ENGLISH TRANSLATION

MULTIMEDIA CODING SPECIFICATION
FOR DIGITAL BROADCASTING
(SECOND GENERATION)

ARIB STANDARD

ARIB STD-B62 Version 1.2
(Fascicle 2)

Version 1.0  July 31,  2014
Version 1.1  March 17,  2015
Version 1.2  July 3,  2015

Association of Radio Industries and Businesses
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Foreword

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This ARIB Standard is developed for “MULTIMEDIA CODING SPECIFICATION FOR DIGITAL BROADCASTING (SECOND GENERATION)”. In order to ensure fairness and transparency in the defining stage, the standard was set by consensus at the ARIB Standard Assembly with the participation of both domestic and foreign interested parties from radio equipment manufacturers, telecommunication operators, broadcasting equipment manufacturers, broadcasters and users.

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Attachment 1  
(N/A)  

Attachment 2  
(Selection of Option 2)  

<table>
<thead>
<tr>
<th>Patent Holder</th>
<th>Name of Patent</th>
<th>Registration No./Application No.</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>Sony Corporation</td>
<td>Submitted comprehensive confirmation of patents for ARIB STD-B62 Ver1.0&lt;sup&gt;Note 1&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharp Corporation</td>
<td>Submitted comprehensive confirmation of patents for ARIB STD-B62 Ver1.0&lt;sup&gt;Note 1&lt;/sup&gt;</td>
<td></td>
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</tr>
</tbody>
</table>

<sup>Note 1</sup>: Valid for ARIB STD-B62 Ver1.0 (received on July 24, 2014)
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   Part 2  Monomedia Coding
   Part 3  Coding of Closed Caption and Superimpose

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   Foreword
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Specification for Multimedia Coding Scheme
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Chapter 1 General Terms

1.1 Purpose
This standard specifies the multimedia coding scheme (second generation) for the data broadcasting in digital broadcasting.

1.2 Scope
This standard applies to the multimedia coding among the data broadcasting on the advanced broadband satellite digital broadcasting.

1.3 References

1.3.1 Normative references
The following documents are those with part of their specifications quoted in this standard.
(1) ARIB STD-B24 “Data Coding and Transmission Specification for Digital Broadcasting”
(2) ARIB STD-B60 “MMT-Based Media Transport Scheme in Digital Broadcasting Systems”
(5) W3C Recommendation “HTML5 A vocabulary and associated APIs for HTML and XHTML,” http://www.w3.org/TR/html
(6) W3C Recommendation “CSS Fonts Module Level 3” http://www.w3.org/TR/css3-fonts/
(7) W3C Recommendation “CSS Respective Specification” http://www.w3.org/Style/CSS/
(8) W3C Candidate Recommendation “W3C DOM4” http://www.w3.org/TR/2014/CR-dom-20140508/
(9) W3C Candidate Recommendation “Web Storage Specification” http://www.w3.org/TR/webstorage/
(10) ECMA-262(ISO/IEC 16262), ECMAEScript 5th Edition
(11) IETF RFC 792 Internet Control Message Protocol
(12) IETF RFC 4443 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
(13) IETF RFC 1034 Domain names · concepts and facilities
(14) IETF RFC 1035 Domain names · implementation and specification
(15) IETF RFC 3986 Uniform Resource Identifier (URI): Generic Syntax
(16) ETSI TS 102 809 V1.1.1 (2010-01) DVB Signalling and carriage of interactive applications and services in Hybrid broadcast/broadband environments
1.4 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIT</td>
<td>Application Information Table</td>
</tr>
<tr>
<td>API</td>
<td>Application Programming Interface</td>
</tr>
<tr>
<td>CSS</td>
<td>Cascading Style Sheet</td>
</tr>
<tr>
<td>DNS</td>
<td>Domain Name System</td>
</tr>
<tr>
<td>EIT</td>
<td>Event Information Table</td>
</tr>
<tr>
<td>EPG</td>
<td>Electronic Program Guide</td>
</tr>
<tr>
<td>FQDN</td>
<td>Fully Qualified Domain Name</td>
</tr>
<tr>
<td>HTML</td>
<td>Hypertext Markup Language</td>
</tr>
<tr>
<td>ICMP</td>
<td>Internet Control Message Protocol</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>MMT</td>
<td>MPEG Media Transport</td>
</tr>
<tr>
<td>MMT-SI</td>
<td>MMT-Signaling Information</td>
</tr>
<tr>
<td>MPEG</td>
<td>Moving Picture Expert Group</td>
</tr>
<tr>
<td>MPEG-2 TS</td>
<td>MPEG-2 Transport Stream</td>
</tr>
<tr>
<td>NPT</td>
<td>Normal Play Time</td>
</tr>
<tr>
<td>TCP</td>
<td>Transmission Control Protocol</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform Resource Locator</td>
</tr>
<tr>
<td>UTC</td>
<td>Coordinated Universal Time</td>
</tr>
<tr>
<td>VOD</td>
<td>Video On Demand</td>
</tr>
<tr>
<td>XML</td>
<td>eXtensible Markup Language</td>
</tr>
</tbody>
</table>
Chapter 2: Apply HTML5 to Television

This chapter presents how to apply W3C HTML5 Recommendation (HTML5, CSS3, Javascript function group) to TV.

For details of HTML5, refer to W3C Recommendation “HTML5 A vocabulary and associated APIs for HTML and XHTML”.

2.1 Character code

2.1.1 Character coding scheme used for HTML documents

For the character coding scheme for HTML documents, UTF-8 specified in Volume 1, Part 2, Chapter 5 shall be used.

2.1.2 External characters

For the external character coding scheme, the scheme specified in Volume 1, Part 2, 5.5 shall be used.

When external characters are used in HTML documents, the font files coded by these schemes are specified as Web Fonts.

For details of Web Fonts, refer to W3C Recommendation “CSS Fonts Module Level 3”.

2.2 Broadcast audio/video object

2.2.1 Application of an object element to broadcast audio/video

This section specifies an object element used to present a broadcast audio/video.

In this specification, a broadcast audio/video object is defined by inheriting the object element specified in W3C Recommendation “HTML5 A vocabulary and associated APIs for HTML and XHTML” 4.7.4 “The object element”.

For an object element with its type attribute specified as "video/x-iptvf-broadcast”, the default stream of the current channel’s broadcast service shall be presented.

Table 2-1: Attribute of the broadcast audio/video object

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>video/x-iptvf-broadcast</td>
</tr>
</tbody>
</table>

For the broadcast audio/video object, initial parameters to be used when the object is generated can be handed over using the param element. Even if the attributes and param element of the object are overwritten by a DOM operation using Javascript, they shall not be reflected on the receiver processing part. The relevant broadcast audio/video is controlled using functions provided by the object.
2.2.2 Broadcast audio/video object definition

The broadcast audio/video object is defined as follows.

### Broadcast audio/video object definition

```javascript
interface BroadcastVideoObjectElement : HTMLObjectElement {
  boolean enableFullscreen();
  boolean disableFullscreen();
  boolean isFullscreen();
  boolean enableAudioMute();
  boolean disableAudioMute();
  boolean isAudioMute();
  boolean setAudioSrc(DOMString url);
  DOMString getAudioSrc();
  boolean setVideoSrc(DOMString url);
  DOMString getVideoSrc();
  boolean setCaptionSrc(DOMString url);
  DOMString? getCaptionComponentURL();
  boolean isCaptionExistent(DOMString url);
  boolean setCaptionVisibility(boolean flag);
  boolean isCaptionVisible();
  void addCaptionListener(CaptionListener listener, optional DOMString url);
  void removeCaptionListener(optional CaptionListener listener);
  callback CaptionListener = void (DOMString captiondata);
}
```

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Return value</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>enableFullscreen()</code></td>
<td>Displays the broadcast video at the foreground in the full screen state. If <code>enableFullscreen()</code> is called in the full screen state, the full screen state shall be maintained, and true shall be returned.</td>
<td>true: success in making a transition to the full screen state false: failure</td>
</tr>
<tr>
<td><code>disableFullscreen()</code></td>
<td>Terminates the full screen display. If <code>disableFullscreen()</code> is called in the full screen termination state, the full screen termination state shall be maintained, and true shall be returned.</td>
<td>true: success in terminating the full screen display false: failure</td>
</tr>
<tr>
<td><code>isFullscreen()</code></td>
<td>Obtains whether or not the broadcast video display is in the full screen state.</td>
<td>true: the broadcast video display is in the full screen state false: Other than the above</td>
</tr>
</tbody>
</table>
**enableAudioMute**

**Description**
Makes a transit to the mute state. If `enableAudioMute()` is called in the mute state, the mute state shall be maintained, and true shall be returned.

**Return value**
*true*: success in making a transit to the mute state  
*false*: failure

**disableAudioMute**

**Description**
Terminates the mute state. If `disableAudioMute()` is called in the mute termination state, the mute termination state shall be maintained, and true shall be returned.

**Return Value**
*true*: success in terminating the mute state  
*false*: failure

**isAudioMute**

**Description**
Obtains whether or not audio is in the mute state.

**Return value**
*true*: the mute state  
*false*: Other than the above

**setAudioSrc**

**Description**
Selects the audio stream that is transmitted by MPEG-2 TS or MMT as a source.

**Arguments**
`url` URL that indicates the audio stream specified as a source. 4.1 and 4.2 shall be followed for format.

**Return value**
*true*: success in specifying the video stream  
*false*: failure

**setVideoSrc**

**Description**
Selects the video stream that is transmitted by MPEG-2 TS or MMT as a source.

**Arguments**
`url` URL that indicates the video stream specified as a source. 4.1 and 4.2 shall be followed for format.

**Return value**
*true*: success in specifying the video stream  
*false*: failure

**getAudioSrc**

**Description**
Obtains the stream that is selected as an audio source.

**Return Value**
URL that indicates the stream selected as an audio source. 4.1 and 4.2 shall be followed for format.

**getVideoSrc**

**Description**
Obtains the stream that is selected as a video source.

**Return value**
URL that indicates the selected video stream. 4.1 and 4.2 shall be followed for format.

**setCaptionSrc**

**Description**
Selects the closed caption stream that is transmitted by MPEG-2 TS or MMT as a source.

**Arguments**
`url` URL that indicates the closed caption stream to be specified. 4.5 and 4.6 shall be followed for format.

**Return value**
*true*: success in selecting the closed caption stream  
*false*: failure
### getCaptionComponentURL

**Description**
Obtains URL that indicates the closed caption stream being selected currently by the receiver. Note that attention must be paid to the cases where the language identification displayed by user manipulation and others may be different from the initial setting by the param element or those specified by setCaptionSrc() function.

**Return value**
URL that indicates the closed caption stream being selected by the receiver. 4.5 and 4.6 shall be followed for format. If there is no selected closed caption, null shall be returned.

### isCaptionExistent

**Description**
Obtains whether or not the specified closed caption stream is currently being broadcast.

**Arguments**
| url | URL that indicates the closed caption stream to be specified. 4.5 and 4.6 shall be followed for format. |

**Return value**
true: the specified closed caption stream is being broadcast.
false: Other than the above

### setCaptionVisibility

**Description**
Instructs whether or not the closed caption should be presented at the receiver.

**Arguments**
| flag | true: instruct the display of closed caption  
      | false: instruct the non-display of closed caption |

**Return value**
true: success
false: failure

### isCaptionVisible

**Description**
Obtains the display state of the closed caption.

**Return value**
true: the closed caption is displayed
false: Other than the above

### addCaptionListener

**Description**
Registers an event listener used to obtain the closed caption that is transmitted by MPEG-2 TS or MMT.

**Arguments**
| listener | The function that is called when receiving the closed caption stream specified by url. |
| url | URL that indicates the closed caption to be obtained. 4.5 and 4.6 shall be followed for format. When this is omitted, the initial setting by the param element and the closed caption stream specified by setCaptionSrc() function are the targets to be obtained. |

### removeCaptionListener

**Description**
Removes the event listener registered by addCaptionListener.

**Arguments**
| listener | The event listener to be removed. When this is omitted, all event listeners that are registered in the applicable broadcast audio/video object are removed. |

### callback CaptionListener

**Arguments**
| captiondata | Closed caption data. The details shall be defined in the operational rules. |
A param element shall be used when specifying the operation state from the initial operation of the broadcast audio/video object. Table 2-2 shows the parameter names and values that can be specified.

Table 2-2: Broadcast audio/video object parameter list

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>fullscreen</td>
<td>enable: Launch in full screen mode</td>
</tr>
<tr>
<td></td>
<td>disable: Disable full screen mode (default)</td>
</tr>
<tr>
<td>video_src</td>
<td>URL indicating the video stream. 4.1 and 4.2 shall be followed for format.</td>
</tr>
<tr>
<td>audio_src</td>
<td>URL indicating the audio stream. 4.1 and 4.2 shall be followed for format.</td>
</tr>
<tr>
<td>audio_mute</td>
<td>enable: Mute audio</td>
</tr>
<tr>
<td></td>
<td>disable: Disable muting of audio (default)</td>
</tr>
<tr>
<td>caption_src</td>
<td>URL indicating the closed caption stream. 4.5 and 4.6 shall be followed for format.</td>
</tr>
</tbody>
</table>

2.3 VOD

To be specified in the future.

2.4 CSS

For the stylesheet to be used for HTML documents, refer to W3C Recommendation CSS Specifications.
Chapter 3: Procedure Description Language

3.1 DOM API

For DOM API to be used for HTML documents, refer to W3C DOM4.

3.2 Script description language

For the script language to be used for HTML documents, refer to ECMA-262 (ISO/IEC 16262), ECMAScript 5th Edition.

3.3 Extension function for broadcasting

3.3.1 ISDB resource reference object

ISDB resource reference object is the object to represent a service, a component, or an event, etc. in the broadcast signal. It is used as the arguments or the like in the interfaces defined in the following sections.

ISDB resource reference object is defined as follows if MPEG-2 TS is used as the transmission scheme.

dictionary ISDBResourceReference {
    attribute unsigned short original_network_id;
    attribute unsigned short transport_stream_id;
    attribute unsigned short service_id;
    attribute unsigned short content_id;
    attribute unsigned short event_id;
    attribute octet component_tag;
    attribute octet channel_id;
    attribute unsigned short module_id;
    attribute DOMString? module_name;
    attribute DOMString? resource_name;
};

Description of the properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>original_network_id</td>
<td>original network identifier</td>
</tr>
<tr>
<td>transport_stream_id</td>
<td>transport stream identifier</td>
</tr>
<tr>
<td>Service_id</td>
<td>service identifier</td>
</tr>
<tr>
<td>content_id</td>
<td>content identifier</td>
</tr>
<tr>
<td>event_id</td>
<td>event identifier</td>
</tr>
<tr>
<td>component_tag</td>
<td>component tag</td>
</tr>
<tr>
<td>channel_id</td>
<td>Number representing a channel or combination of channels contained in the audio component</td>
</tr>
<tr>
<td>module_id</td>
<td>Identifier of module sent by DSM-CC data carousel</td>
</tr>
<tr>
<td>module_name</td>
<td>The name given to the module sent by DSM-CC data carousel</td>
</tr>
<tr>
<td>resource_name</td>
<td>The name identifying the entity contained in the module sent by the DSM-CC data carousel</td>
</tr>
</tbody>
</table>

It is not mandatory that all of the properties are present in an instance of the object. Since
it varies depending on the context in which the object is used, which properties should be present is defined according to its context, respectively.

ISDB resource reference object is defined as follows if MMT is used as the transmission scheme.

```java
dictionary ISDBResourceReference {
    attribute unsigned short original_network_id;
    attribute unsigned short tlv_stream_id;
    attribute unsigned short service_id;
    attribute unsigned short event_id;
    attribute unsigned short component_tag;
    attribute octet event_message_tag;
};
```

**Description of the properties:**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>original_network_id</td>
<td>original network identifier</td>
</tr>
<tr>
<td>tlv_stream_id</td>
<td>tlv stream identifier</td>
</tr>
<tr>
<td>service_id</td>
<td>service identifier</td>
</tr>
<tr>
<td>event_id</td>
<td>event identifier</td>
</tr>
<tr>
<td>component_tag</td>
<td>component tag</td>
</tr>
<tr>
<td>event_message_tag</td>
<td>EMT tag</td>
</tr>
</tbody>
</table>

It is not mandatory that all of the properties are present in an instance of the object. Since it varies depending on the context in which the object is used, which properties should be present is defined according to its context, respectively.

By a transmission scheme specified by the operational rule, one of the definitions of the ISDB resource reference object above shall be selected.

### 3.3.2 EPG related functions

This section specifies the interfaces related to scheduling for program viewing and recording.

```java
partial interface ReceiverDevice {
    boolean isScheduledToTune(
        ISDBResourceReference event_ref,
        optional Date startTime);
    void scheduleToTune(
        ISDBResourceReference event_ref,
        optional Date startTime);
    void unscheduleToTune(
        ISDBResourceReference event_ref);
    boolean isScheduledToRecord(
        ISDBResourceReference event_ref,
        optional Date startTime);
    void scheduleToRecord(
        ISDBResourceReference event_ref,
```
optional Date startTime);
void unscheduleToRecord(
    ISDBResourceReference event_ref);
};

**isccheduledToTune**

*Description* Examine whether or not the specified program is already scheduled for viewing.

*Arguments*
- **event_ref**: Event to be examined
- **startTime**: Start time of the event

*Return value* True if the program specified by the argument is already scheduled for viewing, false if not scheduled yet.

**scheduleToTune**

*Description* Makes a viewing schedule of the specified program.

*Arguments*
- **event_ref**: Event to be scheduled for viewing
- **startTime**: Start time of the event

**unscheduleToTune**

*Description* Cancels a viewing schedule of the specified program.

*Arguments* **event_ref**: Event to cancel its viewing schedule

**isScheduledToRecord**

*Description* Examines whether or not the specified program is already scheduled for recording.

*Arguments*
- **event_ref**: Event to be examined
- **startTime**: Start time of the event

*Return value* True if the program specified by the argument is already scheduled for recording, false if not scheduled yet.

**scheduleToRecord**

*Description* Makes a recording schedule of the specified program.

*Arguments*
- **event_ref**: Event to be scheduled for recording
- **startTime**: Start time of the event

**unscheduleToRecord**

*Description* Cancels a recording schedule of the specified program.

*Arguments* **event_ref**: Event to cancel its recording schedule

### 3.3.3 Closed caption display control function

It is assumed that HTML application access the closed caption data that are transmitted by the method specified in ARIB STD-B24 Volume 3 Chapter 10 or specified in ARIB STD-B60 Chapter 9. The closed captions to be transmitted are presented by the receiver function.

In the broadcast audio/video object shown in 2.2, the initial operating parameters of closed captions referred to shall be specified using a param element. For details of parameters, see the specification for broadcasting object shown in 2.2.2. Regarding the arrangement of the broadcast audio/video object element and param element, however, the application engine
shall not conduct the presentation control over closed captions but shall conduct the control over closed captions by using API that gives an instruction for the presentation of closed captions indicated in 2.2.2.

3.3.4 Root certificate-related function in encrypted communication

To be specified in the future.

3.3.5 Local storage area to be used from application

The access to the persistent storage in a receiver shall conform to the IPTV Forum Specification: IPTVFJ STD-0011 3.1.13.2.1. For other persistent storage function, and the functions equivalent to Ureg, Greg that are specified in ARIB STD-B24 Volume 2, 7.6.15 and 7.6.16 shall be used a localStorage object that W3C is defined in the Web Storage specification (http://www.w3.org/TR/webstorage/). However, the following items are added.

- As a character string to be used as the first argument key of localStorage.setItem(), 128 keywords, "greg0" ... "greg63" and "ureg0" ... "ureg63". They are reserved words.
- If "greg0" ... "greg63" is specified as key, its value is held from power on to power off of the receiver. If "ureg0" ... "ureg63" is specified, the same channel is to hold a value only while it is tuning. When changing into other channels, initialization (key-value disappears) is done. It is also same if the re-election stations operation (tuning by tuning and JavaScript by equipment operation) has occurred in the given channel.
- If "greg0" ... "greg63" or "ureg0" ... "ureg63" is specified as key, regardless of the value of document.domain attribute, the receiver should judge the Origin of the given HTML document as "arib" :: "//" "localhost". Therefore, it is not affected by the domain of the document whether can pass values using these keys.
- When the document.domain attribute is rewritten, based on the rule of the Web Storage specification, the Storage object after that is invalidated and also the related method does not work.
- If "greg0" ... "greg63" is specified as key, it's possible to memorize a character string of up to the limit defined by separate operations in the second argument value of localStorage.setItem(). If exceeding this limit, QUOTA_EXCEEDED_ERR occurs.
- If "greg0" ... "greg63" or "ureg0" ... "ureg63" is specified as key, when the application that is currently running is not a managed application, SecurityError exception occurs and the operation of the method is not performed.
- When use of Ureg and Greg is prohibited by the following items, SecurityError exception occurs, and the operation of the method is not performed.
  - Boundary is changed by addPermissionManagedArea function defined in 3.3.8.3, and the use of Ureg and Greg has become prohibited.
  - Usage of Ureg and Greg is prohibited by an application boundary authority setting descriptor of application control information on the section form, which is defined in 5.1.
  - Usage of Ureg and Greg is prohibited by MH-application boundary authority setting descriptor of application control information on the MMT-SI form, which is defined in 5.2.
  - Usage of Ureg and Greg is prohibited by permissionBitmap in ApplicationBoundaryAndPermission Descriptor elements of the AIT, which is defined in 5.3.5.

Also, the reserved word and specification for any time accessible persistent storage function
per broadcaster shall be determined separately by the operational rule.

3.3.6 Communication function with its TCP/IP connection assumed

This section specifies the interface for confirmation of the connecting state to an IP network.

```javascript
partial interface ReceiverDevice {
    boolean confirmIPNetwork(
        DOMString destination,
        unsigned short confirmType,
        optional unsigned short timeout);
};
```

<table>
<thead>
<tr>
<th>confirmIPNetwork</th>
<th>Confirms the connecting state to an IP network.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arguments</strong></td>
<td></td>
</tr>
<tr>
<td>destination</td>
<td>IP address that is used for a communication destination to confirm the communication connecting state, or the character string that is used to specify FQDN of the host name.</td>
</tr>
<tr>
<td>confirmType</td>
<td>One of the following two values shall be specified as a means to confirm the connecting state to an IP network. 0: trial run for the name solution in obedience to DNS setting 1: confirm whether or not the Echo Reply message of ICMP Echo message is received.</td>
</tr>
<tr>
<td>timeout</td>
<td>Specifies the time for waiting for a response (unit in milliseconds).</td>
</tr>
<tr>
<td><strong>Return Value</strong></td>
<td></td>
</tr>
<tr>
<td>true: success</td>
<td></td>
</tr>
<tr>
<td>false: failure</td>
<td></td>
</tr>
</tbody>
</table>

3.3.7 Application manager object

This section specifies the application manager object that provides the interface for application execution control. The application manager object is provided as the property of the Navigator object. The constructor of the application manager object is not provided.

3.3.7.1 Interface definition

```javascript
[NoInterfaceObject]
interface NavigatorApplicationManager {
    readonly attribute ApplicationManager applicationManager;
};

Navigator implements NavigatorApplicationManager;

[NoInterfaceObject]
interface ApplicationManager {
    Application? getOwnerApplication(optional Document document);
};
```
3.3.7.2 Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>getOwnerApplication</code></td>
<td>Returns the application to which the document indicated by the argument <code>document</code> belongs.</td>
</tr>
</tbody>
</table>

**Arguments**
- `document`: Object identifying the HTML document that wants to obtain information about the application to which it belongs. When this argument is omitted, it is deemed that the object that identifies the HTML document that has executed this method is specified.

**Return value**
- Application object that identifies the application whose information has been obtained. Null if no applicable application exists.

3.3.8 Application object

This section specifies the application object that is an object identifying an application. The application object is returned by the method of application manager object `getOwnerApplication` that was specified in the previous section, or the method of application manager object `getApplications` that was specified in the next section. The constructor of the application object is not provided.

3.3.8.1 Interface definition

```plaintext
[NoInterfaceObject]
interface Application {
    readonly attribute DOMString type;
    readonly attribute unsigned long long organization_id;
    readonly attribute unsigned long long application_id;
    readonly attribute DOMString control_code;
    readonly attribute octet autostart_priority;
    void replaceApplication(
        unsigned long long organization_id,
        unsigned long long application_id,
        DOMString? ait_url);
    void destroyApplication();
    void exitFromManagedState(DOMString url);
    ApplicationInformationTable getOwnerAIT();
    ApplicationBoundaryAndPermissionDescriptor?
        getApplicationBoundaryAndPermissionDescriptor();
};

[NoInterfaceObject]
interface ApplicationBoundaryAndPermissionDescriptor {
    sequence<PermissionManagedArea>?
        getCurrentBoundary();
    void addPermissionManagedArea(PermissionManagedArea pma);
};

dictionary PermissionManagedArea {
    sequence<unsigned short>?
        permission;
    sequence<DOMString>?
        urls;
};
```
3.3.8.2 Property

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>type</strong></td>
<td>Application type of the application. The value of this property is the string that is specified in 5.3.3 as the value of an applicationType element.</td>
</tr>
<tr>
<td><strong>organization_id</strong></td>
<td>Organization identifier of the application. For the organization identifier, refer to 5.2.2.</td>
</tr>
<tr>
<td><strong>application_id</strong></td>
<td>Application identifier of the application. For the application identifier, refer to 5.2.2.</td>
</tr>
<tr>
<td><strong>control_code</strong></td>
<td>Application control code of the application. The value of this property is one of the strings that are specified in 5.3.3 as the values of a controlCode element.</td>
</tr>
<tr>
<td><strong>autostart_priority</strong></td>
<td>Boot priority of the application. Refer to ARIB STD-B24 volume 4 5.3.5 or ARIB STD-B60 10.3.3.5 about the Boot priority.</td>
</tr>
</tbody>
</table>

3.3.8.3 Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>replaceApplication</strong></td>
<td>Terminates the application that has executed this method, and launches the application specified by the argument.</td>
</tr>
<tr>
<td><strong>Arguments</strong></td>
<td></td>
</tr>
<tr>
<td>organization_id</td>
<td>Organization ID of the application to be launched.</td>
</tr>
<tr>
<td>application_id</td>
<td>Application ID of the application to be launched.</td>
</tr>
<tr>
<td>ait_uri</td>
<td>URL identifying the location of the AIT or null. The operation when null is specified is defined in the operational rules.</td>
</tr>
<tr>
<td><strong>destroyApplication</strong></td>
<td>Terminates the application that has executed this method. The behavior of the application engine after the termination of application follows IPTV Forum Specification: IPTVFJ STD-0010 7.4.3.</td>
</tr>
<tr>
<td><strong>exitFromManagedState</strong></td>
<td>Makes a transition to a general application. Terminates the application that has executed this method, and makes a transition to the document specified by the argument in an unmanaged state.</td>
</tr>
<tr>
<td><strong>Arguments</strong></td>
<td></td>
</tr>
<tr>
<td>url</td>
<td>Entry URL of the general application to which the transition is to be made.</td>
</tr>
<tr>
<td><strong>getOwnerAIT</strong></td>
<td>Obtains the application information table (AIT) that controls the given application that has executed this method.</td>
</tr>
<tr>
<td><strong>Return value</strong></td>
<td>Object identifying the obtained AIT.</td>
</tr>
</tbody>
</table>
**getApplicationBoundaryAndPermissionDescriptor**

**Description**
Obtain the object that identifies the application boundary authority setting descriptor that was arranged in the given application. For the application boundary authority setting descriptor, refer to ARIB STD-B24 or ARIB STD-B60.

**Return value**
Object identifying the obtained application boundary authority setting descriptor.

**getCurrentBoundary**

**Description**
Get the current boundary of the application.

**Return value**
The boundary which is an array of access authority managed areas. Each element of this array has the properties described below. If no access authority managed area is set to the application, the number of element of this array is 0.

| permission | Array whose elements are a bitmap representing the access authority of the application in the access authority managed area shown by the urls property, or null which signifies “maximum permission”.
| urls | Array that contains URL string as an element representing the access authority managed area. or null indicating that any of the locations are included in the access authority managed area.

**addPermissionManagedArea**

**Description**
Adds the access authority managed area of the application. The execution of this method is equivalent to adding one loop of the application boundary authority setting descriptor. The access authority managed area added by this method is initialized when the application that made the addition was finished.

**Arguments**

| permission | Array whose elements are a bitmap representing the access authority of the application in the access authority managed area to be added, or null which signifies “maximum permission”. If an array with no elements is specified, it is deemed that null is specified.
| urls | Area to be added to the access authority managed area. This property is an array whose elements are URL strings, or null, which signifies “all other URLs”.

### 3.3.9 ApplicationInformationTable object

This section specifies the ApplicationInformationTable object that is the object identifying the application information table (AIT). The ApplicationInformationTable object is returned by the getOwnerAIT method of the application object. The constructor of the ApplicationInformationTable object is not provided.
3.3.9.1 Interface definition

```
[NoInterfaceObject]
interface ApplicationInformationTable {
    sequence<Application> getApplications();
};
```

3.3.9.2 Method

**getApplications**

**Description**
Obtains all the applications that are arranged in the given AIT.

**Return value**
Array where the application objects identifying applications that are arranged in the given AIT are all stored in the same order as the appearance order in the given AIT.

3.3.10 Capabilities object

This section specifies the capabilities object that provides information about the scope of functions provided by the application engine and the receiver platform. The capabilities object is provided as the capabilities property of the Navigator object. The constructor of the capabilities object is not provided.

```
[NoInterfaceObject]
interface NavigatorCapabilities {
    readonly attribute Capabilities capabilities;
};

Navigator implements NavigatorCapabilities;

[NoInterfaceObject]
interface Capabilities {
    boolean hasCapability(DOMString query, DOMString ... params);
};
```

**hasCapability**

**Description**
Obtains information about whether the application engine or the receiver platform has the functions identified by the argument.

**Arguments**
- **query** Character string identifying the function that is subject to query. The strings that can be specified and their meanings shall be defined in the operational rules.
- **params** Character string identifying supplementary information about the query according to the character string specified in the argument *query*. The character string that can be specified and its meanings shall be defined in the operational rules.

**Return value**
True if the function specified by the argument is present, false if not.
3.3.11 ReceiverDevice object

This section specifies the ReceiverDevice object that provides the interface for accessing the function provided by the device in which the application engine is operating, or for accessing the information managed by this device. The ReceiverDevice object is provided as the receiverDevice property of the Navigator object. The constructor of the ReceiverDevice object is not provided.

There may be some restrictions on how to call a method of the ReceiverDevice object depending on the way the receiver is implemented (such as the maximum number of parallel executions, combinations of methods that cannot be executed simultaneously). If restrictions are required, their details shall be defined in the operational rules.

```
[NoInterfaceObject]
interface NavigatorReceiverDevice {
    readonly attribute ReceiverDevice receiverDevice;
};

Navigator implements NavigatorReceiverDevice;

[NoInterfaceObject]
interface ReceiverDevice {
};
```

### 3.3.11.1 Obtaining the receiver-unique identifier

```
partial interface ReceiverDevice {
    void getDeviceIdentifier(long type,
        DeviceIdentifierCallback resultCallback);
};
callback DeviceIdentifierCallback = void (DOMString? identifier);
```

<table>
<thead>
<tr>
<th>getDeviceIdentifier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Arguments</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

```
callback DeviceIdentifierCallback = void (DOMString? identifier);
```

<table>
<thead>
<tr>
<th>callback DeviceIdentifierCallback</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arguments</strong></td>
</tr>
</tbody>
</table>
3.3.11.2 Obtaining information about product

The `getSystemInformation` method of the `ReceiverDevice` object is specified as an Interface through which the application obtains the information about the receiver as a product. While it is assumed that information that can be obtained with this method includes the receiver manufacturer and the software version of the application engine, the scope of this information shall be specified in the operational rules.

```java
partial interface ReceiverDevice {
    object getSystemInformation(sequence<DOMString>? query);
}
```

getSystemInformation

**Description**
Obtains information about the application engine or the receiver.

**Arguments**
- **query**
  Character string array identifying the name of the item to be queried. The item name that can be specified shall be defined in the operational rules. If this is omitted, it is assumed that an instruction is given to obtain the default item specified in the operational rules.

**Return value**
Object that stores information about the item requested in the argument. The property name of this object is the item name, and the property value of the object is the value of that item. If no information can be returned about any specified items, the object without property shall be returned.

3.3.11.3 Channel selection

```java
partial interface ReceiverDevice {
    void tuneTo(ISDBResourceReference service_ref,
                TuneToResultCallback? resultCallback,
                optional TuneToOptions options);
}
```

**callback TuneToResultCallback** = void (ISDBResourceReference? service_ref);

dictionary TuneToOptions {
    attribute boolean unbound = false;
}

tuneTo

**Description**
Changes the service being received. Even if the specified service is the same as the service being received (except for a case where "true" is set in the argument `unbound`, which makes these regarded as the same), the channel selection operation is executed. If there is any broadcast video and/or audio present, they continue to be broadcast without interruption. Except for the case where true is specified in argument `unbound` and the application continues to be executed, the application engine may terminate before this function sends back a return value.

**Arguments**
- **service_ref**
  Object identifying the service to be changed
- **resultCallback**
  Function to be called when the processing is completed. Null if this is not required.
If the service identified by `service_ref` is not the currently received service, and if the property is true, the service identified by `service_ref` is regarded as the same as the currently received service and continued execution of the application is attempted. After the service is changed, the operation continues if signals that allow the application to continue to be executed are received in this service. Otherwise, the operation is terminated.

**callback TuneToResultCallback**

**Arguments**

- `service_ref`: Object identifying the service that has become the current service after channel selection. Or null, which indicates a failure in channel selection.

### 3.3.11.4 Obtaining information about the event information table (EIT) [current/following]

```java
partial interface ReceiverDevice {
    void getCurrentEventInformation(
        CurrentEventInformationCallback resultCallback);
};

callback CurrentEventInformationCallback = void (CurrentEventInformation info);

dictionary CurrentEventInformation : ISDBResourceReference {
    attribute Date start_time;
    attribute long long duration;
    attribute DOMString name;
    attribute DOMString desc;
    attribute unsigned short f_event_id;
    attribute Date f_start_time;
    attribute long long f_duration;
    attribute DOMString f_name;
    attribute DOMString f_desc;
};
```

**getCurrentEventInformation**

**Description**

Returns information about the EIT [current/following].

**Arguments**

- `resultCallback`: Function to be called when the processing is completed.

**callback CurrentEventInformationCallback**

**Arguments**

- `info`: Information about the current event obtained as a result of the processing.

- `start_time`: Value representing `start_time` in the event information section of EIT [current] in Date format.

- `duration`: Value representing `duration` in the event information.
section of the EIT [current] in milliseconds

<table>
<thead>
<tr>
<th>name</th>
<th>Character string representing the value of program name (event_name_char) in the short event descriptor of the EIT [current]</th>
</tr>
</thead>
<tbody>
<tr>
<td>desc</td>
<td>Character string representing the program description (text_char) in the short event descriptor of the EIT [current]</td>
</tr>
<tr>
<td>f_event_id</td>
<td>Value representing event_id in the event information section of the EIT [following]</td>
</tr>
<tr>
<td>f_start_time</td>
<td>Value representing start_time in the event information section of the EIT [following] in Date format</td>
</tr>
<tr>
<td>f_duration</td>
<td>Value representing duration in the event information section of the EIT [following] in milliseconds</td>
</tr>
<tr>
<td>f_name</td>
<td>Character string representing the value of the program name (event_name_char) in the short event descriptor of the EIT [following]</td>
</tr>
<tr>
<td>f_desc</td>
<td>Character string representing the value of program description (text_char) in the short event descriptor of the EIT [following]</td>
</tr>
</tbody>
</table>

3.3.12 Stream event target object

This section specifies the stream event target object that is the interface with which the application to use events is delivered as broadcast signals.

```plaintext
[NoInterfaceObject]
interface StreamEventTarget {
};

partial interface ReceiverDevice {
    readonly attribute StreamEventTarget streamEvent;
};
```

3.3.12.1 Reception of event messages

This section specifies the interface with which the application uses event messages that are specified in ARIB STD-B24 or ARIB STD-B60.

```plaintext
partial interface StreamEventTarget {
    void addGeneralEventMessageListener(
        GeneralEventMessageListenerParams param,
        GeneralEventMessageListener listener);
    void removeGeneralEventMessageListener(
        GeneralEventMessageListenerParams param,
        optional GeneralEventMessageListener listener);
};
callback GeneralEventMessageListener = void (GeneralEventMessage msg);

dictionary GeneralEventMessageListenerParams {
    attribute ISDBResourceReference source;
}```
addGeneralEventMessageListener
Description Registers the event listener of a event message.

<table>
<thead>
<tr>
<th>Arguments</th>
<th>param</th>
<th>source</th>
<th>Object identifying the source to be monitored</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>message_group_id</td>
<td>Message group identifier of the target event message</td>
</tr>
<tr>
<td></td>
<td></td>
<td>message_id</td>
<td>Message identifier of the target event message</td>
</tr>
<tr>
<td></td>
<td></td>
<td>message_version</td>
<td>Message version of the target event message</td>
</tr>
</tbody>
</table>

| listener | Function that should be called when an event message that satisfies the condition specified by the argument param has been received, and the ignition time described in the event message has arrived. If event messages with the same message identifier are received multiple times, for the second or later messages, this function is executed only if the message has a different message version from one in just the previous message. |

removeGeneralEventMessageListener
Description Removes the event listener of a event message. The event listeners to be removed are those specified by the argument param, and at the same time those whose function is the function specified by the argument listener.

<table>
<thead>
<tr>
<th>Arguments</th>
<th>param</th>
<th>source</th>
<th>Object identifying the source that is monitored by the event listener to be removed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>message_group_id</td>
<td>Message group identifier of the event message targeted by the event listener to be removed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>message_id</td>
<td>Message identifier of the event message targeted by the event listener to be removed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>message_version</td>
<td>Message version of the event message targeted by the event listener that is to be removed</td>
</tr>
</tbody>
</table>

| listener | Function of the event listener to be removed. If omitted, it is deemed that an instruction is given to remove all event listeners |
targeting the event message specified by the argument `param`
irrespective of the event listener function.

<table>
<thead>
<tr>
<th>callback</th>
<th>GeneralEventMessageListener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arguments</td>
<td>msg</td>
</tr>
<tr>
<td></td>
<td>Information about the ignited event message</td>
</tr>
<tr>
<td></td>
<td>source</td>
</tr>
<tr>
<td></td>
<td>message_group_id</td>
</tr>
<tr>
<td></td>
<td>message_id</td>
</tr>
<tr>
<td></td>
<td>message_version</td>
</tr>
<tr>
<td></td>
<td>private_data_byte</td>
</tr>
</tbody>
</table>

Handling of each property in the argument `param` of `addGeneralEventMessageListener` method

If the event message transmitted in a specified manner in ARIB STD-B24 Chapter 7 is the subject:

| source.original_network_id | Application must specify all or omit all of them. |
| source.transport_stream_id | If these all are omitted, the application engine treats as the current service is specified. |
| source.service_id | I |
| source.content_id | I |
| source.event_id | I |
| source.component_tag | The application may specify or omit this property. If this property is omitted, the application engine treats as that the entry component for the specified service is specified. |
| source.channel_id | I |
| source.module_id | I |
| source.module_name | I |
| source.resource_name | I |

If the event message transmitted in a specified manner in ARIB STD-B60 Chapter 11 is the subject:

| source.original_network_id | Application must specify all or omit all of them. |
| source.tlv_stream_id | If these all are omitted, the application engine treats as the current service is specified. |
| source.service_id | I |
| source.event_id | I |
| source.event_message_tag | Application may specify all or omit all of them. If this property is omitted, behavior is set in operation. |

The following properties are used commonly

| message_group_id | The application may specify or omit this property. The operation when this property is already omitted is specified in the operational rules. |
| message_id | The application may specify or omit this property. When this property is omitted, the application engine assumes that any event message has the appropriate message identifier. |
| message_version | When the application has omitted message_id property, the application engine ignores this property. Otherwise, the application may either specify or omit this property. When this property is omitted, the application engine assumes that any event message has the appropriate |
The application engine ignores this property, even if it exists. It is recommended for application to omit the property.

Handling of each property in the argument param of removeGeneralEventMessageListener method

If the event message transmitted in a specified manner in ARIB STD-B24 Chapter 7 is the subject:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>source.original_network_id</td>
<td>Application must specify all or omit all of them. If all are omitted, the application engine treats as the current service is specified.</td>
</tr>
<tr>
<td>source.transport_stream_id</td>
<td></td>
</tr>
<tr>
<td>source.service_id</td>
<td>I</td>
</tr>
<tr>
<td>source.content_id</td>
<td>I</td>
</tr>
<tr>
<td>source.event_id</td>
<td>I</td>
</tr>
<tr>
<td>source.component_tag</td>
<td>O</td>
</tr>
<tr>
<td>source.channel_id</td>
<td>I</td>
</tr>
<tr>
<td>source.module_id</td>
<td>I</td>
</tr>
<tr>
<td>source.module_name</td>
<td>I</td>
</tr>
<tr>
<td>source.resource_name</td>
<td>I</td>
</tr>
</tbody>
</table>

If the event message transmitted in a specified manner in ARIB STD-B60 Chapter 11 is the subject:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>source.original_network_id</td>
<td>Application must specify all or omit all of them. If all are omitted, the application engine treats as the current service is specified.</td>
</tr>
<tr>
<td>source.tlv_stream_id</td>
<td></td>
</tr>
<tr>
<td>source.service_id</td>
<td>If this property is omitted, behavior is set in operation.</td>
</tr>
<tr>
<td>source.event_id</td>
<td>I</td>
</tr>
<tr>
<td>source.event_message_tag</td>
<td>Application may specify all or omit all of them. If this property is omitted, behavior is set in operation.</td>
</tr>
</tbody>
</table>

The following properties are used commonly:

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>message_group_id</td>
<td>The application may specify or omit this property. The value that can be specified is &quot;1&quot;. How the application engine handles any value other than &quot;1&quot; is to be specified later. If this property is omitted, the application engine assumes that &quot;1&quot; is specified.</td>
</tr>
<tr>
<td>message_id</td>
<td>The application may specify or omit this property. When this property is omitted, the application engine does not include the message identifier, which is a target of the event listener, in its requirements at the time of deciding the event listener to be removed.</td>
</tr>
<tr>
<td>message_version</td>
<td>The application may specify or omit this property. When this property is omitted, the application engine does not include the message version, which is a target of event listener, in its requirements at the time of deciding the event listener to be removed.</td>
</tr>
</tbody>
</table>

O: The application may specify or omit this property. If this property is omitted, the application engine treats as that the entry component for the specified service is specified.
I: The application engine ignores this property, even if it exists. It is recommended for application to omit the property.
Handling of each property in the argument msg of GeneralEventMessageListener

If the event message transmitted in a specified manner in ARIB STD-B24 Chapter 7 is the subject:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>source.original_network_id</td>
<td>M</td>
</tr>
<tr>
<td>source.transport_stream_id</td>
<td>M</td>
</tr>
<tr>
<td>source.service_id</td>
<td>M</td>
</tr>
<tr>
<td>source.content_id</td>
<td>-</td>
</tr>
<tr>
<td>source.event_id</td>
<td>-</td>
</tr>
<tr>
<td>source.component_tag</td>
<td>M</td>
</tr>
<tr>
<td>source.channel_id</td>
<td>-</td>
</tr>
<tr>
<td>source.module_id</td>
<td>-</td>
</tr>
<tr>
<td>source.module_name</td>
<td>-</td>
</tr>
<tr>
<td>source.resource_name</td>
<td>-</td>
</tr>
</tbody>
</table>

If the event message transmitted in a specified manner in ARIB STD-B60 Chapter 11 is the subject:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>source.original_network_id</td>
<td>M</td>
</tr>
<tr>
<td>source.tlv_stream_id</td>
<td>M</td>
</tr>
<tr>
<td>source.service_id</td>
<td>M</td>
</tr>
<tr>
<td>source.event_id</td>
<td>-</td>
</tr>
<tr>
<td>source.event_message_tag</td>
<td>M</td>
</tr>
</tbody>
</table>

The following properties are used commonly:

<table>
<thead>
<tr>
<th>Property</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>message_group_id</td>
<td>The application engine must set up all of these properties without fail.</td>
</tr>
<tr>
<td>message_id</td>
<td></td>
</tr>
<tr>
<td>message_version</td>
<td></td>
</tr>
<tr>
<td>private_data_byte</td>
<td></td>
</tr>
</tbody>
</table>

M: The application engine must set all these properties.
-: It is recommended for the application engine not to deploy this property.

3.3.12.2 Reception of timer event based on NPT

This section specifies the interface with which the application to use the timer event based on NPT is specified in ARIB STD-B24.

```cpp
partial interface StreamEventTarget {
    void addNPTReferenceMessageListener(
        ISDBResourceReference component_ref,  
        NPTReferenceMessageListener listener); 
    void removeNPTReferenceMessageListener(
        ISDBResourceReference component_ref,  
        optional NPTReferenceMessageListener listener); 
};

callback NPTReferenceMessageListener = void (ISDBResourceReference component_ref);

partial interface StreamEventTarget {
    unsigned long setAlarmByNPT(
        ISDBResourceReference component_ref,
```
unsigned long long npt_value,
    NPTAlarmHandler handler);
void unsetAlarmByNPT(
    unsigned long handle);
};
callback NPTAlarmHandler = void (  
    ISDBResourceReference component_ref,
    unsigned long long npt_value);

partial interface StreamEventTarget {
    unsigned long long getNPT(ISDBResourceReference component_ref);
};

addNPTReferenceMessageListener
Description Registers an event listener that is executed when the function for using NPT becomes usable

Arguments

<table>
<thead>
<tr>
<th>Arguments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>component_ref</td>
<td>Object identifying the component to be monitored.</td>
</tr>
<tr>
<td>listener</td>
<td>Function that is called when an NPT reference descriptor has been received by the receiver, and has associated NPT with STC, and a function that uses NTP becomes usable. If the application is in the relevant state at the time when this method is executed, the function specified here is called immediately without waiting for reception of the next NPT reference descriptor. After this function has been executed while the application is already in the relevant state, this function is not called again, even if a new NPT reference descriptor is received.</td>
</tr>
</tbody>
</table>

removeNPTReferenceMessageListener
Description Removes the event listeners registered by addNPTReferenceMessageListener

Arguments

<table>
<thead>
<tr>
<th>Arguments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>component_ref</td>
<td>Object identifying the component to be monitored by the event listener to be removed</td>
</tr>
<tr>
<td>listener</td>
<td>Event listener to be removed. When this is omitted, it is assumed that an instruction is given to remove all event listeners where the components shown in argument component_ref are registered to be monitored.</td>
</tr>
</tbody>
</table>

callback NPTReferenceMessageListener

Arguments

<table>
<thead>
<tr>
<th>Arguments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>component_ref</td>
<td>Component on which functions to use NPT have become available</td>
</tr>
</tbody>
</table>
### setAlarmByNPT

**Description**
Registers the processing to be executed at the specified NPT time.

**Arguments**
- **component_ref**: Object identifying the component to be registered.
- **npt_value**: NPT value identifying the time when the function specified by the argument `handler` should be executed.
- **handler**: Function to be executed when the NPT time specified in argument `npt_value` has arrived in the component specified in `component_ref`. If the given NPT time has already elapsed when this method is executed, this function is executed immediately.

**Return value**
Handle identifying the registered processing.

### unsetAlarmByNPT

**Description**
Cancels the registration made using `setAlarmByNPT`.

**Arguments**
- **handle**: Handle identifying what is cancelled. The value returned by `setAlarmByNPT` that executes the registration to be cancelled is specified.

### callback NPTAlarmHandler

**Arguments**
- **component_ref**: Component specified in the argument `component_ref` at the time when `setAlarmByNPT` is executed.
- **npt_value**: NPT value specified in the argument `npt_value` at the time when `setAlarmByNPT` is executed.

### getNPT

**Description**
Obtains the current NPT value.

**Arguments**
- **component_ref**: Object identifying the component to be processed.

**Return value**
Obtained NPT value.

### addNPTReferenceMessageListener, removeNPTReferenceMessageListener

Handling of each property in the argument `component_ref` of `setAlarmByNPT`:

- **original_network_id**: Application must specify all or omit all of them.
- **transport_stream_id**: If these all are omitted, the application engine treats as the current service is specified.
- **service_id**: I
- **content_id**: I
- **event_id**: I
- **component_tag**: The application may specify or omit this property. If this property is omitted, the application engine treats as that the entry component for the specified service is specified.
- **channel_id**: I
- **module_id**: I
- **module_name**: I
- **resource_name**: I

I: The application engine ignores this property, even if it exists. It is recommended for the application to omit the property.
Handling of each property in NPTReferenceMessageListener NPTAlarmHandler argument

<table>
<thead>
<tr>
<th>property</th>
<th>requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>component_ref</td>
<td>M</td>
</tr>
<tr>
<td>original_network_id</td>
<td>M</td>
</tr>
<tr>
<td>transport_stream_id</td>
<td>M</td>
</tr>
<tr>
<td>service_id</td>
<td>M</td>
</tr>
<tr>
<td>content_id</td>
<td>-</td>
</tr>
<tr>
<td>event_id</td>
<td>-</td>
</tr>
<tr>
<td>component_tag</td>
<td>M</td>
</tr>
<tr>
<td>channel_id</td>
<td>-</td>
</tr>
<tr>
<td>module_id</td>
<td>-</td>
</tr>
<tr>
<td>module_name</td>
<td>-</td>
</tr>
<tr>
<td>resource_name</td>
<td>-</td>
</tr>
</tbody>
</table>

M: Application engine must set this property.
*: It is recommended for the application engine not to deploy this property.

3.3.12.3 Reception of timer event based on UTC-NPT

This section specifies the interface with which the application to use the timer event based on UTC-NPT is specified in ARIB STD-B60.

```java
partial interface StreamEventTarget {
    void addUTCNPTReferenceMessageListener(
        UTCNPTReferenceMessageListenerParams param,
        UTCNPTReferenceMessageListener listener);
    void removeUTCNPTReferenceMessageListener(
        UTCNPTReferenceMessageListenerParams param,
        optional UTCNPTReferenceMessageListener listener);
}
```

callback UTCNPTReferenceMessageListener = void
(UTCNPTReferenceMessageListenerCallbackParams param);

```java
partial interface StreamEventTarget {
    unsigned long setAlarmByUTCNPT(
        UTCNPTAlarmParams param,
        UTCNPTAlarmHandler handler);
    void unsetAlarmByUTCNPT(
        unsigned long handle);
}
```

callback UTCNPTAlarmHandler = void (UTCNPTNotification msg);

```java
partial interface StreamEventTarget {
    unsigned long long getUTCNPT(UTCNPTQueryParams param);
}
```

dictionary UTCNPTReferenceMessageListenerParams {
    ISDBResourceReference source;
}
dictionary UTCNPTReferenceMessageListenerCallbackParams {
    ISDBResourceReference source;
};

dictionary UTCNPTAlarmParams {
    ISDBResourceReference source;
    unsigned long long utcnpt_value;
};

dictionary UTCNPTNotification {
    ISDBResourceReference source;
    unsigned long long utcnpt_value;
};

dictionary UTCNPTQueryParams {
    ISDBResourceReference source;
};

addUTCNPTReferenceMessageListener
description Registers an event listener that is executed when the function for using UTC-NPT becomes usable.

Arguments

param source Object indicating the source to be monitored

listener Function that is called when the receiver has received a UTC-NPT reference descriptor and associated UTC-NPT with UTC, and functions that use UTC-NPT have become available. If the receiver is in the relevant state at the time when this method is executed, this function is called immediately without waiting for reception of the next UTC-NPT reference descriptor. After this function is executed once, it is not called again even if another UTC-NPT reference descriptor is received.

removeUTCNPTReferenceMessageListener
description Removes the event listener registered by addUTCNPTReferenceMessageListener.

Arguments

param source Object indicating the source that is monitored by the event listener to be removed.

listener Event listener to be removed. If omitted, it is assumed that an instruction is given to remove all event listeners that are registered.

callback UTCNPTReferenceMessageListener
description This is the argument for compatibility. Application must safely ignore this argument whatever value it is.
<table>
<thead>
<tr>
<th><strong>setAlarmByUTCNPT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Arguments</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Return value</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>unsetAlarmByUTCNPT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Arguments</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>callback UTCNPTAlarmHandler</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arguments</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>getUTCNPT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Arguments</strong></td>
</tr>
<tr>
<td><strong>Return value</strong></td>
</tr>
</tbody>
</table>

**addUTCNPTReferenceMessageListener**, **removeUTCNPTReferenceMessageListener**, **setAlarmByUTCNPT**, **getUTCNPT**

<table>
<thead>
<tr>
<th><strong>Property</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>original_network_id</td>
<td>Application must specify all or omit all of them.</td>
</tr>
<tr>
<td>tlv_stream_id</td>
<td>If these all are omitted, the application engine treats as the current service is specified.</td>
</tr>
<tr>
<td>service_id</td>
<td>I</td>
</tr>
<tr>
<td>event_id</td>
<td>event_message_tag</td>
</tr>
</tbody>
</table>

I: The application engine ignores this property, even if it exists. It is recommended for application to omit the property.

**Handling of each property in the argument source of UTCNPTReferenceMessageListener, UTCNPTAlarmHandler**

<table>
<thead>
<tr>
<th><strong>Property</strong></th>
<th><strong>M</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>original_network_id</td>
<td>M</td>
</tr>
<tr>
<td>tlv_stream_id</td>
<td>M</td>
</tr>
<tr>
<td>service_id</td>
<td>M</td>
</tr>
</tbody>
</table>
3.3.13 Reception of AIT update notification

In this section, it defines the interface to receive notification about the update of the AIT. AIT to the subject of this interface is updated monitoring is AIT to be transmitted in the broadcast, and the details decide by practical operation.

```java
partial interface StreamEventTarget {
    void addAITUpdateListener(
        AITUpdateListener listener);
    void removeAITUpdateListener(
        optional AITUpdateListener listener);
};

callback AITUpdateListener = void (ApplicationInformationTable? ait);
```

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>addAITUpdateListener</td>
<td>Register an event listener to the update of AIT transmitted by broadcast.</td>
</tr>
<tr>
<td>Arguments</td>
<td>listener</td>
</tr>
<tr>
<td></td>
<td>Function to be called when the AIT that this interface has been the subject of update monitoring has been updated. If the AIT has a state that has not been transmitted from the state being transmitted, and is treated as an update of the AIT either case vice versa. Also, if the AIT is one controlling the application that executes this method, the control of the application by the AIT is prioritized.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>removeAITUpdateListener</td>
<td>Delete an event listener that was registered by the addAITUpdateListener.</td>
</tr>
<tr>
<td>Arguments</td>
<td>listener</td>
</tr>
<tr>
<td></td>
<td>Event listener to be deleted. If omitted, all event listeners registered are deleted.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>callback AITUpdateListener</td>
<td>Arguments ait</td>
</tr>
<tr>
<td></td>
<td>Object that represents the AIT after update. Null if this callback is called because AIT is no longer being transmitted.</td>
</tr>
</tbody>
</table>

3.3.14 Storage control of data resources

This section specifies the interface for the storage control of the data resources to be transmitted by the MMT to the cache (see 5.1, Part 1, Volume 1)

```java
partial interface ReceiverDevice {
   readonly attribute CacheEventTarget cacheEvent;
};
```
interface CacheEventTarget {
    void addCacheEventListener(DOMString path, CacheEventListener listener);
    void removeCacheEventListener(DOMString path, optional CacheEventListener listener);
    void storeDataResource(DOMString path, optional CacheEventListener listener);
    void releaseDataResource(optional DOMString path);
};

callback CacheEventListener = void (DOMString path, DOMString event);

### addCacheEventListener

**Description**
Register an event listener to be executed at the time of update, deletion and storage completion of the data resource.

**Arguments**
- **path**: Path name of the file or directory to be monitored.
- **listener**: Function that should be invoked at the time of update, deletion, storage completion of the file or directory specified by the argument `path`. At the time this method has been executed, if the storage of the specified file or directory has been completed, this function is immediately invoked, and "store_finished" event is notified. It should be noted that, as for storage completion, this function can be invoked only if the file or directory has been specified as a storage target by `storeDataResource`.

### removeCacheEventListener

**Description**
Delete the event listener that has been registered by `addCacheEventListener` or `storeDataResource`. The event listener which monitors the file or directory specified by the argument `path`, and whose function is specified by the argument `listener` is deleted.

**Arguments**
- **path**: Path name of the file or directory monitored by the event listener to be deleted.
- **listener**: Event listener to be deleted. If omitted, it is regarded to have been instructed to delete all event listeners that monitor the file or directory specified by the argument `path`.

### storeDataResource

**Description**
Specify the file or directory as a storage target to the cache. In addition, by specifying the optional arguments `listener`, it is possible to register an event listener at the same time. Stored file or directory is guaranteed not to be deleted from the cache until the specification as a storage target is canceled by `releaseDataResource`.
However, if the update of the specified file or directory as a storage target is notified on the transmission path, the receiver automatically performs update process of the file or directory in the cache. If the argument listener is specified, this method performs, in addition to the above processing, the same processing as invoking the addCacheEventListener with the argument path and the argument listener.

<table>
<thead>
<tr>
<th>Arguments</th>
<th>Path name of the file or directory to be specified as a storage target to the cache and to be monitored in the event listener specified by the argument listener.</th>
</tr>
</thead>
<tbody>
<tr>
<td>listener</td>
<td>Function that should be invoked at the time of update, deletion, storage completion of the file or directory specified by the argument path.</td>
</tr>
</tbody>
</table>

**releaseDataResource**

**Description** Cancel to specify the file or directory as a storage target.

<table>
<thead>
<tr>
<th>Arguments</th>
<th>Path name of the file or directory to be canceled to specify as a storage target. If omitted, it is regarded to have been instructed to cancel to specify all files and directories as storage targets.</th>
</tr>
</thead>
</table>

**callback CacheEventListener**

**Arguments** Path name of the file or directory that has been specified by the argument path in addCacheEventListener or storeDataResource.

<table>
<thead>
<tr>
<th>Event type</th>
<th>Event type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;updated&quot;</td>
<td>Update of the file or directory indicated by the argument path has been notified on the transmission path. At this time, if target file or directory has been specified as the storage target by storeDataResource, storage processing of the update file or directory in the cache starts automatically.</td>
</tr>
<tr>
<td>&quot;deleted&quot;</td>
<td>File or directory indicated by the argument path has been deleted on the transmission path.</td>
</tr>
<tr>
<td>&quot;store_finished&quot;</td>
<td>Storage to the cache of the file or directory indicated by the argument path has been completed (including completion of automatic storage processing after &quot;updated&quot; event). It should be noted that this event can be notified only if the file or directory has been specified as a storage target by storeDataResource.</td>
</tr>
</tbody>
</table>

### 3.4 Security model

#### 3.4.1 Requested function

From the standpoint of protecting broadcasting contents and viewers, there is a need to establish a mechanism capable of managing applications and controlling their operating
range, and a mechanism capable of excluding noncompliant receivers. In order to realize these mechanisms, the security function requested for the management of applications in receivers conforms to IPTV Forum Specification: IPTVFJ STD-0010 6.3.1. However, this standard does not apply to the functions relating to enforcement and revocation.

3.4.2 Access control

This shall conform to IPTV Forum Specification: IPTVFJ STD-0010 6.3.2.

3.4.3 Application boundary and broadcasting resource access

This shall conform to IPTV Forum Specification: IPTVFJ STD-0010 6.1.2.
Chapter 4: Namespace

4.1 Identification of resource obtained by MPEG-2 TS transmission

When the audio/video streams transmitted by MPEG-2 TS are specified, they are identified uniquely by the following names. For details of each parameter, refer to ARIB STD-B24 Volume 2 “9.2.3 Reference of AV streams and subtitle component”. Furthermore, for their shortened forms, refer to ARIB STD-B24 Volume 2 “9.2.3.1 Abbreviated AV stream names”. However, the provisions for data carousel transmission of AV streams are excluded. In addition, for the identification of broadcasting services currently under channel selection, refer to ARIB STD-B24 Volume 2 “9.2.5.1 Identification of currently selected broadcasting service on receiver”.

```
arib://<original_network_id>.<transport_stream_id>.<service_id>[;<content_id>]
    [<event_id>]/<component_tag>[;<channel_id>]
```

4.1.1 Abbreviated AV stream names transmitted by MPEG-2 TS

When an AV stream is specified in the following format:

```
/<component_tag>[;<channel_id>]
```

It is interpreted as:

```
arib://....[<event_id>]/<component_tag>[;<channel_id>]
```

4.2 Identification of audio/video by MMT

When the audio/video streams transmitted by MMT are specified, they are identified uniquely by the following names.

```
arib2://<original_network_id>.<tlv_stream_id>.<service_id>[.<event_id>]/<component_tag]
```

For the formats for parameters with the exception of `<tlv_stream_id>`, refer to ARIB STD-B24 Volume 2 “9.2.3 References of AV streams and subtitle component”. `<tlv_stream_id>` is specified in hexadecimal strings as in the case of `<transport_stream_id>`. The characters (strings) indicating that these are written in hexadecimal notation such as "0x" at the top and "h" at the end of character strings are not attached, but 0 is attached at the top if required so that the fixed-length string of length 4 is created.

4.2.1 Identification of broadcasting services currently under channel selection for the Av stream transmitted by MMT

If the special value"-1" is set respectively to `<original_network_id>`, `<tlv_stream_id>`, `<service_id>`, this is interpreted as the broadcasting service currently under channel selection is being specified by receivers.

For example, if

```
arib2://-1.-1.-1/-1
```
is specified as the argument of setVideoSrc function, this is interpreted as the default video stream of the broadcasting service currently under channel selection is being specified by receivers.

4.3 Identification of data resource acquisition by MMT

For the reference of data resources transmitted by MMT, they are identified uniquely by the following name.

http://[hostname]/<directory>/.<filename> or
https://[hostname]/<directory>/.<filename>

<hostname> indicates the host name of the server that can be omitted and where the resource is in existence. <directory> indicates the name of the directory from the root directory of the server specified by the host name. <filename> indicates the name of the file attached to the resource. The maximum value of the layered structure of the directory name and the maximum length of the character string of each parameter shall be defined separately in the operational rules.

No distinction is made between upper- and lower-case alphabetic characters in the characters specified in <filename>, but for example a judgment is made that "abc" and "ABC" are originated from the same resource.

The characters that can be used in <hostname>, <directory>, <filename> are as follows.

filename = startChar *echar
echar = startChar | ":" | "." | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":"
startChar = lowalpha | upalpha | digit | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":" | ":"
lowalpha = "a" | "b" | "c" | "d" | "e" | "f" | "g" | "h" | "i" | "j" | "k" | "l" | "m" | "n" | "o" | "p" | "q" | "r" | "s" | "t" | "u" | "v" | "w" | "x" | "y" | "z"
upalpha = "A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" | "I" | "J" | "K" | "L" | "M" | "N" | "O" | "P" | "Q" | "R" | "S" | "T" | "U" | "V" | "W" | "X" | "Y" | "Z"
digit = "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9"

4.4 Scheme of resource obtained from IP transmission

Resource acquisition that explicitly specified IP transmission is uniquely identified by the URL that is specified in IETF RFC3986. The specified scheme is as follows.
The maximum length of the URL shall be defined separately in the operational rules.

4.5 Identification of closed caption by MPEG-2 TS transmission

The closed caption component of the broadcasting wave transmitted by MPEG-2 TS is uniquely identified by the following name. A shortened form is not used. For details of each parameter with the exception of $<\text{module\_id}>$, refer to ARIB STD-B24 Volume 2 “9.2.3 Reference of AV streams and subtitle component”.

\[
\text{arib://}<\text{original\_network\_id}.<\text{transport\_stream\_id}.<\text{service\_id}>[;<\text{content\_id}>] \\
[.<\text{event\_id}>]/<\text{component\_tag}>[;<\text{module\_id}>]
\]

When the component tag was specified as `-1`, the closed caption component currently selected was regarded as specified. $<\text{module\_id}>$ is used to uniquely identify languages. $<\text{module\_id}>$ employs hexadecimal strings. However, the characters (strings) indicating that these are written in hexadecimal notation such as "0x" at the top and "h" at the end of the character strings are not attached, but 0 is attached at the top if required so that the fixed-length string of length 4 is created. For instance, if the module identification is 0x0001, 0001 is specified in $<\text{module\_id}>$.

4.6 Identification of closed caption by MMT

The closed caption component transmitted by MMT is uniquely identified by the following name.

\[
\text{arib2://}<\text{original\_network\_id}.<\text{tlv\_stream\_id}.<\text{service\_id}>[.<\text{event\_id}>]/<\text{component\_tag} >
\]

For details of each parameter, 4.2 shall be followed.

4.7 Identification of receiver built-in sound

Receiver built-in sound is identified by the character string:

\[
\text{romsound://}<\text{sound\_id}>
\]

Here $<\text{sound\_id}>$ is the value of the identifier expressed by the decimal string that is used to identify the types of built-in sounds defined separately in the operational rules.
Chapter 5: Application Control Information

5.1 Application control information of section format

The application control information of section format that is used in the broadcasting system using MPEG-2 TS shall be specified in ARIB STD-B24 Volume 4 Chapter 5.

5.1.1 Application type

0x0011 shall be used as the value showing the application type (ARIB-HTML5 Application).

5.2 Application control information of MMT-SI format

The application control information of MMT-SI format that is used in the broadcasting system using MMT shall be specified in ARIB STD-B60 as MH-Application Information Table (MH-AIT).

5.2.1 Application type

0x0011 shall be used as the value showing the application type (ARIB-HTML5 Application).

5.2.2 Identification of application

The application is uniquely identified by the application identifier shown in Table 5-1. This identifier is composed of a structure with 6 bytes (48 bits) in length, and is stored in MH-AIT.

<table>
<thead>
<tr>
<th>Data Structure</th>
<th>Number of Bits</th>
<th>Bit String Noteation</th>
</tr>
</thead>
<tbody>
<tr>
<td>application_identifier(){</td>
<td>16</td>
<td>uimsbf</td>
</tr>
<tr>
<td>organization_id</td>
<td>32</td>
<td>uimsbf</td>
</tr>
<tr>
<td>application_id</td>
<td></td>
<td></td>
</tr>
<tr>
<td>}</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meaning:

organization_id (system identification): indicates the system that prepared the application. This identification specifies the number uniquely given.

application_id (application identification): indicates the number that identifies the application. The number is uniquely given in system identification.

5.2.3 Application control code

The application control code specified in ARIB STD-B60 shall be used.

5.3 Application control information of XML format

The application control information of XML format shall conform to ETSI TS 102 809 V1.1.1 (2010-01) DVB Signalling and carriage of interactive applications and services in
Hybrid broadcast/broadband environments “5.4 XML-based syntax” with the extension attached.

Figure 5.1 shows the superior structure of AIT of XML format.

![Fig.5-1: Superior structure of AIT of XML format](image)

A ServiceDiscovery element is present at the top, an ApplicationDiscovery element down below, and an ApplicationList element further down below that. Each element up to these elements conforms basically to ETSI TS 102 809 V1.1.1 (2010-01) DVB Signalling and carriage of interactive applications and services in Hybrid broadcast/broadband environments “5.4 XML-based syntax”, but the Application element down below, and the elements further down below that shall be additionally specified as follows. As the namespace, each superior element shall also be specified as isdb2:ApplicationDiscovery, isdb2:ApplicationList.

5.3.1 Application element

As an Application element, the following XML schema shall be additionally applied. This element responds to part of the structure of AIT that is specified in ARIB STD-B24 and MH-AIT that is specified in ARIB STD-B60 (part of the application loop). Each information element has the meaning in common.

Table 5-2 shows the syntax of the Application element, and Fig.5-2 shows the structure of the Application element.

<table>
<thead>
<tr>
<th>Table 5-2: Syntax of Application element</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;xsd:complexType name=&quot;Application&quot;&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:sequence&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;applicationIdentifier&quot; type=&quot;isdb2:ApplicationIdentifier&quot;/&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;applicationDescriptor&quot; type=&quot;isdb2:ApplicationDescriptor&quot;/&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;applicationTransport&quot; type=&quot;isdb2:TransportProtocolDescriptorType&quot; maxOccurs=&quot;unbounded&quot;/&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;applicationLocation&quot; type=&quot;mhp:SimpleApplicationLocationDescriptorType&quot;/&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;autostartPriorityDescriptor&quot; type=&quot;isdb2:AutostartPriorityDescriptorType&quot; minOccurs=&quot;0&quot;/&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;cacheControlInfoDescriptor&quot; type=&quot;isdb2:CacheControlInfoDescriptorType&quot; minOccurs=&quot;0&quot;/&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;randomizedLatencyDescriptor&quot; type=&quot;isdb2:RandomizedLatencyDescriptorType&quot; minOccurs=&quot;0&quot;/&gt;</code></td>
</tr>
<tr>
<td><code>&lt;xsd:element name=&quot;applicationBoundaryAndPermissionDescriptor&quot;/&gt;</code></td>
</tr>
</tbody>
</table>
5.3.2 ApplicationIdentifier element

The following XML schema is additionally applied as an ApplicationIdentifier element. This element responds to the identification of the applications that are specified in ARIB STD-B24 and 0. Each information element has the meaning in common.

Table 5-3 shows the syntax of the ApplicationIdentifier element, and Fig.5-3 shows the structure of the ApplicationIdentifier element.

Table 5-3: Syntax of ApplicationIdentifier element

```xml
<xsd:complexType name="ApplicationIdentifier">
  <xsd:sequence>
    <xsd:element name="orgId" type="xsd:unsignedShort"/>
    <xsd:element name="appId" type="xsd:unsignedInt"/>
  </xsd:sequence>
</xsd:complexType>
```

Fig. 5-3: Structure of ApplicationIdentifier

5.3.3 ApplicationDescriptor element

The following XML schema is additionally applied as an ApplicationDescriptor element. This element responds to part of the section structure of AIT (part of the application loop) that is specified in ARIB STD-B24 and the application descriptor, and part of the structure of MH-AIT (part of the application loop) that is specified in ARIB STD-B60 and the MH-application descriptor. Each information element has the meaning in common. ARIB-HTML5 is introduced as the ApplicationType element to be used in this standard.

Table 5-4 shows the syntax of the ApplicationDescriptor element, and Fig.5-4 shows the structure of the ApplicationDescriptor element.
Table 5-4: Syntax of ApplicationDescriptor

```xml
<xsd:simpleType name="Isdb2ApplicationType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="ARIB-HTML5"/>
  </xsd:restriction>
</xsd:simpleType>
<xsd:complexType name="ApplicationType">
  <xsd:choice>
    <xsd:element name="Isdb2App" type="isdb2:Isdb2ApplicationType"/>
    <xsd:element name="OtherApp" type="mpeg7:mimeType"/>
  </xsd:choice>
</xsd:complexType>
<xsd:complexType name="ApplicationDescriptor">
  <xsd:sequence>
    <xsd:element name="type" type="isdb2:ApplicationType"/>
    <xsd:element name="controlCode" type="mhp:ApplicationControlCode"/>
    <xsd:element name="visibility" type="mhp:VisibilityDescriptor" minOccurs="0"/>
    <xsd:element name="serviceBound" type="xsd:boolean" default="true" minOccurs="0"/>
    <xsd:element name="priority" type="ipi:Hexadecimal8bit"/>  
    <xsd:element name="version" type="ipi:Version"/>
    <xsd:element name="mhpVersion" type="mhp:MhpVersion" minOccurs="0"/>
    <xsd:element name="icon" type="mhp:IconDescriptor" minOccurs="0"/>
    <xsd:element name="storageCapabilities" type="mhp:StorageCapabilities" minOccurs="0"/>
  </xsd:sequence>
</xsd:complexType>
```
5.3.4 ApplicationTransport element

The following XML schema is additionally applied as an ApplicationTransport element. This element responds to the transport protocol descriptor that is specified in ARIB STD-B24, and part of the MH-transport protocol descriptor that is specified in ARIB STD-B60. Each information element has the meaning in common.

Table 5-5 shows the syntax of the ApplicationTransport element, and Fig.5-5 shows the structure of the ApplicationTransport element.

### Table 5-5: Syntax of ApplicationTransport

```xml
<xsd:complexType name="HTTPTransportType">
  <xsd:complexContent>
    <xsd:extension base="isdb2:TransportProtocolDescriptorType">
      <xsd:sequence>
        <xsd:element name="URLBase" type="xsd:anyURI"/>
        <xsd:element name="URLExtension" type="xsd:anyURI" minOccurs="0" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="ComponentTagType">
  <xsd:attribute name="ComponentTag" type="ipi:Hexadecimal8bit"/>
</xsd:complexType>

<xsd:complexType name="DCTransportType">
  <xsd:complexContent>
    <xsd:extension base="isdb2:TransportProtocolDescriptorType">
      <xsd:sequence>
        <xsd:element name="DvbTriplet" type="ipi:DVBTriplet"/>
        <xsd:element name="ComponentTag" type="isdb2:ComponentTagType"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
```
<xsd:complexContent>
  <xsd:extension base="isdb2:TransportProtocolDescriptorType">
    <xsd:sequence>
      <xsd:element name="URLBase" type="xsd:anyURI"/>
      <xsd:element name="URLExtension" type="xsd:anyURI" minOccurs="0" maxOccurs="unbounded"/>
    </xsd:sequence>
  </xsd:extension>
</xsd:complexContent>
<xsd:complexType name="TransportProtocolDescriptorType" abstract="true"/>
5.3.5 ApplicationBoundaryAndPermissionDescriptor element

The following XML schema is additionally applied as an ApplicationBoundaryAndPermissionDescriptor element. This element responds to the application boundary and permission descriptor that is specified in ARIB STD-B24, and the MH-application boundary and permission descriptor that is specified in ARIB STD-B60. Each information element has the meaning in common.

Table 5-6 shows the syntax of the ApplicationBoundaryAndPermissionDescriptor element, and Fig.5-6 shows the structure of the ApplicationBoundaryAndPermissionDescriptor element.

Table 5-6: Syntax of ApplicationBoundaryAndPermissionDescriptor element

```xml
<xsd:complexType name="BoundaryAndPermissionType">
  <xsd:sequence>
    <xsd:element name="permissionBitmap" type="ipi:Hexadecimal16bit" maxOccurs="unbounded"/>
    <xsd:element name="managedURL" type="xsd:anyURI" minOccurs="0" maxOccurs="unbounded"/>
  </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="ApplicationBoundaryAndPermissionDescriptorType">
  <xsd:sequence>
    <xsd:element name="boundaryAndPermission" type="isdb2:BoundaryAndPermissionType" maxOccurs="unbounded"/>
  </xsd:sequence>
</xsd:complexType>
```
5.3.6 AutostartPriorityDescriptor element

The following XML schema is additionally applied as an AutostartPriorityDescriptor element. This element responds to the autostart priority descriptor that is specified in ARIB STD-B24, and the MH-autostart priority descriptor that is specified in ARIB STD-B60. Each information element has the meaning in common.

Table 5-7 shows the syntax of the AutostartPriorityDescriptor element, and Fig.5-7 shows the structure of the AutostartPriorityDescriptor element.

Table 5-7: Syntax of AutostartPriorityDescriptor element

```xml
<xsd:complexType name="AutostartPriorityDescriptorType">
  <xsd:simpleContent>
    <xsd:extension base="xsd:string">
      <xsd:attribute name="autostartPriority" type="xsd:unsignedShort" use="required"/>
    </xsd:extension>
  </xsd:simpleContent>
</xsd:complexType>
```

Fig.5-7: Structure of AutostartPriorityDescriptor element
5.3.7 CacheControlInfoDescriptor element

The following XML schema is additionally applied as a CacheControlInfoDescriptor element. This element responds to the cache control info descriptor that is specified in ARIB STD-B24, and the MH-cache control info descriptor that is specified in ARIB STD-B60. Each information element has the meaning in common.

Table 5-8 shows the syntax of the CacheControlInfoDescriptor element, and Fig.5-8 shows the structure of the CacheControlInfoDescriptor element.

Table 5-8: Syntax of CacheControlInfoDescriptor element

```xml
<xsd:complexType name="CacheControlInfoDescriptorType">
  <xsd:simpleContent>
    <xsd:extension base="xsd:string">
      <xsd:attribute name="applicationSize" type="xsd:unsignedShort" use="required"/>
      <xsd:attribute name="cachePriority" type="xsd:unsignedShort" use="required"/>
      <xsd:attribute name="packageFlag" type="xsd:boolean" use="required"/>
      <xsd:attribute name="applicationVersion" type="xsd:unsignedShort" use="required"/>
      <xsd:attribute name="expireDate" type="xsd:string" use="required"/>
    </xsd:extension>
  </xsd:simpleContent>
</xsd:complexType>
```

Fig.5-8: Structure of CacheControlInfoDescriptor Element

5.3.8 RandomizedLatencyDescriptor element

The following XML schema is additionally applied as a RandomizedLatencyDescriptor element. This element responds to the randomized latency descriptor that is specified in ARIB STD-B24, and the MH-randomized latency descriptor that is specified in ARIB STD-B60. Each information element has the meaning in common.

Table 5-9 shows the syntax of the RandomizedLatencyDescriptor element, and Fig.5-9 shows the structure of the RandomizedLatencyDescriptor element.

Table 5-9: Syntax of RandomizedLatencyDescriptor element

```xml
<xsd:complexType name="RandomizedLatencyDescriptorType">
  <xsd:simpleContent>
    <xsd:extension base="xsd:string">
      <xsd:attribute name="range" type="xsd:unsignedInt" use="required"/>
    </xsd:extension>
  </xsd:simpleContent>
</xsd:complexType>
```
5.3.9 XML schema of entire AIT of XML format

Table 5-10 shows the XML schema of the entire AIT of XML format.

---

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:ipi="urn:dvb:metadata:iptv:sdns:2008-1"
  xmlns:mpeg7="urn:tva:mpeg7:2005"
  xmlns:mhp="urn:dvb:mhp:2009"
  xmlns:isdb2="urn:arib:isdb2:2014"
  targetNamespace="urn:arib:isdb2:2014"
  elementFormDefault="qualified" attributeFormDefault="qualified">
  <xsd:import namespace="urn:dvb:mhp:2009"
    schemaLocation="imports/mis_xmlait.xsd"/>
    schemaLocation="imports/sdns_v1.4r10_modded.xsd"/>
  <xsd:import namespace="urn:tva:mpeg7:2005"
    schemaLocation="imports/tva_mpeg7.xsd"/>
  <xsd:simpleType name="Isdb2ApplicationType">
    <xsd:restriction base="xsd:string">
      <xsd:enumeration value="ARIB-HTML5"/>
    </xsd:restriction>
  </xsd:simpleType>
  <xsd:complexType name="ApplicationType">
    <xsd:choice>
      <xsd:element name="Isdb2App" type="isdb2:Isdb2ApplicationType"/>
      <xsd:element name="OtherApp" type="mpeg7:mimeType"/>
    </xsd:choice>
  </xsd:complexType>
  <xsd:complexType name="ApplicationDescriptor">
    <xsd:sequence>
      <xsd:element name="type" type="isdb2:ApplicationType"/>
      <xsd:element name="controlCode" type="mhp:ApplicationControlCode"/>
      <xsd:element name="visibility" type="mhp:VisibilityDescriptor" minOccurs="0"/>
      <xsd:element name="serviceBound" type="xsd:boolean" default="true" minOccurs="0"/>
      <xsd:element name="priority" type="ipi:Hexadecimal8bit"/>
      <xsd:element name="version" type="ipi:Version"/>
      <xsd:element name="mhpVersion" type="mhp:MhpVersion" minOccurs="0"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:schema>
```
<xsd:element name="icon" type="mhp:IconDescriptor" minOccurs="0"/>
<xsd:element name="storageCapabilities" type="mhp:StorageCapabilities" minOccurs="0"/>
</xsd:sequence>
</xsd:complexType>
<xsd:complexType name="HTTPTransportType">
  <xsd:complexContent>
    <xsd:extension base="isdb2:TransportProtocolDescriptorType">
      <xsd:sequence>
        <xsd:element name="URLBase" type="xsd:anyURI"/>
        <xsd:element name="URLExtension" type="xsd:anyURI" minOccurs="0" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name="ComponentTagType">
  <xsd:attribute name="ComponentTag" type="ipi:Hexadecimal8bit"/>
</xsd:complexType>
<xsd:complexType name="DCTransportType">
  <xsd:complexContent>
    <xsd:extension base="isdb2:TransportProtocolDescriptorType">
      <xsd:sequence>
        <xsd:element name="DvbTriplet" type="ipi:DVBTriplet"/>
        <xsd:element name="ComponentTag" type="isdb2:ComponentTagType"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name="MMTTransportType">
  <xsd:complexContent>
    <xsd:extension base="isdb2:TransportProtocolDescriptorType">
      <xsd:sequence>
        <xsd:element name="URLBase" type="xsd:anyURI" minOccurs="0" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
<xsd:complexType name="TransportProtocolDescriptorType" abstract="true"/>
<xsd:complexType name="AutostartPriorityDescriptorType">
  <xsd:simpleContent>
    <xsd:extension base="xsd:string">
      <xsd:attribute name="autostartPriority" type="xsd:unsignedShort" use="required"/>
    </xsd:extension>
  </xsd:simpleContent>
</xsd:complexType>
<xsd:complexType name="CacheControlInfoDescriptorType">
  <xsd:simpleContent>
    <xsd:extension base="xsd:string">
      <xsd:attribute name="applicationSize" type="xsd:unsignedShort" use="required"/>
      <xsd:attribute name="cachePriority" type="xsd:unsignedShort" use="required"/>
      <xsd:attribute name="packageFlag" type="xsd:boolean" use="required"/>
      <xsd:attribute name="applicationVersion" type="xsd:unsignedShort" use="required"/>
      <xsd:attribute name="expireDate" type="xsd:string" use="required"/>
    </xsd:extension>
  </xsd:simpleContent>
</xsd:complexType>
<xsd:element name="ServiceDiscovery">
  <xsd:complexType>
    <xsd:choice>
      <xsd:element name="ApplicationDiscovery" type="isdb2:ApplicationOfferingType" maxOccurs="unbounded"/>
    </xsd:choice>
  </xsd:complexType>
</xsd:element>
</xsd:schema>
Description

1 Code example of broadcast audio/video object

Each method and code examples of param elements in the broadcast audio/video objects that are specified in 2.2 are shown as follows (MPEG-2 TS case).

Code example of enableFullscreen function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.enableFullscreen)) {
  video.enableFullscreen();
} else {
  /* Width, height, z-index are overwritten to bring the element to the foreground and display it in full screen */
}
```

Code example of disableFullscreen function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.disableFullscreen)) {
  video.disableFullscreen();
} else {
  /* Width, height, z-index are overwritten to bring the element back to its original size */
}
```

Code example of is Fullscreen function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.isFullscreen)) {
  if (video.isFullscreen()) {
    /* In case of full screen display */
  } else {
    /* In case of normal display */
  }
}
```

Code example of enableAudioMute function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.enableAudioMute)) {
  video.enableAudioMute();
} else {
  /* When muting is not possible */
```
Code example of disableAudioMute function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.disableAudioMute)) {
    video.disableAudioMute();
} else {
    /* When muting disabling is not possible */
}
```

Code example of isAudioMute function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.isAudioMute)) {
    if (video.isAudioMute()) {
        /* When in muting state */
    } else {
        /* When audio output is possible */
    }
}
```

Code example of setAudioSrc function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.setAudioSrc)) {
    /* When specifying the second audio channel in a dual monoral audio stream */
    video.setAudioSrc("arib://-1.-1.-1/-1;2");
} else {
    /* When src specification of audio is not possible */
}
```

Code example of setVideoSrc function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.setVideoSrc)) {
    video.setVideoSrc("arib://-1.-1.-1/-1");
} else {
    /* When src specification of video is not possible */
}
```

Code example of getAudioSrc function

```javascript
var video = document.getElementById('video');
if ('function' === typeof(video.getAudioSrc)) {
```
var src = video.getAudioSrc();
/* processing pursuant to src information*/
} else {
/* When acquisition of audio src is not possible */
}

Code example of `getVideoSrc` function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.getVideoSrc)) {
    var src = video.getVideoSrc();
    /* processing pursuant to src information*/
} else {
    /* When acquisition of audio src is not possible */
}
```

Code example of `setCaptionSrc` function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.setCaptionSrc)) {
    /* when the first language was specified in the captions on the air */
    video.setCaptionSrc("arib://-1.-1.-1/-1;0");
} else {
    /* when sec specification of caption is not possible */
}
```

Code example of `getCaptionComponentURL` function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.getCaptionComponentUrl)) {
    var url = video.getCaptionComponentUrl();
    /* processing pursuant to the caption component url information */
} else {
    /* When acquisition of caption character is not possible */
}
```
Code example of isCaptionExistent function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.isCaptionExistent)) {
    if(video.isCaptionExistent("arib://-1.-1.-1/-1;0")){
        /* First language is being broadcast in the captions on the air */
    } else {
        /* First language is not on the air */
    }
}
```

Code example of setCaptionVisibility function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.setCaptionVisibility)) {
    /* Instruct to present the caption on the air */
    video.setCaptionVisibility();
} else {
    /* When setCaptionVisibility is not possible */
}
```

Code example of isCaptionVisible function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.isCaptionVisible)) {
    if (video.isCaptionVisible()) {
        /* in caption display state */
    } else {
        /* in caption non-display state */
    }
}
```

Code example of addCaptionListener function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.addCaptionListener)) {
    /* When the acquired text is processed by a callback function in the first language captions on the air */
    video.addCaptionListener(function(captiondata) ,"arib://-1.-1.-1/-1;0");
} else {
    /* When adding the acquired listener in caption text is not possible */
}
```
Code example of removeCaptionListener function

```javascript
var video = document.getElementById('video');

if ('function' === typeof(video.removeCaptionListener)) {
    /* removal of all listeners relevant to the captions on the air */
    video.removeCaptionListener();
} else {
    /* when removal of acquired listeners in the caption text is not possible */
}
```

Description example of initial parameter using param element

```html
<object id="video" type="video/x-iptvf-broadcast">
    <param name="video_src" value="arib://-1.-1.-1/-1">
    <param name="audio_src" value="arib://-1.-1.-1/-1;2">
    <param name="audio_mute" value="disable">
    <param name="fullscreen" value="enable">
    <param name="caption_src" value="arib://-1.-1.-1/-1;0">
</object>
```
Appendix
Reprinted parts from IPTV Forum technical specification in this standard

Part of this standard “Specification for Multimedia Coding scheme” is reprinted from IPTV Forum Specification: IPTVFJ STD-0011 Version 2.0. The reprinted parts are shown in Table 1.

- Regarding these reprinted parts, IPTV Forum Specification: IPTVFJ STD-0011 Version 2.0 is the authentic text.
- The Association of Radio Industries and Businesses (ARIB) assumes the responsibility for this reprint.

Table 1: Reprinted Parts

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