index
  - indexing focus target
* nav-up, nav-down, nav-left, nav-right
  - specify the target where to move, if the user push the arrow key
* used-key-list
  - Specify the key which datacasting application can use
    * For example, numeric key use as inputting number, not selecting channel number

See STD B24 Vol.2 5.4.13.3
Navigation (cont.)

Focus navigation
Misc.

* resolution
  - Specify screen size
* scene-aspect-ratio
  - Specify aspect ratio of screen
ECMAScript extension

- No extension ECMAScript itself
- Extended Functions (browser pseudo Object) for broadcasting
- these functions can use in script without definition
Extended functions (1)

- Extended functions for broadcasting
  - EPG functions
  - Event group index functions
  - Series reservation functions
  - Subtitle presentation control functions
  - Non-volatile memory functions
  - Extended APIs for storing

See STD B24 Vol.2 7.6
**APIs (2)**

* Extended functions for broadcasting
  - Interaction Channel functions (Basic procedures, TCP/IP connection)
  - Operational control functions
  - Receiver sound control
  - Timer functions
  - External character functions
  - Functions for controlling external devices
  - Functions for controlling bookmark areas
  - Others (random number, get data and time)
  - Ureg / Greg
  - Functions for Printing
Table operation functions

- Extended object for broadcasting
  - CSV (Comma Separated Value)
  - Binary Table (Original format)
- For Basic Profile, binary table should be used
  - 4096 columns
  - 1024Byte/records 32 fields
  - 255k bytes maximum

See STD B24 Vol.2 7.5
Non-volatile memory functions

- Not operate by file access, read/write per block (64 bytes * 16 blocks)
- The usage depends on broadcasters
- Assign the area per broadcasters
  - Some broadcaster can’t rewrite another broadcaster’s area
  - Ensure the area which binds by each media (BS, CS, Terrestrial)

See STD B24 Vol.2 7.6
External character functions

- Reading per document by extended APIs for broadcasting
  - loadDRCS / unloadDRCS functions
  - DRCS (Dynamically Redefinable Character Set)
BML Basic Profile

- Restriction the contents description for ensuring uniqueness of content
  - must be specified absolute positioning
  - boxing the elements (only div and p elements containing body element)
  - must be specified nav-index property to all elements which can be focused
  - ECMAScript and CSS are also restricted

See STD B24 Vol.2 A2-4.8
BML Basic Profile (1)

- Available elements and declaration in BML document
  - `<?xml`
  - `<!doctype`
  - `?bml`

- These three declarations are mandatory and must appear this order
**BML Basic Profile (2)**

- *bml*
  - bml element consists of one head element and one body element (both mandate and this order must be keep)
BML Basic Profile (3)

- head
- In the head element, a meta element, a style element, a script element and a bevent element appear once at maximum according to this sequence following the mandatory title element
- script and style elements have CDATA section as child elements
BML Basic Profile (4)

- body
- body element must contain div or p elements.
- div element must contain boxed elements.
- p element must be PCDATA text or normal flow element.
- boxed element is with positioning and either one of div, input, object or p elements.
- normal flow element is without positioning and either one of a, br or span elements.
CSS Restriction

- The style sheet is also restricted.
- It is limited to minimum operation required. The following restrictions are applied to keep the “unique presentation”
  - *Boxed* element must be specified with absolute positioning
  - Not operate the style which will be meaningless due to fixed screen platform
  - Only pixel unit (no use pt, pica, etc.)
  - Not operate complex inherit structure
**ECMAScript Restriction**

- **Basic Profile Restriction**
  - Number object is support 32 bit, not 64 bit
  - No support for floating number
  - No support for Math built-in class object
  - Character code set is EUC, not Unicode
  - The run-time interruption of a script character string must not be supported. Therefore the eval() function of the Global object is not supported
datacasting for CS110

- CA alternative service
  - Derived to appropriate channel with current CA status
    - promotion channel, etc.
- Recommended contents registration service (bookmark service)
Bookmark concept

Register bookmark by user input

Bookmark recording service (by script in BML)

Basic data write

Basic data area 1

Basic data area 2

Extend data write

Extended data area

Dependenc

Inquiry whether extend data exists

Bookmark list service (by script in BML)

Providing link destination service

Selection

View/Refer

Bookmark pre-list service

Basic Data write

Extended data part (broadcaster defined)

Read

delete

lock/unlock

Range of implemention of receiver

Resident bookmark Manager
Bookmark service

* Registering bookmark by user input
  - Input bookmark with receiver function by user.
  - Basic data corresponding input write into basic data area 1
  - Basic data area 1 can store all kind of user data, however the receiver only can get them (privacy protection issue)
Bookmark service (cont.)

Bookmark recording service

- The service which broadcast contents which is recording bookmarks
- The receiver receives this program and execute BML contents which is included in the program, then the contents can write bookmark into basic data area 2 and broadcaster-specific area
- And also can inquiry whether extended area is exists
Bookmark service (cont.)

- Resident bookmark manager
  - The receiver has management functionality of bookmark operation.
    - Reading Basic data part
    - Deleting a bookmark in basic data part
    - Setting a flag which indicates permit/accept deleting bookmark
      - Basic data area 2 associated with corresponding extended data
      - If the user deletes a bookmark in the basic data area 2, the receiver must delete the corresponding extended data at same time automatically
Bookmark service (cont.)

 Bookmark list service
  - The broadcaster can distribute the TV program which has list service by BML script
  - The receiver receives the program and execute distributed BML document. The document can delete bookmark in basic data area 2 or broadcaster-defined extended data area and set the flag which permits or accepts deleting bookmark
  - The BML document also can browsing all bookmark lists which is satisfied broadcaster’s demand (especially appearance)
Bookmark service (cont.)

- Pre-list service
  - The service which presents list of bookmark list service channels
  - This service makes the user knows the location of bookmark list service
  - Because the bookmark list service may be operated by several broadcasters, the pre-list service operate as a portal of these list service
Bookmark service (cont.)

* Link destination service
  - The service which broadcasts contents that is related with bookmarked content
  - Select and present by selecting bookmark list service
Storing datacasting

- From B24 ver2.0, added items as follows
  - Basic APIs for storing
    - Save / Move / Delete file function
    - Data retrieving from network (http: https: support)
  - Transmitting MPEG stream with time stump by data carousel
  - Transmitting MPEG4 Video
Datacasting for mobile

* Corresponding to mobile media
  - Car navigation system
  - Mobile phone
  - PDA
  - Radio
Controlling external devices

- Controlling from external devices
  - using bevent
    - Capable to receive events from external devices by PeripheralEventOccured
- New ECMAScript API and XML document object are introduced
  - Introducing XML document object can read any XML document and access the document by DOM using ECMAScript and output DOM tree to external file as XML document
Controlling external devices

* Example for car navigation system
  - Retrieving physical information of the car, for example parking brake status, etc., will change the appearance of contents

[Diagram with arrows and nodes labeled: Car Navi, BML Browser, PeripheralEventOccured event, data for car running, switch, data for car stopping]
Handling generic XML document in addition to BML document

- load
- edit
- send
- launch normally

Map data

BML application

External device
Media Crossing

* In the future, mixed version of BML will broadcast at the same time
  - Retrieving browser version API
* Enhanced bi-directional communication
  - IP connection functionality
    * Consideration connectivity to router directly for ADSL
* Consideration of Internet content
  - Introducing Namespace and new tag set, etc.
Mobile profile
Mobile profile

- On July 22 2004, ARIB Standard Committee approved ARIB TR-B14 version 2.0, however there remains still T.B.D. items
- On September 2004, Version 2.1 approved
- Finally on March 2005 (now!), Version 2.2 approved
  - Unfortunately there is Japanese version only available
  - This profile for mobile phone can handle datacasting contents and communication contents seamlessly
Main concept for mobile profile

- Standard: STD-B24
- Profile of B24 part is Appendix 4
  - Main body + Appendix 1 (Mandatory)
    - Appendix 2 (BS/CS110/Terrestrial)
    - Appendix 3 (Advanced profile: unused)
    - Appendix 5 (another mobile profile for Auto)
- Corresponding TR-B14 is known as C-Profile
  - A-Profile: Terrestrial fixed profile (operation guideline)
  - B-Profile: T.B.D.
  - C-Profile: This profile
Mobile Profile (1)

- Used key for datacasting (Virtual key)
  - Specify “enter”, “back”, “bookmark”, “0”-”9”, “*”, “#”
  - “up arrow (↑)”, ”down arrow (↓)” key use for scrolling and moving cursor (do not use in datacasting contents)
  - “left arrow (←)”, “right arrow (→)” do not operate (avoid to overlap the functionality)

- Operation of BML elements
  - Link elements can used so that CSS file can be external file
  - Adding capability that specify script file as external file in src attribute of script element
  - root element is <html> not <bml>
Mobile Profile(2)

- Operation of BML elements (cont.)
  - Do not use style element
  - Adding to use pre element which presents string sequence with carriage return
  - Adding to use textarea element which can input multi-line string by user
  - Adding onfocus attribute to object element for focusing its element
Mobile Profile(3)

- Operation of CSS
  - Adding to marquee property which is familiar with mobile phone contents and can scroll text line
  - Screen resolution is fixed in 240x480 (virtual screen)

- Operation of DOM
  - No operate dynamic behaviors of document tree changes
  - Adding to a kind of onoccur event handler of beitem element
    - MediaStopped
Introducing virtual screen
- C profile introduce 240x480 virtual screen
- How this virtual screen shall display on device is depends on implementation
- It suppose that a part of virtual screen may show in the device, such a case, the screen may scroll within the display area
Mobile Profile(5)

- Extended functions for C profile
  - Mainly it can access to mobile phone functionality
    - calling phone
    - get/set address book
    - get the location information from GPS / station
    - etc.
Mobile Profile(6)

* BML document restriction
  - All BML documents require to add the stylesheet
    * All presentation elements must have the positions
  - No operate vertical writing
  - Presentation mono-media (image/jpeg,png,X-arib-mng) with Object elements
    * Maximum moon-media size = (240x320)
  - Specify the CSS2 property
    * Virtual screen size (240x480) restricts top/left/width/height properties
Mobile Profile(7)

**Linkage status**
- Introducing Linkage state which is defined in Terrestrial broadcast
- Linkage contents are treated as broadcasting content (trusted contents)
Software platform

* Estimated receiver software platform

The receiver without original web contents

- Datacasting Browser
  - Datacasting contents
  - Terminate/Select channel
  - Execute network browser
  - C Profile Network browser
  - Network contents

Contents server

- C Profile Linkage contents
- C Profile non-linkage contents
- Web contents for A Corp.

The receiver with original web contents

- Datacasting Browser
  - Datacasting contents
  - Execute Network Browser
  - Web contents for A Corp.
  - Original network browser for A Corp.

Internet
Execution Engine
PE and AE

* Presentation Engine (PE)
  - Engine for a Declarative content such as HTML, BML, etc.
  - Suitable for stylized application

* Application execution Engine (AE)
  - Engine for a Procedural content such as Java, C, C++
  - Suitable for dynamic behavior application such as games
## Advantages and Disadvantages

<table>
<thead>
<tr>
<th></th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>● Easy template operation</td>
<td>● Difficult to make real-time application like games</td>
</tr>
<tr>
<td></td>
<td>● Easy authoring without special tool (e.g. notepad)</td>
<td></td>
</tr>
<tr>
<td>AE</td>
<td>● Easy to make real-time applications</td>
<td>● Difficult to make applications without special tools like a compiler</td>
</tr>
<tr>
<td></td>
<td>● Software components reusable for other applications</td>
<td>(needs programming skill)</td>
</tr>
</tbody>
</table>

- Both PE and AE should be supported in Datacasting ideally and appropriately used for each applications
Datacasting in Japan

- B23 (AE standard) ver1.1
  - GEM 1.1 fully compliant
  - NO operational guideline is available
- B24 (PE standard: BML) ver.4.0
  - Operational guideline for terrestrial TR-B14 ver2.1
  - Operational guideline for satellite TR-B15 ver3.0
- Currently DTV receiver with BML engine deployed over 4 million.
  - 1.22 (Terrestrial) + 2.45 (BS) + 0.5 (CS)
Features of B23

- GEM fully compliant Japanese standard
  - Additional specifications for Japan
    - Carousel adaptation
      - Object and data are optional
      - AIT on data carousel
    - SI information package (Localized)
  - Screen resolution (Localized)
  - Extended character encoding
    - Composite font
  - Conditional Access
B24 standard

- Matured standard
  - Four year has past since actual use of BML
- Tight coupling between TV Program and BML
- Real-time authoring (football game, live program, etc.)
What remains to be done

- No operational guideline of B23
  - It means there is no demand of broadcaster that uses execution engine currently.
  - ARIB-J (Java) is powerful tool however the broadcaster do not have the idea about appeal point of Java.
    - BML can do anything
    - No thread model for making datacast application
    - Debugging difficulty
    - Cost efficiency

Need to clarify the appeal point of datacasting
To be discussed..

- Evolution toward to new services
  - Investigate combination between mobile phone and television
  - Server type broadcast service
  - etc.
- Developing harmonization among the world
  - DVB
  - ATSC/OCAP
  - ISDB-T
Thank you for listening!