Errata to HbbTV 2.0.4

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Introduction

The present document identifies changes to the HbbTV 2.0.4 specification (ETSI TS 102 796 V1.7.1) to address issues found since publication. It may also include the removal or deprecation of features not used in the real world or that have been over-taken by events.

It does not systematically attempt to capture all changes to the 2.0.1, 2.0.2 and 2.0.3 specifications as there are too many of those. Changes to 2.0.4 that are also applicable to 2.0.1/2/3 are identified as such on a “best effort” basis.

This is an evolving document that will be added to over time.

Some changes arise from issues identified with the HbbTV test suite and implementing the change is necessary to pass the test suite.

In addition to the present document, the HbbTV Association also publishes versions of the specifications with the changes integrated and marked. In many cases, seeing changes in context is more useful than the format used by the present document, particularly as the set of changes grows over time and multiple changes impact the same paragraph(s). Users of the specifications can use the issue number to cross-reference the present document with those specification documents.

Feedback is welcome. HbbTV members should provide this through the HbbTV internal issue tracking system. Non-members may provide it by email to info@hbbtv.org.

For avoidance of doubt, the contents of this document have not been reviewed or approved by ETSI.

1 Format

Each issue has the following information.

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other

The categories used are the following.

Ambiguity	Feature where different implementations may behave in different ways, e.g. a feature is under-specified.
Editorial	Purely editorial change – formatting, spelling, punctuation, broken cross-references, ...
Error	Clear technical error in the specification. Cannot be implemented as written and/or system does not work as written.
Implementation	Feature removed, simplified or modified in order to simplify implementation and testing.
Inconsistency	The specification is inconsistent within itself or there is an inconsistency between the specification and a normative reference.
Other	Something that does not fit in the above.

In the present document, text quoted from other documents or to be added to other documents is indented except where it appears in a table. Fine-grained changes in text from other documents are shown using the underline and strikethrough convention.

2 10.2.2, table 12 clarification

Issue Number	**Applicable Specification Version**				**Category**
	2.0.1	**2.0.2**	**2.0.3**	**2.0.4**	**Ambiguity / Editorial / Error / Implementation / Inconsistency / Other**

11656				YES	Error

1) In clause 10.2.2.1, an additional column is added to table 12 and text modified as shown by underline / strikethrough.

Button (for conventional remote controls)	**DOM-2 Key Event. ~~K~~keyCode**	**DOM KeyboardEvent .code (see [i.30])**	**DOM KeyboardEvent .key (see [i.45])**	**Status**	**Availability**
4 colour buttons (red, green, yellow, blue)	VK_RED, VK_GREEN, VK_YELLOW, VK_BLUE	~~"ColorF0Red", "ColorF1Green", "ColorF2Yellow", "ColorF3Blue"~~	"ColorF0Red", "ColorF1Green", "ColorF2Yellow", "ColorF3Blue"	Mandatory	Always available to applications
4 arrow buttons (up, down, left, right)	VK_UP, VK_DOWN, VK_LEFT, VK_RIGHT	"ArrowUp", "ArrowDown", "ArrowLeft", "ArrowRight"	"ArrowUp", "ArrowDown", "ArrowLeft", "ArrowRight"	Mandatory	Always available to applications
ENTER or OK button	VK_ENTER	"Enter"	"Enter"	Mandatory	Always available to applications
BACK button	VK_BACK	"BrowserBack"	"BrowserBack"	Mandatory	Always available to applications
Number keys Play, stop, pause	VK_0 to VK_9 inclusive VK_STOP and either VK_PLAY and VK_PAUSE or VK_PLAY_PAUSE	"Digit0" to "Digit9" inclusive "MediaStop" and ~~either "MediaPlay" and "MediaPause" or~~ "MediaPlayPause" (1)	"0" to "9" inclusive. "MediaStop" and either "MediaPlay" and "MediaPause" or "MediaPlayPause"	Mandatory Mandatory	Only available to applications once activated Only available to applications once activated except as defined in clause O.7.
Fast forward and fast rewind	VK_FAST_FWD VK_REWIND	~~"MediaFastForward" "MediaRewind"~~	"MediaFastForward" "MediaRewind"	Mandatory	Only available to applications once activated except as defined in clause O.7.
Record	VK_RECORD	~~"MediaRecord"~~	"MediaRecord"	Mandatory if the PVR feature is supported, otherwise optional.	Only available to applications once activated except as defined in clause O.7.
TEXT or TXT or comparable button	Not available to applications	Not available to applications		mandatory	
2 program selection buttons (e.g. P+ and P-)	Not available to applications	Not available to applications		Optional	
WEBTV or comparable button	Not available to applications	Not available to applications		Optional	
EXIT or comparable button	Not available to applications	Not available to applications		Mandatory	
(1) No mapping is defined for the code attribute for separate play and pause keys, only for the combined play pause.					

A new informative reference is added as follows.

[i.45] W3C® Working Draft (30 May 2023): "UI Events KeyboardEvent key Values".

In clause A.3.3, “KeyCode” with a capital K is changed to “keyCode” with a lower case k.

3 DASH error handling ambiguity

Issue Number	**Applicable Specification Version**				**Category**
	2.0.1	**2.0.2**	**2.0.3**	**2.0.4**	**Ambiguity / Editorial / Error / Implementation / Inconsistency / Other**

12004	Yes	Yes	Yes	Yes	Ambiguity

The normative reference for TS 103 285 is replaced with the following.

[1] ETSI TS 103 285 (V1.4.1): "Digital Video Broadcasting (DVB); MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks".

4 Keypress events due to voice interaction when an application is not yet voice-ready

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
12636				Yes	Inconsistency

Clause 16.6 is modified as shown.

Key events of the standard HbbTV keyset

A terminal supporting voice interaction shall generate key events for the keys listed in Table 43 and defined in clause 10.2.2.1 if:

- the respective event has been requested by the application; and
- either
  - the application has indicated it is currently voice-ready (see clause 16.4.1) and the event is indicated in Table 43 as “Generate if application is voice-ready”; or
  - the application is not currently voice-ready and the event is indicated in Table 43 as “Generate if application is NOT voice-ready”; and
- the voice assistant function determines that the user has spoken a request for that key to be pressed:

Table 43: Keys for which key events can be generated due to voice interaction.

Button (for conventional remote controls)	DOM-2 Key Event.KeyCode	Generate if application is NOT voice ready?	Generate if application is voice-ready?
4 colour buttons (red, green, yellow, blue)TAL	VK_RED, VK_GREEN, VK_YELLOW, VK_BLUE	yes	yes
4 arrow buttons (up, down, left, right)	VK_UP, VK_DOWN, VK_LEFT, VK_RIGHT	yes	yes
ENTER or OK button	VK_ENTER	yes	yes
BACK button	VK_BACK	yes	yes
Number keys	VK_0 to VK_9 inclusive	yes	yes
Play, stop, pause	VK_STOP and either VK_PLAY and VK_PAUSE or VK_PLAY_PAUSE	yes	no
Fast forward and fast rewind	VK_FAST_FWD VK_REWIND	yes	no
Record	VK_RECORD	yes	yes

The grammar and syntax of the utterances that the user uses to make such a request is beyond the scope of the present document.

The activation rules of 10.2.2.1 shall be obeyed.

For other keys listed in clause 10.2.2.1 key events shall not be generated triggered by voice interaction.

5 AVComponent.encoding property

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
12835	Inconsistency	Inconsistency	Inconsistency	Inconsistency	

In Table A.1, in the row for “AVComponent”, the text shown underlined is added. The surrounding text is taken from 2.0.4 and there are differences in that surrounding text in 2.0.1, 2.0.2 and 2.0.3.

AVComponent	8.4.2	M(*)	Only for properties that are required by the present document. Statements that a property "may" be derived in a particular way shall be read as "shall" be derived in that way For `AVComponent`s corresponding to an MPEG DASH Adaptation Set, the `language` property shall be what is encoded in the MPD which may be an ISO 639-1 [18] 2-character language code and not an ISO 639-2 [19] 3-character language code. See clause A.2.5.3 of the present document for the mapping for EBU-TT-D subtitles. Some properties defined in AVComponent and AVAudioComponent are deprecated for instances returned from an A/V control object. See L.5. The contents of the "encoding" row of the two columns for MPEG-2 TS for COMPONENT_TYPE_VIDEO and COMPONENT_TYPE_AUDIO do not apply. The definition of the encoding property, "A string identifying the video or audio format as defined in section 3 of [OIPF_MEDIA2]" shall apply using the strings defined and referenced by clause 7.3.1.1.	

6 Regular HbbTV application controlling media presentation and parental access control and Scope of verifyParentalControlPIN when DVB-I not supported

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
12890				Yes	Error

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13907				Yes	Error

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14308				Yes	Error

1. Clause A.1 is modified as shown.

Parental access control APIs				
application/oipfParentalControlManager embedded object	7.9.1	M(*)	The parentalRatingSchemes property shall be supported. Other properties and methods are not included. For terminals that support annex **O**, the `verifyParentalControlPIN` method and the extensions and clarifications in clause A.2.31 shall be supported for broadcast-related applications and broadcast-independent applications excluding linked applications of types 4.1, 4.2 and 4.3.	None

2. A new clause A.2.31 is added as follows.

A.2.31 Extensions to the application/oipfParentalControlManager object

A.2.31.1 Properties

For terminals that support annex O, the application/oipfParentalControlManager object shall be extended with the following property.

`readonly Integer parentalPINLength`
The number of digits that make up the parental control PIN in the terminal. Shall return 0 if parental access control is disabled (e.g. explicitly by the user). Shall return -1 if parental access control is enabled but does not use a PIN code (e.g. uses a gesture or voice input).

NOTE: This is identical to the property defined in clause A.2.8.1 of TS 103 606 [i.31].

A.2.31.2 Methods

For terminals that support annex O, the application/oipfParentalControlManager class shall be extended with the following method.

`Promise requestParentalControlApproval(Object context)`	
Description	Run the terminal's process for approving access for content that is blocked by parental access control. The method is asynchronous. If the terminal uses a PIN code the terminal will prompt for that PIN code and validate it. If the terminal uses some other mechanism (e.g. a gesture or voice input) then the terminal will prompt for that and validate it. Returns a Promise which indicates if the access was approved or not. If access to the blocked content was approved then the promise shall be resolved with value "approved". If access to the blocked content was not approved (either explicitly or implicity through a timeout or repeated failure to input a correct PIN code) then the promise shall be resolved with value "notApproved".
Arguments	Either null or an object containing a set of key-value pairs where each key shall be a BCP-47 [101] language code and each value is a human-readable name of the content to be unblocked in the language of the key that will be shown to the user if the terminal needs one. If an object is passed then it should include at least one key-value pair where the key is the same BCP47 primary language subtag as Configuration.preferredUILanguage47.

NOTE: This is identical to the method defined in clause A.2.8.2 of TS 103 606 [i.31].

7 CSS "nav-" properties are still mentioned in the specification despite deprecation and removal

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
12916				Yes	Ambiguity

In clause 10.2.2.1, the text in brackets is removed as shown.

Applications shall set the NAVIGATION bit of the keyset object even if the navigation keys are only used for focus based navigation ~~(including the CSS nav-* properties)~~ and not used in JavaScript event handlers.

8 E.2.1 doesn't support subtitle only dash

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
12995	Yes	Yes	Yes	Yes	

In clause E.2.1, the following text is modified as shown.

- Except as stated below, the~~The~~ profile specific MPD shall include at least one Adaptation Set encoded using the audio or video codecs defined in clause 7.3.1 of the present document. Adaptation Sets and Representations in non-supported codecs shall be ignored.

  - MPDs that are only used with Media Synchronisation (as defined in clause 13) may, as defined in case 3 of table 14, only contain subtitles.

9 Multi-stream synchronisation – removal of media objects and re-evaluation of component selection

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13061			Yes	Yes	

1. In clause 8.2.3.1, the example for multi-stream synchronisation is modified as shown underlined.

```
// synchronisation can be stopped by removing the DASH object from the MediaSynchroniser
// while also ensuring only components from the video/broadcast media object (and not the DASH
// media object) are selected and that the DASH media object stops.
vba1.selectComponent(0); // COMPONENT TYPE VIDEO
vba1.selectComponent(1); // COMPONENT TYPE AUDIO
vba1.selectComponent(2); // COMPONENT TYPE SUBTITLE
ms.removeMediaObject(dasha1);
dasha1.stop();
```

2. In clause 8.2.3.2.2, the description of `removeMediaObject` is modified as shown.

`void removeMediaObject (Object mediaObject)`		
Description	Removes an object from this `MediaSynchroniser`. Using this method to remove all media objects added to a `MediaSynchroniser` using `addMediaObject` shall terminate multi-stream synchronization but shall leave the timeline specified when the `MediaSynchroniser` was initialized being monitored. Applications shall be able to continue to read the value of the timeline from the `currentTime` property. Using this method to remove the master media object (specified in the call to `initMediaSynchroniser`) shall stop timeline monitoring and release all scarce resources associated with this `MediaSynchroniser`. The `MediaSynchroniser` object shall enter the permanent error state and en error event shall be triggered with error code 18. The terminal shall not stop the presentation of media objects purely as a result of this method call. However, if there are insufficient decoders available to continue to present this media object, the presentation of the media object may cease due to insufficient resources. Component selection should be re-evaluated as a result of this method call (see clauses 10.2.7.2 and 10.2.7.3); causing presentation of the removed media object to cease because it is no longer a part of multi-stream synchronisation. NOTE: Application developers can ensure that the removed media object is no longer presenting after a call to removeMediaObject() by explicitly selecting components on the remaining media objects and ensuring the stopped media object is stopped (by calling the stop() method). If the media object has not already been added to the `MediaSynchroniser` and is not the master media object then this call shall be ignored and an error event dispatched with error code 8. If the `MediaSynchroniser` is not initialized, or is in a permanent error state, then this call shall be ignored and an error event dispatched with error code 7 or 13 (according to the definition of the error codes).	
Arguments	`mediaObject`	The media object to be removed.

3. In clause 10.2.7.2, the following paragraph is modified as shown.

In particular, when a new media object is added to a MediaSynchroniser, the terminal shall re-evaluate the default selection of presented components and component types including all of the components that make up that media object (as well as the existing media objects added to the MediaSynchroniser). Likewise, the removal of a media object from a MediaSynchroniser shall cause the terminal to re-evaluate which components to be presented by

default, should select components from media objects that remain added to the MediaSynchroniser and should not select components from the removed media objects.

4. In clause 10.2.7.3, the underlined text is added in the location shown.

- a component, selected by the application, is being presented and is part of a video/broadcast object or an A/V Control object or an HTML5 media element or a MediaSynchroniser object (as appropriate) which is destroyed:
  - in which case component selection for that component type shall revert to the control of the terminal;
- a component, selected by the application, is being presented and is part of a media object that is removed from a MediaSynchroniser object using the removeMediaObject method call:
  - in which case component selection for that component type shall revert to the control of the terminal;

10 Clarification about browser HTTP cache

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13124	Yes	Yes	Yes	Yes	Amiguity

In clause 10.2.1, the following row is amended as shown by underline / strike-through.

Browser HTTP cache	Terminals shall allocate at least 10 MB of storage to the browser HTTP cache (see clause 7.3.2.6).	Terminals may restrict the data cached for any single page, origin or application in order to prevent any one application from degrading the overall user experience.

11 preferred(Audio|Subtitle|UI)Language47 writeable or not?

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13154				Yes	

Clause A.20.2.6 is modified as shown.

A.2.20.6 Extensions for audio and subtitle languages

The following properties are added to the `Configuration` class.

readonly String **preferredAudioLanguage47**
A comma-separated set of languages to be used for audio playback, in order of preference. Each language shall be indicated by its language code as defined according to IETF BCP 47 - IETF RFC 4647 [100] and IETF RFC 5646 [101].

readonly String **preferredSubtitleLanguage47**

A comma-separated set of languages to be used for subtitle playback, in order of preference. Each language shall be indicated by its language code as defined according to IETF BCP 47 - IETF RFC 4647 [100] and IETF RFC 5646 [101].

12 Signalling of HbbTV spec version and features for use within DVB specs

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13216				Yes	

A new annex Q is added as shown.

Annex Q (normative): List of uniform resource names (URN)

Annex A of CTA-5000 [76] and Table Q.1 provide URNs that can be used for signalling the necessary compliance to a web standard for rendering an application. Typical usage for these URNs is the signalling of required terminal capabilities to deliver access services via a linked application as described in clause 4.5.3 of TS 103 770 [96].

Table Q.1 URN for required standard version to run a linked application

URN	Reference	Description
urn:hbbtv:appinformation:standardversion:hbbtv:1.2.1	ETSI TS 102 796 [2116] v1.2.1	HbbTV 1.5
urn:hbbtv:appinformation:standardversion:hbbtv:1.5.1	ETSI TS 102 796 [21] v1.5.1	HbbTV 2.0.2
urn:hbbtv:appinformation:standardversion:hbbtv:1.6.1	ETSI TS 102 796 [21] v1.6.1	HbbTV 2.0.3
urn:hbbtv:appinformation:standardversion:hbbtv:1.7.1	ETSI TS 102 796 [21] v1.7.1	HbbTV 2.0.4

Table Q.2 lists URNs for signalling the usage of optional terminal capabilities to deliver access services via a linked application as described in clause 4.5.3 of TS 103 770 [96].

Table Q.2 URN for required optional feature to run a linked application

URN	Reference	Description
urn:hbbtv:appinformation:optionalfeature:hbbtv:2decoder	ETSI TS 102 796 [21]	Optional HbbTV terminal feature: `+2DECODER`
urn:hbbtv:appinformation:optionalfeature:hbbtv:2html	ETSI TS 102 796 [21]	Optional HbbTV terminal feature: `+2HTML`
urn:hbbtv:appinformation:optionalfeature:hbbtv:graphics_01	ETSI TS 102 796 [21]	Optional HbbTV terminal feature: `+GRAPHICS_01`
urn:hbbtv:appinformation:optionalfeature:hbbtv:graphics_02	ETSI TS 102 796 [21]	Optional HbbTV terminal feature: `+GRAPHICS_02`
urn:hbbtv:appinformation:optionalfeature:hbbtv:screader	ETSI TS 102 796 [21]	Optional HbbTV terminal feature: `+ARIA`

NOTE: The right most element of the URNs is aligned with the optional feature names in the HbbTV test suite, hence "screader" rather than "aria".

13 Expectations when unselectComponent is called

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13247				Yes	Inconsistency

Clause 10.2.7.1 is modified as shown underlined

Enabling control **E1** is the application's control over whether subtitles are presented. It is 'closed', enabling subtitles, unless an application is running and all available subtitle components are deselected (via the `unselectComponent(Integer componentType)` method of a video/broadcast or A/V control object, or by setting the mode attribute of all TextTracks linked to an HTML5 media element to 'disabled' or 'hidden'). The user does not have any ability to control this setting directly. Moreover, this control is influenced solely by the application state and the action of application APIs and may be 'open', disabling subtitles, even when component selection is under the control of the terminal (as in clause 10.2.7.2).

14 Accessibility Framework: Scope of "enabled" setting in many of the messages isn't clear enough.

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13265				Yes	Ambiguity

1. The following text is to be added to clause 15.2.2.3.2 as shown.

15.2.2.3.2 Feature detailed settings query response message

The results parameter contains a response which describes the detailed settings corresponding to the requested Accessibility Feature. The responses are feature specific and are detailed in the related sub-clauses of clause 15.3.

Temporary settings changes made (for example via a contextual pop-up menu) that override the main system menu settings need to be reflected in any response to a settings query. The latest overall setting value is expected to be returned to the application.

Terminals may provide optional user setting parameters in responses, and terminals shall provide mandatory user setting parameters in responses. Terminals shall map provided parameters in any responses as accurately as possible to the corresponding terminal user setting. See the related sub-clauses of clause 15.3 for further clarifications on specific parameter mapping considerations.

If an application requests user settings using `org.hbbtv.af.featureSettingsQuery` for a feature that is not supported by a TV OS (i.e. a response to a `org.hbbtv.af.featureSupportInfo` message would be a `value` of `notSupported` or `supportedNoSetting`) then a JSON-RPC error with a `code` value of `-23` and a `message` value of "`Invalid accessibility settings query`" (as indicated in Table 10e in clause 9.9.7) shall be returned to the application.

2. The following text is to be added to clause 15.2.2.4 as shown.

15.2.2.4 Change of TV OS Accessibility Feature setting

In addition to the JSON-RPC Request message enabling HbbTV® applications to query individual TV OS Accessibility Feature settings, terminals shall, under certain defined conditions, send feature specific notifications to the HbbTV® application to reflect a change to the setting.

Each individual accessibility feature defines its own user Setting Change notification message, specific to each accessibility feature. See clauses 15.3.2 to 15.3.9.

Temporary settings changes made (for example via a contextual pop-up menu) that override the main system menu settings need to be reflected to applications, and as such these trigger a notification message to be sent to the application. The latest overall setting value is expected to be notified to the application. This includes situations where the system removes a temporary setting change which was initiated by the user.

15 New hcType strategy for High Contrast UI feature

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13370				Yes	Other

1. Clause 15.3.5.2 is modified as shown.

15.3.5.2 High Contrast UI settings query response message

Table 36 below describes the variable parameters of `value` field of a response message to an `org.hbbtv.af.featureSettingsQuery` request message where the `"feature"` field of the `"params"` object is set to `"highContrastUI"`.

Table 36: High contrast UI response message parameters

Parameter	Data Type	Mandatory (M) or Optional (O)	Valid Values	Description
"enabled"	Boolean	M	true or false	If the user has enabled a high contrast UI in their TV OS settings then this parameter shall be set to `true`.
"hcType"	String	O	"monochrome", "hcText", "other"	This parameter describes the type of High Contrast scheme currently set by the TV OS. It shall be present if the `"enabled"` parameter is set to `"true"`. The value `"monochrome"` is used for High Contrast schemes that use a single colour in the on-screen user interface - typically a grey scale. The value `"hcText"` is used for High Contrast schemes that adjust the readability of text elements in the UI, typically by putting some highlighting or a narrow background around the edge of text characters. If the terminal cannot approximate its selected `"hcType"` to any of those defined in this list (other than `"other"`) then it should set the `"hcType"` to `"other"`. See note.
NOTE	In the present document, only ~~one~~ two defined High Contrast ~~scheme is~~ schemes are defined ("monochrome" and "hcText"). This list may be extended in a future version of the present document to accommodate additional High Contrast schemes. In this version, any High Contrast scheme that cannot be described as "monochrome" or "hcText", should be set to "other".			

An example response message for communicating the High Contrast UI user settings is as follows:

```
{
  "jsonrpc" : "2.0",
  "result"  : {
    "method" : "org.hbbtv.af.featureSettingsQuery",
    "feature": "highContrastUI",
    "value"  : {"enabled" : true, "hcType": "monochrome"}
  },
  "id"      : 1
}
```

2. Clause 15.4.6 is modified as shown.

15.4.6 High Contrast UI

Clause 15.3.5.2 defines a single High Contrast UI type of "monochrome". This can be achieved application side by applying of an alternative set of styles (ref CSS) to visible elements of the application.

Original coloured images could be retained by the application or could be replaced with monochrome images - perhaps with some enhancements to assist visibility. These could be realized by applications calling for mono-chrome or enhanced image variants rather than using the standard coloured images.

Note that it would be beyond an applications control to change video content from its original format.

Clause 15.3.5.2 also defines a High Contrast UI type of "hcText". This can be achieved by adjusting the font or font parameters and may also benefit from some CSS styles being applied to textual elements in the page – perhaps adjusting them further as elements take focus.

3. The electronic attachments are modified as shown.

```
--- response__org.hbbtv.af.featureSettingsQuery.highContrastUI.schema.json.old  2023-11-14
11:02:32.518516900 +0000
+++ response__org.hbbtv.af.featureSettingsQuery.highContrastUI.schema.json  2023-11-14
11:02:55.572162300 +0000
@@ -12,7 +12,7 @@
           "type" : "object",
           "properties" : {
             "enabled": { "type" : "boolean" },
-            "hcType" : { "enum" : ["monochrome", "other"] }
+            "hcType" : { "enum" : ["monochrome", "hcText", "other"] }
           },
           "required": ["enabled"]
         }
```

16 Enabling use of TV native UI for audio or video or subtitle component selection when media playback is via MSE

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13373				Yes	Other

1. Clause 10.2.7.6 is modified as shown.

10.2.7.6 Component selection with MSE ~~(informative)~~

10.2.7.6.1 Introduction

When MPEG DASH content is being presented by an HTML5 media element using a `MediaSource` object, the application feeding data to the `SourceBuffers` is responsible for selecting video and audio Adaptation Sets, and for presenting subtitles. Applications can use the `preferredAudioLanguage`, `preferredSubtitleLanguage`, `subtitlesEnabled` and `audioDescriptionEnabled` properties of the `Configuration` class (see clause A.2.20.1 and OIPF DAE [1] clause 7.3.2.1 for details).

The following are defined so that the terminal UI for component selection may remain active during MSE media presentation.

- The application informs the terminal about the components that are available and changes in this using the `org.hbbtv.ipplayback.setComponents` request. The terminal may use this information in its component selection UI. See clause 10.2.7.6.4.
- The terminal informs the application about changes in component selection made with the component selection UI using the `org.hbbtv.ipplayer.selectComponents` request. See clause 10.2.7.6.5.

10.2.7.6.2 Information on available components

Applications presenting media using MSE should keep the terminal informed about the set of available media components and changes in that set of components by sending the `org.hbbtv.ipplayback.setComponents` JSON message to the terminal. At the start of playback, applications should send this message no later than 1 second after video and audio are presented to the user. When the set of media components changes during playback, applications

should send this no earlier than 1 second before the new components are presented to the user and no later than 1 second after the new components are presented to the user. At the end of playback using MSE, applications should send this message with an empty component list.

Terminals that include a UI for component selection which offers the user a choice of the available components shall support the `org.hbbtv.ipplayback.setComponents` JSON message and should use the information from this JSON message for that UI. The normative definition of this message is found in Annex N of the present document. Table 13a describes the properties of the `params` object for this method, when those properties are required or optional, and the meaning of the values they can take.

Table 13a: Properties for `org.hbbtv.ipplayback.setComponents`

Property	Required?	Values and their meaning
sessionID	Always required	Shall be set to zero. If the `sessionID` is not set to zero, the method shall fail with error code -3 "Not found".
componentList	Always required	Shall be an array of objects. Each object's properties shall be name:value pairs carrying at least the fields required to populate an instance of one of the `AVVideoComponent`, `AVAudioComponent` or `AVSubtitleComponent` classes, including the fields of the base class `AVComponent`. Any field whose value would be undefined in the `AVComponent` classes shall be omitted. The class to use shall be chosen based on the `type` field which shall be present in each object. The `componentTag` field shall be present for each component and shall have a unique value among the set of components. For future compatibility, terminals shall ignore any additional properties present that they do not understand.

Applications may set name-value pairs corresponding to any of the fields of the `AVVideoComponent`, `AVAudioComponent` and `AVSubtitleComponent` classes for which a mapping for MPEG DASH is defined in clause 8.4.2 of OIPF DAE or clause O.6.3 of TS 102 796 v1.7.1. Table 13b defines additional name-value pairs for use in any of the components.

NOTE: Language codes from DASH content may be passed through unmodified. This may result in terminals seeing 2-character language codes.

Table 13b: Additional name-value pairs for `org.hbbtv.ipplayback.setComponents`

Component property name	Required?	Component property value
dashRole	Optional	An array of objects with string properties `schemeIdUri` and `value` populated with the attributes of MPEG DASH `Role` elements associated with the component. The `value` property may be omitted if no `Role@value` attribute is present.
dashAccessibility	Optional	An array of objects with string properties `schemeIdUri` and `value` populated with the attributes of MPEG DASH `Accessibility` elements associated with the component. The `value` property may be omitted if no `Accessibility@value` attribute is present.
dashPproperty	Optional	An array of objects with string properties `schemeIdUri` and `value` populated with the attributes of MPEG DASH `SupplementalProperty` and `EssentialProperty` elements associated with the component. The `value` property may be omitted if no `@value` attribute is present.
dashLlabel	Optional	An array of objects containing text that annotates the element in the DASH Media Presentation, populated with the attributes of the MPEG DASH Label elements associated with the component. The `lang` property identifies the language of the audience the label is targeted at. The `id` and/or `lang` properties may be omitted if `Label@id` or `Label@lang` attributes are not present. The content of the DASH `Label` element shall be reflected as the label property in the JSON.
dashGgroupLabel	Optional	An array of objects containing labels for a group of labels with identical `Label@id` attributes with properties as defined for label above.
tag	Optional	A string value referencing the Preselection to be decoded, populated with the `@tag` attribute of the MPEG DASH element associated with the component. The `tag` property may be omitted if no `@tag` attribute is present.
initiallyActive	Always required	A Boolean value indicating if the component is selected at the time of the call.

The example below illustrates this request:

```
{
    "jsonrpc": "2.0",
    "method": "org.hbbtv.ipplayback.setComponents",
    "params": {
        "sessionID": 0,
        "componentList": [
            {
                "type": 0,
                "componentTag": 10,
                "encoding": "avc3.640028",
                "encrypted": false,
                "aspectRatio": 1.78,
                "initiallyActive": true
            },
            {
                "type": 1,
                "componentTag": 20,
                "encoding": "mp4a.40.5",
                "encrypted": false,
                "language": "en",
                "audioDescription": false,
                "audioChannels": 2,
                "dashRole": [
                    {
                        "schemeIdUri": "urn:mpeg:dash:role:2011",
                        "value": "main"
                    }
                ],
                "initiallyActive": true
            },
            {
                "type": 1,
                "componentTag": 21,
                "encoding": "mp4a.40.5",
                "encrypted": false,
                "language": "en",
                "audioDescription": true,
                "audioChannels": 2,
```

```
                "dashRole": [
                    {
                        "schemeIdUri": "urn:mpeg:dash:role:2011",
                        "value": "alternate"
                    }
                ],
                "dashAccessibility": [
                    {
                        "schemeIdUri": "urn:tva:metadata:cs:AudioPurposeCS:2007",
                        "value": "1"
                    }
                ],
                "dashLabel": [
                    {
                        "label": "English for the visually impaired",
                        "lang": "en"
                    },
                    {
                        "label": "Englisch mit Bildbeschreibung für Menschen mit
Sehbehinderungen",
                        "lang": "de"
                    }
                ],
                "initiallyActive": false
            },
            {
                "type": 2,
                "componentTag": 30,
                "encoding": "stpp.ttml.etd1|im1t",
                "encrypted": false,
                "language": "en",
                "hearingImpaired": true,
                "initiallyActive": false
            }
        ]
    },
    "id": "1620296880423"
}
```

The example below illustrates a corresponding response:

```
{
    "jsonrpc": "2.0",
    "result": {
        "method": "org.hbbtv.ipplayback.setComponents"
    },
    "id": "1620296880423"
}
```

10.2.7.6.3 Component selection using terminal UI

Terminals that include a UI for component selection that remains functional when an application is presenting media using MSE shall send `org.hbbtv.ipplayer.selectComponents` requests to applications that have registered to receive them whenever the user requests a change of selected components. The normative definition of this message is found in Annex N of the present document.

Table 13c describes the properties of the params object for this request, whether those properties are required or optional, and the meaning of the values they can take.

Each component to be selected is identified from the set of available components (as passed to the terminal using the immediately previous `org.hbbtv.ipplayback.setComponents` request, see clause 10.2.7.6.2) by its `componentTag` value.

Table 13c: Properties for `org.hbbtv.ipplayer.selectComponents`

Property	Required ?	Values and their meaning
sessionID	Always required	Shall be set to zero. Applications shall ignore values other than zero to avoid accidental interference with operator applications where TS 103 606 [i.31] is supported.
videoComponents	Always required	An array of numbers representing `componentTag` values that identify the video components to be selected. If the array is empty, the player is requested to stop presenting any video components. Behaviour is undefined if more than one video component is included.
audioComponents	Always required	An array of numbers representing `componentTag` values that identify the audio components to be selected. If the array is empty, the player is requested to stop presenting any audio components.
subtitleComponents	Always required	An array of numbers representing `componentTag` values that identify the subtitle components to be selected. If the array is empty, the player is requested to stop presenting any subtitle components.

The example below illustrates this request, using components selected from the set illustrated in the `org.hbbtv.ipplayback.setComponents` example (see clause 10.2.7.6.2):

```
{
    "jsonrpc": "2.0",
    "method": "org.hbbtv.ipplayer.selectComponents",
    "params": {
        "sessionID": 0,
        "videoComponents": [ 10 ],
        "audioComponents": [ 21 ],
        "subtitleComponents": []
    },
    "id": 1682340878654
}
```

The example below illustrates a corresponding response:

```
{
    "jsonrpc": "2.0",
    "result": {
        "method": "org.hbbtv.ipplayer.selectComponents"
    },
    "id": 1682340878654
}
```

2. Annex N is modified as shown.

- notification__org.hbbtv.af.inVisionSigning.schema.json
  This is the normative JSON schema that will validate for a correctly formed JSON-RPC notification with method name org.hbbtv.notify and a msgType of inVisionSigningPrefChange, as referred to in clause 15.3.9.3 of the present document.

- request__org.hbbtv.ipplayer.selectComponents.schema.json
  This is a normative JSON schema that will validate a correctly formed JSON-RPC request with method name org.hbbtv.ipplayer.selectComponents, as referred to in clause 10.2.7.6.3 of the present document.

- request__org.hbbtv.ipplayback.setComponents.schema.json
  This is a normative JSON schema that will validate a correctly formed JSON-RPC request with method name org.hbbtv.ipplayback.setComponents, as referred to in clause 10.2.7.6.2 of the present document.

NOTE: The zip file also contains electronic versions of a number of the examples included in the body of the present document.

17 Conflicting modifications to onPlayPositionChanged event definition

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other

13392			Yes	Yes	Inconsistency

In clause A.2.4.5, the following text is deleted.

In clause 7.13.2.2 of the OIPF DAE specification [3], the definition of the property `onPlayPositionChanged( Integer position )` is changed as shown:

> The function that is called when change occurs in the play position of a channel due to the use of ~~trick play functions~~ random access functions.

Clause A.2.4.7.3 is modified as shown by underline / strike-through.

`function onPlayPositionChanged( Integer position )`
The function that is called when a change occurs in the play position of a channel due to the use of random access functions (i.e. seek) or due to trick play ~~functions~~ during time-shift. The specified function is called with one argument, position, which is defined as follows: • Integer position - the playback position of the media at the time the event was dispatched, measured from the start of the time-shift buffer in milliseconds. If the play position cannot be determined, this argument takes the value `undefined`.

18 Potentially confusing order of sections in 9.9 (websocket)

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13433				X	Editorial

1. Clause 9.9.4.1 is modified as follows.

The `"msgType"` determines which type of message is being carried in the notification, and determines the format of the `"value"` parameter. The `"value"` parameter is always an aggregate data type, but there are no conditions on how many parameters it carries.

These notifications shall conform to generic schema whose normative definition is found in the electronic attachments - see annex N of the present document.

NOTE: The terminal does not send `org.hbbtv.notify` notifications unless use of that method has first been negotiated (see clause 9.9.5).

9.9.4.2 Registration for JSON-RPC Notifications (informative)

2. Clause 9.9.4.3 is modified as follows.

As per ATSC A/344 [95], Annex E, section 5.1, JSON-RPC Responses in an error condition shall contain an error Object which, as a member, contains a parameter of integer type named code. HbbTV® uses the JSON-RPC defined code values shown in the table in ATSC A/344 [95] Annex E, section 5.1. In addition, Table 10e in clause 9.9.7 of the present document documents additional HbbTV® defined error codes.

NOTE: The `org.hbbtv.subscribe` method can only be used after its use has been negotiated (see clause 9.9.5).

9.9.4.4 Unsubscribe API

3. Clause 9.9.4.4 is modified as follows.

As per ATSC A/344 [95], Annex E, section 5.1, JSON-RPC Responses in an error condition shall contain an `error` Object which, as a member, contains a parameter of integer type named `code`. HbbTV® uses the JSON-RPC defined code values shown in the table in ATSC A/344 [95], Annex E, section 5.1. In addition, Table 10e in clause 9.9.7 of the present document documents additional HbbTV® defined error codes.

NOTE: The `org.hbbtv.unsubscribe` method can only be used after its use has been negotiated (see clause 9.9.5).

9.9.5 Request capability negotiation

4. Clause 9.9.5 is modified as follows.

The set of `JSON`-RPC requests supported by the terminal shall remain static for at least the lifetime of the HbbTV® application.

NOTE 1: Applications need to perform this negotiation as soon as is practical every time the application is launched. If it is not performed then the terminal can reasonably assume that no JSON-RPC requests are supported by the application.

NOTE 2: For the purposes of capability negotiation, the term "JSON-RPC request" and "JSON-RPC message" include both request messages that expect a response and notification-style messages that do not. As illustrated in the example, the use of `org.hbbtv.notify` and `org.hbbtv.subscribe` and `org.hbbtv.unsubscribe` is only possible after they have been negotiated via the `org.hbbtv.negotiateMethods` method.

9.9.6 Extensibility and compatibility

19 TLS versions in text about client certificates

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13511			Yes	Yes	Inconsistency

Clause 11.3 is modified as shown.

11.3TLS client certificates

In HTTP over TLS, the use of a client certificate authenticates the client to a service provider. Some business models require that an HbbTV® application is delivered exclusively to trusted HbbTV® terminal implementations. To support these, terminals may support use of client certificates.

Negotiation and delivery of client certificates to the server is defined by the TLS 1.2 specification [8] and the TLS 1.3 specification [73].

Client certificates shall comply with IETF RFC 5280 [9].

The provision of client certificates is outside the scope of the present document.

20 DataCue(TextTrackCue) id property type

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13576	Yes	Yes	Yes	Yes	

Clause 9.3.2.2 is modified as shown (all property names starting with an upper-case character should be lower case).

TextTrack property	MPD Events	Inband Events
~~K~~kind	Metadata	Metadata
~~L~~label	Empty string	Empty string
~~L~~language	Empty string	Empty string
~~i~~id	Empty String	Empty String
inBandMetadataTrackDispatchType	@schemeIdUri + "U+0020" (SPACE character) + @value	@schemeIdUri + "U+0020" (SPACE character) + @value
~~M~~mode	Hidden	Hidden

DataCue(TextTrackCue) property	MPD Events	Inband Events
~~id~~id	@id. If the @id attribute is not specified, id shall be set to an empty string. With reference to clause 9.1.5 of ETSI TS 103 285 [1], events without a value of @id specified shall not be considered as repetitions of the same event.	Id
startTime	@presentationTime (scaled according to the EventStream @timescale attribute) + the time offset of the start of the period from the start of the presentation (MPEG DASH defines that the value of @presentationTime defaults to zero if the attribute is not present).	presentation_time_delta (scaled according to the timescale value) + the time offset of the start of the segment from the start of the presentation.
endTime	The startTime + @duration, subject to the minimum duration requirements below. If the @duration attribute is not specified, endTime shall be set to `Number.MAX_VALUE`.	The startTime + the event_duration, subject to the minimum duration requirements below. If event_duration is 0xFFFF, endTime shall be set to `Number.MAX_VALUE`.
pauseOnExit	False	False
~~O~~onenter	As defined in the HTML5 Recommendation [6].	As defined in the HTML5 Recommendation [6].
~~O~~onexit	As defined in the HTML5 Recommendation [6].	As defined in the HTML5 Recommendation [6].
data	An ArrayBuffer containing the (character data) value of the `Event` element. If the optional `contentEncoding` attribute is set to "base64" then the (character data) value of the `Event` element shall be decoded as described in IETF RFC 4648 [7] before use. If the `Event` element does not solely contain character data (e.g. if it contains child elements or if it is empty) then this property shall contain a UTF-8 encoded XML document subset such that the canonical form of the XML returned by reading this property shall be identical to the canonical form of the `Event` element in the MPD starting with the opening `<Event>` tag and the closing `</Event>` tag. See clause 2.4, "Document subsets" of Canonical XML Version 1.1 [8]. Note that MPEG DASH [9] requires that the encoding of MPDs be UTF-8 so no change to the encoding is required when returning an XML document subset taken from the MPD.	`message_data`

21 Conflict between annex O and DVB-I spec on precedence

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13624				YES	Inconsistency

Table O.3 is modified as shown.

Table O.3: Property mapping for Channel objects corresponding to a DVB-I service instance delivered by Broadcast

Property name	Source/Value
channelType	As defined in clause 8.4.3 of the OIPF DAE specification [1].
idType	The appropriate one of ID_DVB_C, ID_DVB_T, ID_DVB_T2, ID_DVB_S, ID_DVB_S2 for the broadcast technology concerned.
ccid	Unique identifier for the service instance generated by the terminal. The value shall be different from the value of the parent service.
onid	As defined in clause 8.4.3 of the OIPF DAE specification [1].
nid	As defined in clause 8.4.3 of the OIPF DAE specification [1].
tsid	As defined in clause 8.4.3 of the OIPF DAE specification [1].
sid	As defined in clause 8.4.3 of the OIPF DAE specification [1].
name	ServiceInstance.DisplayName if present otherwise as ~~As~~ defined in clause 8.4.3 of the OIPF DAE specification [1]. If multiple language versions of ServiceInstance.DisplayName are present one of which is the same as Configuration.preferredUILanguage then that language shall be used.
majorChannel	As defined in clause 8.4.3 of the OIPF DAE specification [1].
dsd	As defined in clause 8.4.3 of the OIPF DAE specification [1].
ipBroadcastID	As defined in clause 8.4.3 of the OIPF DAE specification [1].
parentService	See clause O.5.3.

22 JSON-RPC Error Messages

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13680				Yes	Error

In clause 9.9.7, in both of tables 10e and 10f, “Parse Error” is changed to “Parse error” and “Invalid request” is changed to “Invalid Request”.

23 §10.2.6.1 "shall"..."eventually" not specific

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13688			Yes	Yes	Error

Clause 10.2.6.1 is modified as shown using underline and strike-through.

- If access to broadcast TV content is blocked when changing to a channel due to either of the above mechanisms being followed, the state machine defined in Table 8 of the OIPF DAE specification [3] shall be followed:
  - Specifically, the presenting state is not entered, a transient error occurs leaving the video/broadcast object in the connecting state.
  - If the terminal provides a mechanism to authorize access to TV content (e.g. entering a PIN code) then the following shall apply:
    - If the user successfully authorizes access then the video/broadcast object recovers from the transient error and enters the presenting state. Otherwise
    - If the signalling in the broadcast changes to being below the threshold then the video/broadcast object recovers from the transient error and enters the presenting state. Otherwise
    - If the mechanism has an (implementation-specific) time-out and this has passed then ~~Otherwise~~ the video/broadcast object ~~eventually~~ has a permanent error and enters the unrealized state.
    - Otherwise the terminal shall continue in the connecting state until the user uses the terminal UI to leave the channel concerned
- If the terminal does not provide a mechanism for the user to authorize access for the specific mechanism that resulted in content being blocked then the video/broadcast object shall have a permanent error immediately.

24 Annex O.5.2 The ChannelList class getChannelByTriplet on multiple Service Instances Clarification

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13689				Yes	Ambiguity

Clause O.5.2 is modified as shown using underline and strike-through.

The method `Channel getChannelByTriplet( Integer onid, Integer tsid, Integer sid, Integer nid )` shall be supported as follows:

- If the arguments of the method match the triplet of a DVB-I service as signalled by the `DVBTriplet` extension to the DVB-I `Service` element then the `Channel` object in the `ChannelList` corresponding to that service shall be returned, otherwise;
- If the arguments of the method match the triplet of a single DVB-I service instance delivered by classic RF-based broadcast then the `Channel` object returned shall be the one corresponding to that service instance in the `serviceInstances` array of the `Channel` object corresponding to the parent DVB-I service of the matching service instance in the `ChannelList`, otherwise;
- ~~If both the above apply then the Channel object corresponding to the service shall be returned.~~
- If the arguments of the method match the triplet of a DVB-I service instance delivered by classic RF-based broadcast that is included in the currently selected DVB-I service then that service instance shall be returned even if a service instance with the same triplet is included in other DVB-I services, otherwise;
- If the arguments of the method match the triplet of more than one DVB-I service instance delivered by classic RF-based broadcast none of which are included in the currently selected DVB-I service then the service instance included in the DVB-I service with the lowest value of `terminalChannel` shall be returned.

25 Conflict between O.3 and A177R6 5.2.13

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13697				X	Inconsistency

The following text is inserted in clause O.3

- The following clarifications shall apply concerning DVB-I linked applictions stopping or being stopped.
  - If the DVB-I client / linked application manager terminates the linked application due to an irrecoverable error in the application (e.g. running out of memory) then the linked application shall be re-restarted. The number of times an application is re-started after being terminated may be limited but shall be greater than one. If the linked application is not re-started then the DVB-I client shall choose a different service instance.
  - If the “Exit or comparable button” mechanism from Table 2 is used by the end-user, the service instance shall remain selected and the application shall be re-started according to clauses O.74 and 6.
  - If the application signalling changes and a running linked application is no longer permitted to carry on running then the DVB-I client shall follow the new signalling including terminating the running application.
    For the specific case of a type 1.2 application, the application signalling can only change when the service list changes. Terminals shall not run applications while processing such a change. This typically happens during the night when no service is selected and hence no application would be running anyway.
  - If a running linked application triggers a change of service or of the service instance within a service then the DVB-I client shall follow the signalling of the new service or service instance which may include terminating the running application.

If the result of following clause 5.2.13 of TS 103 770 [5] is that no service instances remain that can be selected then the terminal shall show an error message. This should be aligned with the error message that would be shown if an installed DVB-C/S/T service can no longer be received.

26 Remove DNT

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13706	Yes	Yes	Yes	Yes	Implementation

1. The normative references are modified as shown.

[i.9] ~~W3C® Last Call Working Draft (24 April 2014): "Tracking Preference Expression (DNT)".~~ Void.

2. The contents of clause 12.1.1 including all sub-clauses are removed and replaced by the following.

This clause (previously titled “Tracking preference expression (DNT)”) and it’s subclauses have been removed from the current version of this specification. The Do Not Track (DNT) feature has not been deployed in services, and the presence of this feature in a terminal, especially the settings user interface to control this feature, could be viewed as providing users with a sense of privacy that does not exist.

3. Clause 12.1.3 is modified as shown.

Manufacturers of HbbTV® terminals should consider providing the option of disallowing requests to tracking websites. If such an option is provided, manufacturers shall allow the user to set this option ~~in a similar way to the DNT setting in clause 12.1~~.

4. The abbreviation “DNT” is removed.

27 W3C media capabilities API added in 2.0.4 (CTA-5000-D) without truthfulness requirement

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13713				Yes	Ambiguity, Other

A new clause A.3.27 is added as below.

A.3.27 Media Capabilities API

The Media Capabilities API [i.1] (normatively referenced through the Web Media API Snapshot [10]) shall truthfully reflect the terminal capabilities. Specifically, the `supported` property in the `result` returned from a call to the `decodingInfo` method shall return `true` if the specified combination of `VideoConfiguration` (if present), `AudioConfiguration` (if present) and `MediaCapabilitiesKeySystemConfiguration` (if present) is fully supported and `false` if it is not.

For an equivalent query, the result returned by the Media Capabilities API shall be consistent with that returned by the `MediaSource.isTypeSupported` method (see clause 9.6.13) and what is included in the XML capabilities (see clause 10.2.4.7).

A new informative reference is added as below.

[i.1] W3C Working Draft: "Media Capabilities"

28 O.7: conflict with DVB-I specification for app controlling media presentation & other issues

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13735				Yes	Inconsistency

The following text is added in clause O.3.

- For a service instance where an ‘application controlling media presentation’ is used, the flow charts in clauses 6.2.2.2 and 6.2.2.3 of the present document are modified as follows.

  - When selecting such a service instance, if presentation of the service instance is blocked by parental rating (see clause 8.4 of TS 103 770 [5]) and the application is not already running then it shall not be started. If the application is already running, then either it shall be killed or it shall be frozen as defined by the page lifecycle API [17] and clause 6.2.4 of the present document.

NOTE 1: The referenced requirements were added in TS 103 770 [5] V1.2.1.

  - If the blocking of the service is later removed while the service instance remains selected then the “application controlling media presentation” shall be started if it is not running and shall resume if frozen.

  - While a service instance presented by an ‘application controlling media presentation’ is selected, if the parental rating changes and presentation is to be blocked then either;

    - The application shall be killed. When or if the blocking is later removed, the application shall be re-started.

    - The application shall be frozen as defined by the page lifecycle API [17] and clause 6.2.4 of the present document. When or if the blocking is later removed, the application resume from frozen as defined by that API.

Clause O.7 is modified as shown using underline and strike-through markup.

The following requirements shall apply for parental access control when a linked application is present:

The ParentalGuidance element defined in clause 6.10.15 of ETSI TS 103 770 [96] and clause 9.1.2.3 of ETSI TS 103 285 [45] shall not apply to linked applications of type 1.1 or 2. It shall apply only to the video, audio and subtitle components of a DVB-I service instance delivered by DASH. ~~It shall not apply to any linked application according to the present document.~~ Parental access control of linked applications of type 1.1 and 2 shall be controlled only by the parental rating element as defined in clause 7.2.3.2 of the present document.

For a linked application of type 1.2, the application is killed or frozen according to the requirements defined in clause O.3. ~~an "Application controlling media presentation" clause 9.1.2.3 of ETSI TS 103 285 [45] does not apply as the terminal's DASH player is not used. The application is responsible for detecting and enforcing any changes in parental rating for video, audio and subtitles.~~

29 Graphics constraints ambiguities and inconsistencies

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13737			Yes	Yes	Ambiguity, Inconsistency

In clause 7.2.3.1, the following changes are made to table 5.

5.2.9 Graphics constraints	21	M/NI	Support for this descriptor is mandatory for terminals that support graphics coordinate systems other than 1 280 x 720. Otherwise it is not included. The fields `can_run_without_visible_ui`, `handles_configuration_changed` and `handles_externally_controlled_video` have no meaning for HbbTV® applications. Applications should not be signalled with `can_run_without_visible_ui`, `handles_configuration_changed` or `handles_externally_controlled_video` set to "1". Terminals should ignore the values of these flags. Applications should not be signalled with `graphics_configuration_byte` values of 1 or 2. If this descriptor is present, the list of `graphics_configuration_byte` shall include all the graphics co-ordinate systems that the application supports. Except where an application is targeting a subset of terminals with known capabilities, applications shall support 1 280x720 (value 3) as this is the only mandatory co-ordinate system required by the present document. Terminals shall ignore applications (i) that have this descriptor, and ~~do not list any graphics co-ordinate system that the terminal supports~~ (ii) where the descriptor lists at least one graphics co-ordinate system, and (iii) where none of the listed graphics co-ordinate systems are supported by the terminal. Applications should not be signalled with this descriptor present but the list of graphics configurations empty. Applications that can adapt to any graphics coordinate system should be signalled as supporting all of them. Signalling an empty list of graphics configurations may result in an application being discarded. Values for `graphics_configuration_byte` from the range "Reserved for future use by DVB project" are allocated for HbbTV® applications as follows; 3 840 x 2 160 - 5 7 680 x 4 320 - 6 See Table 11, row "HbbTV® application graphics co-ordinate system" for more information. This descriptor is only defined in the application (inner) descriptor loop.
5.3.5.8 Graphics constraints descriptor	39	M/NI	Same as 5.2.9.

In clause 7.2.3.2, the following changes are made.

- Where applications are able to take advantage of graphics co-ordinate system resolutions higher than 1 280 × 720, the inclusion of a `<GraphicsConstraints>` element as shown below in the extended format of the application's `<ApplicationDescriptor>` element indicates the graphics constraints for that application. The elements and attributes shall have the same semantics as the fields of the equivalent name in the graphics_constraints_descriptor in clause 5.2.9.2 of ETSI TS 102 809 [3] as modified by the row "5.2.9 Graphics constraints" of table 5. Graphics configurations shall be encoded as URNs and listed in order of preference with the most preferred first. Only the following values are in the scope of the present document but other values are not excluded:

  - `urn:hbbtv:graphics:resolution:1280x720`
  - `urn:hbbtv:graphics:resolution:1920x1080`
  - `urn:hbbtv:graphics:resolution:3840x2160`
  - `urn:hbbtv:graphics:resolution:7680x4320`

  The `<GraphicsConstraints>` element should not be present if only 1280x720 is supported.

30 DVB-I service instances whose physical layer is not supported/installed/connected by/in a terminal

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13741				Yes	Implementation

In clause O.5.3, the definition of the serviceInstance property is modified as shown.

In ChannelList serviceInstances	
Description	When the channel corresponds to a service in a DVB-I service list (and not to a service instance) the value of this property shall be an array of Channel objects where each one corresponds to a DVB-I service instance in that service and where there is one object for each service instance excluding ones that are not supported, not installed or are otherwise disabled by the terminal, e.g. DVB-S not being connected, e.g. non-supported OtherDeliveryParameters (see TS 103 770 [96] table 16 and clause G.2.2). Otherwise the value of this property shall be `undefined`.

31 Improved EAA compatibility

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13742	Yes	Yes	Yes	Yes	Ambiguity

The following text is added to the descriptions of both the `subtitlesEnabled` and `audioDescriptionEnabled` properties.

> Temporary settings changes made (for example via a contextual pop-up menu) that override the main system menu settings shall be reflected in any response to a settings query. The latest overall setting value is to be returned to the application.

32 Uniform resource names identifying specification versions and optional features

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13758			Yes	Yes	Other

The following annex is added.

Annex Q: List of Uniform Resource Names (URN)

Table Q.1 provide URNs that can be used for signalling the necessary compliance to a web standard for rendering an application. Typical usage for these URNs is the signalling of required terminal capabilities to deliver access services via a linked application as described in clause 4.5.3 of TS 103 770 [5].

Table Q.1: URN for required standard version to run a linked application

URN	Reference	Description
urn:hbbtv:appinformation:standardversion:hbbtv:1.2.1	ETSI TS 102 796 [] v1.2.1	HbbTV 1.5
urn:hbbtv:appinformation:standardversion:hbbtv:1.5.1	ETSI TS 102 796 [] v1.5.1	HbbTV 2.0.2
urn:hbbtv:appinformation:standardversion:hbbtv:1.6.1	ETSI TS 102 796 [] v1.6.1	HbbTV 2.0.3
urn:hbbtv:appinformation:standardversion:hbbtv:1.7.1	The present document	HbbTV 2.0.4

Table Q.2 lists URNs for signalling the usage of optional terminal capabilities to deliver access services via a linked application as described in clause 4.5.3 of TS 103 770 [5].

Table Q.2: URN for required optional feature to run a linked application

URN	Reference	Description
urn:hbbtv:appinformation:optionalfeature:hbbtv:2decoder	The present document	Optional HbbTV terminal feature: +2DECODER
urn:hbbtv:appinformation:optionalfeature:hbbtv:2html	The present document	Optional HbbTV terminal feature: +2HTML
urn:hbbtv:appinformation:optionalfeature:hbbtv:graphics_01	The present document	Optional HbbTV terminal feature: +GRAPHICS_01
urn:hbbtv:appinformation:optionalfeature:hbbtv:graphics_02	The present document	Optional HbbTV terminal feature: +GRAPHICS_02
urn:hbbtv:appinformation:optionalfeature:hbbtv:screader	The present document	Optional HbbTV terminal feature: +ARIA

NOTE: The right most element of the URNs is aligned with the optional feature names in the HbbTV test suite, hence "screader" rather than "aria".

33 No ID_OTHER definition found

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other

13775				Yes	Error

In clause O.5.3, the following text is added.

`ID_OTHER` used in the `idType` property to indicate a DVB-I service instance for which no other `ID_DVB_` constant is applicable. The value shall be 52.

34 DVB-I has age-based rating without a scheme

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13794				Yes	Error

The following row in table O.4 is amended as shown.

parentalRatings	ProgramInformation / BasicDescription/ParentalGuidance. If the minimumAge is not 255 then the "scheme" in the ParentalRating class shall be "dvb-si".

35 v/b object state machine conflict for linked apps in the stopped state

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13795				Yes	Inconsistency

In clause O.5.4, the following paragraph is modified as shown.

- Calling the bindToCurrentChannel method when a video/broadcast object is in the stopped state and the current channel is a DVB-I service instance delivered by DVB-DASH shall start a transition to the connecting state and then on to the presenting state and, if no errors occur, start the video of the DVB-I service being presented in the video/broadcast object and start the audio being decoded and output.

36 Annex O.5.4 createChannelObject

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13807				Yes	Ambiguity

The following paragraph is added in clause O.5.4 between the paragraph starting “idType is one of ID_DVB_C/S/S2/T/T2” and the paragraph starting “idType is ID_DVB_I, ipBroadcastID is present and”.

- There is no requirement for the `onid`, `tsid` and `sid` in the method call to match the triplet of any actual broadcast service, the only requirement is to match the triplet in the `extension` as stated above. Whilst it is not expected that a service would have multiple service instances on the corresponding physical layer, if this does happen then `ServiceInstance@Priority` shall be used.

37 Clarification on O.5.4 regarding setChannel to Service Instances and "becomes unavailable" ambiguous

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13840				Yes	Error/Ambiguity

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14208				Yes	Error/Ambiguity

In clause O.5.4, the following text is modified as shown underlined.

> If the `Channel` object is one that corresponds to a DVB-I service instance (and not to a DVB-I service) then the DVB-I player shall attempt to select the corresponding service instance and shall not change this while that service remains selected and the application remains running except at the request of the application - even if the service instance either goes outside its scheduled service hours or the media becomes unavailable (e.g. due to a network error). Changing from a channel that corresponds to a DVB-I service to one that corresponds to one of the DVB-I service instances within that service enables an application to take control of service instance selection from the DVB-I player. If such a change has the optional `quiet` argument (see clause A.2.4.3) set to `true` then the change shall be invisible.

Note that the last sentence of the paragraph above is also modified by clause 43 of the present document.

38 Ambiguity on length of URLs in XML AIT (URLBase & applicationLocation)

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13843	Yes	Yes	Yes	Yes	Ambiguity

In clause 7.2.3.2, table 7, text is added to the following rows as shown underlined.

`applicationTransport/`	Mandatory. Shall be `HTTPTransportType`. The `URLBase` element shall be a URL ending with a slash ("/") character. No `URLExtension` elements shall be present. Only one `applicationTransport` element with type `HTTPTransportType` shall be present in the scope of the application.	Mandatory. Terminals shall support URLBase at least 2048 characters in length. See note 2.
`applicationLocation/`	Mandatory.	Mandatory. Terminals shall support applicationLocation at least 2048 characters in length. See note 2.

and

NOTE 1: This value shall be used in the XML AIT regardless of whether the application uses HTML or XHTML serialization, or whether it was authored for a previous revision of the present document. See also clause A.2.6. NOTE 2: Terminals shall support strings produced from the concatenation of URLBase and applicationLocation of at least 2048 characters in length. Content Providers shall ensure the length of the concatenation of URLBase and applicationLocation is 2048 characters or less.

39 Format of orgid and appid in URL

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13844	Yes	Yes	Yes	Yes	

Clause 9.2 is modified with the 3 references to "/1.1/?" replaced with "/70.e2a?" and other text added as shown underlined.

It shall be possible to use `dvb:` URLs referring to applications signalled in the current service as defined in Table 4 of ETSI TS 102 851 [**11**] and optionally appended fragment component with the `Application.createApplication()` method. As described in clause 14.5 of TS 102 812 (referenced from clause 6.3.1 of TS 102 85 1[**11**]), the values of orgid and appid shall be lower case hexadecimal encoded without leading zeros. Use of `dvb:` URLs referring to applications from another service will cause `createApplication()` to fail as if the initial page could not be loaded. Attempts to use such a dvb: URL from the start of a channel change until a ChannelChangeSucceeded or ChannelChangeError event is generated shall fail. Attempts to use such a dvb: URL between when a ChannelChangeSucceeded event is generated and when the AIT of the new channel is acquired shall not be completed until the AIT of the new channel is received (if no AIT is received, the application will be terminated by the usual lifecycle rules). Any query component and fragment component assigned to this `dvb:`URL shall be attached to the application location URL signalled inside the corresponding AIT as follows:

and

- Examples for a resulting URL (for an application with appid 0x00000e2a and orgid 0x00000070) include:

40 Clarification needed on O.5.4 setChannel and ServiceChangeSucceeded/ServiceChangeFailed messages

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13847	No	No	No	Yes	Ambiguity

Clause O.5.4 is modified as shown underlined.

`PlayStateChange` and either `ChannelChangeSucceeded` or `ChannelChangeFailed` events shall be generated. The `channel` argument to the last 2 events shall be the channel object passed to the `setChannel` method.

41 Generic HTML5 apps signalled instead of HbbTV

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13848				Yes	Other

The following text is added in clause O.3 as shown underlined.

NOTE 1: It is intentional that the above is a requirement even though the referenced text uses "may" or "should" or is located in an informative clause.

- DVB-I allows generic HTML applications signalled in a service list with either 1) `MediaURI@contentType` set to either text/html or application/xhtml+xml (as defined in table 7 of TS 103 770 [5] or 2) an XML AIT where `applicationDescriptor.type` is set to either text/html or application/xhtml+xml. Terminals should not run such applications as they may not offer a good user experience on TV sets - e.g. lacking the functionality to cleanly share key input between the application and the terminal.

NOTE 2: Service providers that want to signal the same application for both TV and non-TV devices should signal it twice, once as a generic HTML application and once as an HbbTV application.

The only aspects of clause 6 of the present document not applicable in the context of DVB-I are the following:

42 Conflict in v/b states for DVB-I type 1.2 apps

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13886				Yes	Error

Clause O.5.4 is modified with the addition of the text shown underlined.

- Linked applications regardless of how they are signalled shall be able to create a video/broadcast object (by API call or inclusion as an object element in an HTML page) and call the bindToCurrentChannel method. The call to the method shall succeed and the video/broadcast object shall transition to the presenting state for a type 1.1 application and the connecting state (as defined later in this clause) for type 1.2 and type 2 applications. The video/broadcast object shall be bound to the DVB-I service instance and shall follow the state transition model defined in clause 7.13.1.1 of the OIPF DAE specification [1] and modified by clause A.2.4 of the present document. The currentChannel property shall reflect the DVB-I service.

NOTE: This is further modified by #14220.

43 O.5.4 incorrect reference to setChannel 'quiet' argument values

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13897				Yes	Error

Clause O.5.4 is modified as shown using underline / strike-through markup (twice).

If such a change has the optional quiet argument (see clause A.2.4.3) set to ~~true~~ 1 or 2 then the change shall be invisible.

44 Incorrect reference in A.3.26 (Web Crypto API)

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13903			Yes	Yes	Error, Other

The following note is added in clause A.3.26 and the existing note re-numbered accordingly.

NOTE 1: Although clause 28 of the Web Crypto API defines support for AES-CBC key lengths of 128, 192 and 256 bits, 192 bit keys are not widely implemented in practice.

If the first bullet point in A.3.26 includes a reference as shown then this is removed.

- At least all the algorithms that are suggested in clause 18.5.2 of that document ~~[76]~~ shall be supported excluding support for 192-bit AES keys is optional.

45 Manipulating decoded video and audio in the browser

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13923	Yes	Yes	Yes	Yes	Implementation

The following is added at the end of clause A.3.10 ("Web Audio API").

NOTE: The present document does not require support for `AudioContext.createMediaElementSource`. Even if the method is present, it may not work correctly and the Web Audio API may not support all audio formats and/or codecs. Applications should not attempt to use this without significant care and testing.

A new clause (A.3.27 in 2.0.3, A.3.28 in 2.0.4, A.3.29 in 2.0.5) is added in A.3 as follows:

A.3.28 Canvas
The present document does not require support for using a video element as a `CanvasImageSource` in the HTML Canvas API. This may fail or work only in some set of circumstances. Applications should not attempt to use this without significant care and testing.

46 Timing of ChannelChangeSucceeded events

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13940				Yes	Implementation

In clause A.2.4.1, the table is replaced with the following.

Old State	Trigger	New State	State Transition Events	Description
All states	`setChannel( channel)` where `channel` != null and the channel type is supported and the combination of channel properties is valid and a suitable tuner is available	Connecting	ChannelChangeSucceeded (1) (2) PlayStateChange	The terminal attempts to connect to the requested channel. The `currentChannel` object reflects the channel being changed to.
All states	`setChannel( channel)` where `channel` != null but either the channel type is not supported or the combination of channel properties is invalid or a suitable tuner is not available	No change	ChannelChangeError	The terminal remains in the same state.
Connecting or Presenting or Stopped	`nextChannel()`, `prevChannel()` where the video/broadcast object `currentChannel` is in the channel list and a suitable tuner is available	Connecting	ChannelChangeSucceeded (1) (2) PlayStateChange	The terminal attempts to connect to the requested channel. The currentChannel object reflects the channel being changed to.
Connecting	`nextChannel()`, `prevChannel()` where the video/broadcast object `currentChannel` is not in the channel list	Unrealized	ChannelChangeError PlayStateChange	
Presenting or Stopped	`nextChannel()`, `prevChannel()` where the video/broadcast object `currentChannel` is not in the channel list	No change	ChannelChangeError	The terminal remains in the same state.
Connecting or Presenting or Stopped	`nextChannel()`, `prevChannel()` where the video/broadcast object `currentChannel` is in the channel list but no suitable tuner is available	No change	ChannelChangeError	The terminal remains in the same state.
Unrealized	`bindToCurrentChannel()` when at least one channel is currently being presented by the OITF and binding to the necessary resources does not fail	Presenting	PlayStateChange	The terminal binds the video/broadcast object to the current channel being natively presented. The currentChannel object reflects the channel being presented.
Unrealized	`bindToCurrentChannel()` when there is no channel currently being presented or binding to the necessary resources to play the channel through the video/broadcast object fails	Unrealized	PlayStateChange	The terminal continues to present the current channel, if any.
Connecting	The terminal successfully connected to the broadcast or IP multicast stream and presented its contents.	Presenting	~~ChannelChangeSucceeded~~ PlayStateChange	This transition occurs automatically when media presentation starts.

Connecting	Transient error (3) - The terminal successfully connected to the broadcast or IP multicast stream but presentation of content is blocked, e.g. by a parental rating mechanism, ~~or~~ content protection mechanism or resources cannot be claimed that are currently in use for presenting broadband content.	Connecting	ChannelChangeSucceeded (1) PlayStateChange	This is conceptually equivalent to a successful channel change where a transient error immediately pre-empts media presentation without the video/broadcast object entering the presenting state.
Connecting	Recovery from a transient error, including - presentation of content no longer being blocked by a content protection mechanism (e.g. the start of a free preview period or a channel that changes from being encrypted to being in the clear during the day) - the end-user entering a PIN code or other equivalent authorization to enable access to content protected by parental access control - resumption of delivery of media data	Presenting	PlayStateChange	If a video/broadcast object was forced from the presenting state to the connecting state due to a transient error and that error condition clears while the video/broadcast object remains in the connecting state then the video/broadcast object SHALL automatically transition back to the presenting state.
Connecting or Presenting or Stopped	`release()` or `setChannel(null)`	Unrealized	PlayStateChange	The control is returned to the terminal. The `currentChannel` object is set to null. If an application has modified the set of components being presented (e.g. changing the audio or subtitle stream being presented) then the same set of components will continue to be presented.

Connecting	Permanent error (3) including `setChannel` to a locally defined-defined channel and use of `next`() and `prev`() when the current channel is not in the channel list. ~~- failure to change to a new channel (e.g. the channel cannot be found or none of the media components can be decoded or insufficient resources are available to present the channel)~~ ~~- exhaustion of all possibilities for an end-user to authorize access to content protected by a parental access control mechanism (e.g. timeout on a PIN entry dialogue or the terminal not providing the ability to authorize access)~~ ~~- delivery of media data was interrupted and has not resumed after an implementation-dependent timeout~~	Unrealized	ChannelChangeError PlayStateChange	The terminal encountered a permanent error. In most circumstances terminals may choose to generate either a transient error or a permanent error.
Connecting or Presenting	`stop()`	Stopped	PlayStateChange	
Presenting	Transient error including - presentation of content being blocked by a content protection mechanism, - presentation of content being blocked by a parental rating mechanism, - interruption of delivery of media data (either via IP or hybrid) if either; a) the media data is delivered over a connection and the connection remains intact or b) the media data is delivered via a connectionless mechanism	Connecting	PlayStateChange	The terminal encountered a transient error. During media presentation, transient errors (e.g. transient errors in the bitstream, temporary loss of signal or temporary halting of media decoding due to parental control issues) MAY cause the object to transition from the `presenting` state to the `connecting` state. Temporary loss of resources due to presentation being interrupted by playback of audio from memory MAY cause the object to transition from the `presenting` state to the `connecting` state.
Presenting or Stopped	Permanent error including; - interruption of delivery of media data where the media data is delivered over a connection and the connection terminates	Unrealized	PlayStateChange	The terminal encountered a permanent error.
Stopped	`bindToCurrentChannel`()	Connecting	PlayStateChange	~~Video and audio presentation is enabled~~ The terminal starts to present the current channel.
Stopped	`bindToCurrentChannel` when suitable video and audio decoders are not available	Stopped	PlayStateChange	

All states	Destroy video/broadcast	N/A		When a video/broadcast object is destroyed (e.g. by the video/broadcast object being garbage collected) control of broadcast video SHALL be returned to the terminal. If an application has modified the set of components being presented (e.g. changing the audio or subtitle stream being presented) then the same set of components will continue to be presented. When a video/broadcast object is destroyed due to a page transition within an application, terminals MAY delay this operation until the new page is fully loaded in order to avoid display glitches if a video/broadcast object is also present in the new page. Presentation of broadcast video or audio SHALL not be interrupted in either case.
(1) The order in which ChannelChangeSucceeded and PlayStateChange are listed in this cell does not imply a requirement on terminals to send them in that order. (2) For each channel selection, either exactly one ChannelChangeSucceeded or one ChannelChangeError shall be generated. PlayStateChange may be sent more than once. (3) Failure to successfully present the media of a new channel should be handled as a transient error and if not, shall be handled as a permanent error. Particularly for Channels in the ChannelList, permanent errors should never be used although applications need to be prepared to handle them.				

Also in clause A.2.4.1, the following is inserted.

- In clause 7.3.1.2 of the OIPF DAE specification [3], the definition of the `onChannelChangeSucceeded` property is modified as shown using underline/strike-through markup

`function` **`onChannelChangeSucceeded`**`( Channel channel )`
The function that is called when a request to switch ~~a tuner~~ to another channel ~~has~~ is guaranteed to be successfully completed. This function may be called either in response to a channel change initiated by the application, or a channel change initiated by the OITF (see section 7.13.1.1). The specified function is called with argument `channel`, which is defined as follows: • `Channel channel` – the channel ~~to which the tuner~~ that was switched to. This object SHALL have the same properties with the same values as the `currentChannel` object (see section 7.13.7). ChannelChangeSucceeded shall be generated as soon as possible after the channel change is guaranteed not to fail (i.e. once it is certain that ChannelChangeError will not be generated) without waiting for the media of the channel to be presented. See also additional constraints on when it is generated in clause O.5.4. Excluding those additional constraints, this may therefore be generated effectively immediately on some implementations, particularly for Channels in the ChannelList, i.e. excluding locally defined channels.

In clause O.5.4, i) the following text is deleted;

- The generation of a ChannelChangeSucceeded event shall follow the video for the new service being presented in the video/broadcast object and the audio for the new service being output.

And ii) the underlined text is inserted as shown.

- For applications of type 1.2 ("Application controlling media presentation"):
  - any video/broadcast object shall not be in the Presenting state. If such an application has a video/broadcast object in the Unrealized state and calls the bindToCurrentChannel method then the

video/broadcast object shall transition to the Connecting state and never transition to the Presenting state.

- When changing Channel for any reason, the time when ChannelChangeSucceeded shall be generated is further constrained to occur after all of the following - the fetching of the XML AIT, the application of the flow chart in clause 6.2.2.2 and the killing of any application that is to be killed.

47 DVB-I linked Applications 1.2 - Resource management and user-initiated channel change

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13949				Yes	

The following is inserted in clause A.2.4.1.

- If a broadcast-related application is running that is using the video and audio decoders and the application is signalled as being permitted to run in other services, then the application shall register for `ChannelChangeSucceeded` and `ChannelChangeError` events. If such an application receives a `ChannelChangeSucceeded` event, then it shall determine if it still needs the video and audio decoders in the context of the new channel and release them if it does not. Under these circumstances, when an application releases the video and audio decoders, if a video/broadcast object is in a transient error state awaiting decoder resources, the terminal shall acquire the released decoders and clear the transient error (unless the transient error is due to multiple conditions others of which continue to apply). If the application does not release the resources, the transient error shall continue.

48 Encoding of "dvb-si" parental ratings for the regional number range 900...999

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13951	Yes	Yes	Yes	Yes	Error

The following is added at the end of clause A.2.28.

NOTE: The present document does not support the signalling of "A group of countries" "identified by the string representation of a decimal number in the range 900 to 999" defined in clause 3.2.28 of EN 300 468 [4].

49 Host player mode not completely removed

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
13999			Yes	Yes	Error

In clause 11.5, all text except for the last paragraph is removed and the beginning of the last paragraph is modified as shown with underline / strike-through markup below.

~~For terminals that do not support the "IP delivery Host player mode" as defined in the DVB Extensions to CI Plus ETSI TS 103 205 [22], t~~The only requirement for supporting decryption of content delivered via the broadband channel is that in clause B.3 of the present document. When decryption is supported via the integration of HbbTV® with one or more embedded content protection technologies, the terminal shall support at least the ISO base media file format using MPEG common encryption as defined by CENC (ISO/IEC 23001-7) [**20**] and constrained by annex **B** of the present document as a format for encrypted content.

In clause 11.6, all text except for the last paragraph is removed and the beginning of the last paragraph is modified as shown with underline / strike-through markup below.

~~For terminals that do not support the "IP delivery Host player mode" in CI Plus but do support the download feature, s~~Support for decrypting protected content acquired using a download API is optional in the present document. When decryption is supported via the integration of HbbTV® with one or more embedded content protection technologies the terminal shall support at least the ISO base media file format used with MPEG common encryption as defined by CENC (ISO/IEC 23001-7) [30] and constrained by annex B of the present document as a format for encrypted content.

50 Move of CICAM Player Mode to OpApp Spec Incomplete

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14000			Yes	Yes	Other

The following changes are made;

1) In clause 3.3, the definition "IPC", "IP delivery CICAM player mode", is removed.

2) In clause 9.6.7, "Limitations apply to CICAM player mode due to the feature set of the protocol between the HbbTV® terminal and the CICAM. For more details, see clauses 10.2.9.1 and K.5." is removed.

3) In clause 10.2.4.8, table 13, the row starting “+IPC” is removed.

4) In clause 10.2.8.1, “The present document does not require HbbTV® terminals to support multi-stream media synchronization for content played by CICAM player mode as defined in clause 11.4.5 and annex K of the present document.” Is removed.

5) In clause 10.2.9.1, “The present document does not require HbbTV® terminals to support inter-device media synchronisation for content played by CICAM player mode as defined in clause 11.4.5 and annex K of the present document.” is removed.

6) Clause 11.4.5 is replaced with “Void”

7) In clause A.2.25, the following paragraph is modified as shown with underline and strikethrough.

   The CICAMPlayerPreferred element is not used in the present document and should be ignored~~indicates if the HbbTV® terminal shall give preference when playing back the content to a CICAM player (as defined in clause 11.4.5 and annex K of the present document) if one is present~~.

8) Annex K is replaced with “Void”

51 Clarification on type 1.2 and ChannelChangeSucceeded.

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other

14023				Yes	Error

The following text is added in clause O.3.

- If the 'application controlling media presentation' cannot be started, the service instance shall be discarded as defined in clause 5.2.13 of TS 103 770 [5].

NOTE 2: Additional examples of when an application cannot be started beyond those in TS 103 770 [5] include being unable to load the XML AIT for any reason (name lookup failure, inability to open connection to server, TLS negotiation failure, error 404 when the XML AIT is requested) and being unable to load the first page of the application for any reason.

52 Incorrect usage of ChannelChangeFailed instead of ChannelChangeError

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14024				Yes	Error

In clause O.5.4, the two references to `ChannelChangeFailed` are replaced with `ChannelChangeError`.

53 Network id needs to be defined for some existing HbbTV apps to load when installed as a DVB-I service

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14030				Yes	Error

In clause O.4, the following XML fragment is amended as shown below using underline and strikethrough markup.

```
…. xmlns:hbbtv-i="urn:hbbtv:dvbi:schema:2025" …
<complexType name="ServiceIdentifierTriplet">
    <complexContent>
        <extension base="dvbisd:ExtensionBaseType">
            <element name="DVBTriplet" type="dvbisd:DVBTripletType"/>
            <element name="NetworkID" type="dvbi-types:unsignedShort" use="optional"/>
        </extension>
    </complexContent>
</complexType>
```

In clause O.6.2.1, the following row of table O.1 is changed as shown underlined.

nid	If `Service.AdditionalServiceParameters` contains an extension with `extensionName` "urn:hbbtv:dvbi:service:serviceIdentifierTriplet" (see clause O.4) and that extension contains the optional `NetworkID` element then this shall be `NetworkID` from that extension. Otherwise shall be `undefined`

54 Annex O.8.2 and PlayReady with license request URL in the manifest

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14034				Yes	Other

1) Clause O.8.2 is modified as shown below using underline and strike-through markup.

O.8.2 Support for protected content delivered via broadband

See annex B of the present document clause 5.5.20 of ETSI TS 103 770 [96] and TS 104 227 [i.2].

ETSI TS 103 770 [96] notes that "The present document does not define a dedicated mechanism for delivering licenses to content protection systems. This may be done using a linked application, see clause 5.1.6". This does not apply in combination with TS 104 227 [i.2] where one of the DRM systems includes "Automatic “post-acquisition” license acquisition triggered by the media player".

~~Consequence of this include the following:~~

In most circumstances, the following apply:
• Video and audio in protected DVB-I services delivered by DVB-DASH will only become visible and audible once a linked "Application controlling media presentation" (see clause 5.2.3.2 of ETSI TS 103 770 [5]) has been started and has obtained licenses from a license server. The delay between when the user selects a service and when the video and audio are visible and audible will be longer for protected services than for unprotected services.
• Broadcast-related applications linked to protected DVB-I services delivered by DVB-DASH will need to present video and audio using an HTML5 video element. They will not be able to rely on declaring a video/broadcast object and then calling the bindToCurrentChannel method on that object.

The exception to the above is when all of the following apply 1) the content can be accessed using a DRM system that supports post-acquisition, 2) the content includes a license request URL ("LA_URL"), 3) the terminal supports the previously mentioned DRM system, 4) the content is accessed using the native DASH player and 5) the native DASH player chooses to use the previously mentioned DRM system (or there is no alternative DRM system that can provide access).

~~NOTE 1: Individual content protection technologies / DRM systems may define how to obtain licenses from a license server without the involvement of a linked application. They may even include tests for this as part of a certification regime. This is all outside the scope of the present document. Involvement of an application is required for OTT media services using web technologies as EME requires all interfacing to the license server to be mediated by the web application.~~

NOTE ~~2~~1: Some content protection technologies may support persistent licenses ~~with W3C EME (as referenced from the CTA Web Media API Snapshot [76])~~ , e.g. licenses with an expiration date or a duration or a play count. ~~This is outside the scope of the present document.~~ This is described in clause 5.6.1 of TS 104 227 [**i.2**]. ~~Even if these would be supported, since the DVB-I client would not know if a valid persistent license was available for a particular protected service, the linked application would still need to be run. Persistent licenses may reduce the delay between when the user selects a protected service and when the video and audio are visible and audible but will not remove the need to load and run an application.~~ Neither the present document nor TS 103 770 [5] define a mechanism for the DVB-I client to omit starting a linked application if a suitable persistent license is available.

2) Informative reference is added as follows.

[i.2] ETSI TS 104 227: "Hybrid Broadcast Broadband Television; Integration of Digital Rights Management (DRM)"

55 Validity of method negotiation over a dropped JSON RPC connection question

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14042				Yes	

The following paragraph in clause 9.9.5 is modified as shown.

Initially, when an HbbTV® application is launched, both the terminal and application shall assume that no JSON-RPC requests are supported by the application and the terminal except this capability negotiation JSON-RPC request. Terminals may also revert to these assumptions whenever the WebSocket connection is closed. While the WebSocket connection is open, ~~Every subsequent~~ every time the HbbTV® application sends this JSON-RPC request, it adds to the set of method names that the terminal shall consider that application supports and the terminal's reply adds to the set of method names that the application shall consider that the terminal supports. Applications shall always send this JSON-RPC request again after re-opening a WebSocket connection in case the terminal has reverted to assuming that no JSON-RPC requests are supported except this capability negotiation JSON-RPC request. ~~The terminal shall assume that all method names from all past instances of this request are supported for the remaining lifetime of the HbbTV® application.~~

56 JSON-RPC request capability negotiation

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14049				Yes	Ambiguity / Implementation

A new clause 9.9.9 is added as shown.

9.9.9 Pre-existing WebSocket Connections

When an application attempts to create a WebSocket connection to the endpoint described in clause 9.9.2, any pre-existing connections may be terminated by the WebSocket Server. If they do so, they shall send a CloseEvent as defined in clause 8 of the Websocket API [15] with a reason parameter set to the string "Terminated due to new connection." and a code parameter set to the value 1000 (Normal Closure) as defined in IETF RFC 6455 [14] clauses 7.1.5 and 7.4.1. Closing the WebSocket connection may also reset the negotiated capabilities as described in clause 9.9.5.

57 Ambiguity in Voice Assistant Requirements

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14059				Yes	Ambiguity

In clause 16.5.6 org.hbbtv.app.intent.media.seek-content, a new is NOTE is added after existing NOTE 1 as follows.

NOTE 2: The requirement in this clause is only that an intent sent by the terminal conforms with the schema. The present document does not require a terminal to support interactions with the user that invoke any specific combination of parameters. For example, a compliant terminal could send this intent with the anchor property set to "start" and never with it set to "end".

In clause 16.5.8 org.hbbtv.app.intent.media.seek-live, a new NOTE is added after existing NOTE 1 as follows.

NOTE 2: The requirement in this clause is that an intent sent by the terminal conforms with the schema. The present document does not require a terminal to support interactions with the user that invoke any specific combination of parameters. For example, a compliant terminal might only ever send this intent with offset property set to 0.

In both cases the existing notes are renumbered accordingly.

58 JSON schema doesn't match the specification

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14066				Yes	Inconsistency

In the electronic attachments referenced from Annex N, the following changes are made.

```
$ diff errata_response__org.hbbtv.af.featureSettingsQuery.screenReader.schema.json
response__org.hbbtv.af.featureSettingsQuery.screenReader.schema.json
40a41,53
>                       "if": {
>                           "properties": {
>                               "enabled": {
>                                   "const": true
>                               }
>                           },
>                           "required": ["enabled"]
>                       },
>                       "then": {
>                           "required": [
>                               "voice"
>                           ]
>                       },
65c78
< }
---
> }
```

And also

```
$ diff errata_notification__org.hbbtv.af.screenReader.schema.json
notification__org.hbbtv.af.screenReader.schema.json
40a41,53
>                       "if": {
>                           "properties": {
>                               "enabled": {
>                                   "const": true
>                               }
>                           },
>                           "required": ["enabled"]
>                       },
>                       "then": {
>                           "required": [
>                               "voice"
>                           ]
>                       },
57c70
< }
---
> }
```

59 Timing of starting and stopping apps with DVB-I

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other

14107				Yes	Ambiguity

The following text is added at the end of clause O.3.

- The following clause of 6.2.2.11 does not apply to the same extent for a DVB-I service instance delivered by broadband.

  - When an application selects a new broadcast channel, there is a period of time between the channel change having been completed (when the onChannelChangeSucceeded event is triggered) and the AIT having been received and parsed. During this period, the application shall retain its type (broadcast-related or broadcast-independent) and trust level (trusted or untrusted). Hence, while a broadcast-independent application is transitioning to become broadcast-related, access to features limited to broadcast-related applications will continue to fail as they did before the transition started until the AIT has been received and parsed.

  When the terminal selects a DVB-I service instance delivered by broadband, the terminal shall immediately request the XML AIT and once received, act on the information according to the present clause and clause 6 of the present document.

NOTE: In the case of DVB-I, the "period of time" referred to in the text quoted above would be the time needed for successful retrieval of an XML AIT which would usually be very significantly less than the cycle time for a broadcast AIT. Hence the clause quoted above does not apply to the same extent. Applications not allowed to run in the new service should expect to be killed before receiving events that they may receive with a broadcast signalled service.

60 Channel object representing a Service Instance using a type 1.2 app for delivery

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14124				Yes	Ambiguity

The following table is added at the end of clause O.6.2.1.

Table O.1: Property mapping for Channel objects corresponding to a DVB-I service instance delivered by an application controlling media presentation

Property name	Source/Value
channelType	Same for the property of the same name in Table O.1.
idType	ID_OTHER (see clause O.74.2).
ccid	Same for the property of the same name in Table O.1. The value shall be different from the value of the parent service.
onid	Same for the property of the same name in Table O.1.
nid	Same for the property of the same name in Table O.1.
tsid	Same for the property of the same name in Table O.1.
sid	Same for the property of the same name in Table O.1.
name	`ServiceInstance.DisplayName` if present otherwise `Service.ServiceName`. If multiple languages are present one of which is the same as `Configuration.preferredUILanguage` then that language shall be used.
majorChannel	Same for the property of the same name in Table O.1.
dsd	Same for the property of the same name in Table O.1.
ipBroadcastID	Shall be set to `ServiceInstance.RelatedMaterial.MediaLocator.MediaUri.`.
terminalChannel	Shall be `undefined`.
parentService	See clause O.74.2.

Clause O.5.3 is amended as shown using underline / strike-through markup.

- ID_OTHER used in the idType property to indicate a DVB-I service instance for which no other ID_DVB_ constant is applicable. One example of this is DVB-I service instances where the content is presented by a linked 'application controlling media presentation'.

NOTE 3: See tables O.1 ~~and~~ O.2 and O.4 for the mapping between the Channel class and the information in the DVB-I service list.

61 Relative URLs with createApplication

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14141	Yes	Yes	Yes	Yes	

The following text is added at the end of clause 9.2.

For the purposes of the present document, the requirements applying to a relative URL shall be those applying to the absolute URL that is used to resolve it. Within this constraint, it shall be possible to use relative URLs interchangeably with absolute URLs unless explicitly prohibited.

EXAMPLE: Where an 'https:' URL is required to be supported, relative URLs that would be resolved relative to an 'https' URL are also required to be supported.

62 Clarification for ChannelChange Event on selection of a instances within the same DVB-I Service

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14178				Yes	Ambiguity

1) The following is added at the end of clause O.5.4.

- When the application has registered appropriately and survives a channel change, as defined by 6.2.2.2, or an instance change as defined by 6.2.2.3, and clauses O.74 of the present document, it shall receive exactly one of either `ChannelChangeSucceeded` or `ChannelChangeError` events, even if some iteration is required to determine the finally selected service instance.

2) In clause O.5.4, the following text is replaced with the text following it. Note that a number of other issues modify the original text.

    - `PlayStateChange` and either `ChannelChangeSucceeded` or `ChannelChangeFailedChannelChangeError` events shall be generated. The `channel` argument to the last 2 events shall be the channel object passed to the `setChannel` method.
    - The Channel object passed to the setChannel method shall in turn be passed to the ChannelChangeSucceeded or ChannelChangeError event resulting from that method call. This shall apply regardless of whether the specified Channel object represents a DVB-I service or a DVB-I service instance in a DVB-I service that is not currently selected or a DVB-I service instance in a DVB-I service that is currently selected.

63 Required TextTrack mapping for optional subtitle format support

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14200	Yes	Yes	Yes	Yes	Implementation

Clause A.2.12.1 is modified as shown using underline / strike-through markup.

- A `TextTrack` object shall be created for each elementary stream in the transport stream that can be decoded by the terminal and meets one of the following criteria:

  - it is a DVB subtitle component as identified by a `subtitling_descriptor` (as defined in ETSI EN 300 468 [4]) in the 'Elementary Stream Descriptors' in the PMT entry for a stream with a '`stream_type`' of "0x06".

  The order of `TextTrack` objects in the `TextTrackList` shall be the same as the order of the corresponding elementary stream in the PMT.

The following shall apply when an HTML5 `media` element is presenting content whose system format is the ISO BMFF:

- A `VideoTrack` object shall be created for each track in the ISOBMFF file whose 'handler_type' is 'vide'. The order of `VideoTrack` objects in the `VideoTrackList` shall be the same as the order of the corresponding 'trak' boxes in the 'moov' box.

- An `AudioTrack` object shall be created for each track in the ISOBMFF file whose 'handler_type' is 'soun'. The order of `AudioTrack` objects in the `AudioTrackList` shall be the same as the order of the corresponding 'trak' boxes in the 'moov' box.

- A `TextTrack` object shall be created for each track in the ISOBMFF file that the terminal can decode and whose 'handler_type' is either 'subt' or 'text' and whose `SampleEntryFormat` is `XMLSubtitleSampleEntry` as defined in ISO/IEC 14496-30 [16]. The order of `TextTrack` objects in the `TextTrackList` shall be the same as the order of the corresponding 'trak' boxes in the 'moov' box.

NOTE 2: As explained in clauses **7.3.1.1** and 7.3.1.5.1, support for subtitles multiplexed into a single ISOBMFF file along with video and audio is a capability only required for downloaded content and only where the download option is supported by the terminal. It is not required for non-adaptive HTTP streaming.

64 Inconsistency about setChannel(... , contentAccessDescriptorURL)

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14214				Yes	Error

In clause A.2.4.3.1, the following paragraph is replaced by “The optional contentAccessDescriptorURL parameter may be ignored.”.

The optional attribute `contentAccessDescriptorURL` allows for the inclusion of a Content Access Streaming Descriptor (the format of which is defined in clause E.2 of the OIPF DAE specification [3]) to provide additional information for dealing with IPTV broadcasts that are (partially) DRM-protected. The descriptor may for example include Marlin action tokens or a previewLicense. The attribute SHALL be `undefined` or `null` if it is not applicable. If the attribute `contentAccessDescriptorURL` is present, the trickplay attribute shall take a value of either `true` or `false`.

Asjdhksajd

65 Linked Application 1.2 and calling stop() prior to playing media and non-stopped "connecting" play state clarification

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14220				Yes	Ambiguity

1) In clause O.5.4 the following changes are made as shown with underline / strike-through markup.

- When either 1) the currentChannel corresponds to a DVB-I service and a service instance delivered by broadband is selected or 2) the currentChannel corresponds to a service instance delivered by broadband then:
    - Linked applications regardless of how they are signalled shall be able to create a video/broadcast object (by API call or inclusion as an object element in an HTML page) and call the bindToCurrentChannel method. The call to the method shall succeed and the video/broadcast object shall transition to the presenting state for a type 1.1 application and the ~~connecting~~ Stopped state (as defined later in this clause) for type 1.2 and type 2 applications. The video/broadcast object shall be bound to the DVB-I service instance and shall follow the state transition model defined in clause 7.13.1.1 of the OIPF DAE specification [1] and modified by clause A.2.4 of the present document. The currentChannel property shall reflect the DVB-I service.
- For applications of type 1.2 ("Application controlling media presentation"):
  ....
    - Any video/broadcast object shall not be in the Presenting state. If such an application has a video/broadcast object in the Unrealized state and calls the bindToCurrentChannel method then the video/broadcast object shall transition to the ~~Connecting~~ Stopped state and never transition to the Presenting state. Such applications should not call the bindToCurrentchannel method when already in the Stopped state.
    - When selecting a service (or service instance) results in an already running application changing to act as a type 1.2 application and continuing to run, the video/broadcast object shall transition through the Connecting state to the Stopped state. On service or service instance change, if the application is using the video and audio decoders, then it shall follow A.2.4.1.
    - Type 1.2 applications should not call the stop method in either of the above situations. When such an application requests to present video and/or audio, resources previously used by the terminal to present either broadcast video/audio or broadband-delivered video/audio using the native DASH player shall be available to the application automatically. It is implementation specific whether the resources become available while the application is being started or later when the application does something that needs those resources.

2) In clause A.2.4.1, text is added as shown underlined.

Old State	Trigger	New State	State Transition Events	Description
Unrealized	bindToCurrentChannel() when there is no channel currently being presented or binding to the necessary resources to play the channel through the video/broadcast object fails	Unrealized	PlayStateChange	The terminal continues to present the current channel, if any. This transition is modified by clause O.5.4 for DVB-I type 1.2 linked applications.

Connecting or Presenting	stop()	Stopped	PlayStateChange	This transition is modified by clause O.5.4 for DVB-I type 1.2 linked applications.
Stopped	bindToCurrentChannel()	Connecting	PlayStateChange	The terminal starts to present the current channel. This transition is modified by clause O.5.4 for DVB-I type 1.2 linked applications.

3) The following note is added to A.2.1.

NOTE 5: Clause O.73.1 defines additional requirements relating to resource management when a type 1.2 DVB-I linked application is started or when an already running application continues to run after a service selection and becomes a type 1.2 DVB-I linked application.

66 Calling stop when in the stopped state

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14227	Yes	Yes	Yes	Yes	Error

The following text is added at the end of clause A.2.4.5.

In clause 7.13.1.3 of the OIPF DAE specification [3],in the description of the `stop` method, if the video/broadcast object is already in the stopped state then this method shall have no effect.

67 Inconsistency about language on subtitle timing APIs

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14234				Yes	Ambiguity

The following paragraph is added at the end of clause 9.6.13.

MSE only requires support for `SourceBuffer`s for video and audio. There is no requirement for `SourceBuffer`s for subtitle data to be supported. Display of subtitles with video and audio presented using MSE needs to be done either by JavaScript code in the application (e.g. using `WebVTTCue` (see clause A.3.29) as used by imscJS [i.3]) or as out of band subtitles as defined in clause A.2.12.2.

A new clause A.3.29 is added as follows. (Note this is the same text as clause A.3.4 of TS 103 736).

A.3.29 VTTCue

The `VTTCue` class (see clause 9.1 of WebVTT [2]) shall be supported as follows:

- It shall be possible to construct instances of the `VTTCue` class using the constructor.
- It shall be possible for HbbTV® applications to get and set properties on such instances.
- It shall be possible to add such instances to `TextTracks` using the `addCue` method as defined for `TextTrackCue` in HTML5 [6].
- It shall be possible to remove such instances from `TextTracks` using the `removeCue` method as defined for `TextTrackCue` in HTML5 [6].

- The `onenter` and `onexit` handlers shall be called for such instances according to the "time marches on" algorithm in HTML5 [6].

NOTE: The above is believed to be the minimum support for `VTTCue` necessary to enable JavaScript rendering of TTML subtitles using approaches like that taken by imscJS [i.3].

The present document neither requires nor excludes support for more of WebVTT [2] than listed above. HbbTV® applications shall not rely on more of that specification than the above being implemented or indeed working correctly even if implemented.

A new normative reference shall be added as follows.

[2] W3C Candidate Recommendation (4 April 2019): "WebVTT: The Web Video Text Tracks Format".

A new informative reference shall be added as follows.

[i.3] "JavaScript library for rendering IMSC Text and Image Profile documents to HTML5".

68 Confusion about minimum implementation of accessibility framework

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14244				Y	Ambiguity

1) In clause 15.2.2.1.2, the first row of the table is amended as shown.

Results code String	Description	Example
"notSupported"	The TV OS does not ~~recognize nor~~ have any support ~~(including a corresponding user setting)~~ for the accessibility feature including the absence of any TV OS setting that corresponds to the accessibility feature.	The TV does not have a text to speech capability (nor a setting for TTS in the user menu).

And the following row added on the end.

"unknown"	The TV OS may have support for the feature or the setting but the Accessibility Framework is unable to determine the extent of this support. This should not be used unless there is a credible reason to justify it, which may need to be communicated to third parties.	The Accessibility Framework is not connected to that part of the TVOS.

2) Clause 15.2.1 is split into a 15.2.0 and a 15.2.1 with the split being at the first "shall". The new clause 15.2.1 is called “General requirements”

3) The following is added to 15.3.2.1.

Clauses 15.3.2.2 and 15.3.2.3 shall be supported by terminals in combination with the method required by the following text in clause 10.2.7.2 - "Terminals shall support a method for the user to enable and disable subtitles and to select at least one preferred subtitle language."

4) The following is added to 15.3.4.1.

Clauses 15.3.4.2 and 15.3.4.3 shall be supported by terminals that offer a screen magnification setting in their UI.

5) The following is added to 15.3.5.1.

Clauses 15.3.5.2 and 15.3.5.3 shall be supported by terminals that offer a high contrast setting in their UI.

6) The following is added to 15.3.6.1.

Clauses 15.3.6.2 through 15.3.6.7 shall be supported by terminals that offer a screen reader setting in their UI.

7) The following is added to 15.3.7.1

Clauses 15.3.7.2 through 15.3.7.4 shall be supported by terminals that offer a "response to user action" setting in their UI.

8) The following is added to 15.3.8.1

Clauses 15.3.8.2 and 15.3.8.3 shall be supported by terminals in combination with the method from clause 10.2.7.2 that "Terminals shall support a method for the user to enable and disable audio description streams as defined in clause 7.1.2 of the present document. "

9) The following is added to 15.3.9.1

Clauses 15.3.9.2 and 15.3.9.3 shall be supported by terminals that offer an In-Vision Signing setting in their UI.

10) The following is added to the bulleted list in 15.2.1.

Requirements for the support of each Accessibility Feature are listed in clauses 15.3.2.1, 15.3.3.1 and 15.3.4.1 through 15.3.9.1.

69 Formalise top-down model for different types of b-r app incl. DVB-I

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14271					Ambiguity

Clause 6.1 is amended with the addition of a table and a reference to it as shown.

The present document defines a model which supports one HbbTV® application visible at one time.

Two types of applications are supported:

- Broadcast-related applications. These are signalled as part of a broadcast channel as defined in clause 7.2.3.1 and follow the lifecycle rules defined in clauses 6.2.2.2 and 6.2.2.3. Broadcast-related applications are further sub-divided as shown in table nn.
- Broadcast-independent applications. These are either not signalled at all or are signalled as in clause 7.2.3.2. They follow the lifecycle rules defined in clause 6.2.2.6.

Applications may transition between these two types as described later in the present document.

Table nn: Application types

Application model	Sub-model	Normal video/broadcast object state(s)	Media decoding resources	Examples
Broadcast-related	Inherits media presentation	Presenting (2) or Unrealized	Available for applications only after calling the stop method.	Applications signalled from an AIT in a regular DVB "digital television service" (1); DVB-I linked applications of type 1.1.
	Does not inherit media presentation	Stopped	Available for app immediately	Applications signalled from an AIT in a data service as defined in clause 7.2.6 of the present document; DVB-I linked applications of type 1.2, 1.3 and 2.
Broadcast-independent	None	Unrealized	Available for app immediately	Clause 6.2.2.6 of the present document.
(1) i.e. Services carried over DVB-C/S/S2/T/T2 signalled with an EN 300 468 [4] service_type defined as some form of "digital television service" and corresponding to DVB-I service type "linear" or "linear-radio" as defined in table D.1 in TS 103 770 [5]. (2) Broadcast-related applications inheriting media presentation are able to move to the Stopped state and back again to the Presenting state within a service. Broadcast-related applications not inheriting media presentation are unable to move to the Presenting state.				

70 Clarity about how applications determine the DVB-I 'context' in which they're running

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14273				Yes	Ambiguity

1) In clause O.5.4, the description of the currentServiceInstance property is revised as shown underlined.

`Channel currentServiceInstance`	
Description	When the current channel corresponds to a service in a DVB-I service list, this property shall return a `Channel` object corresponding to the currently selected service instance <u>(if there is one)</u>. Otherwise `undefined` shall be returned.

2) The following is added at the end of clause O.5.4.

- When the current service is outside of the scheduled hours for all service instances, this shall be reflected as a service being selected but no service instance being selected. The following additional requirements shall apply:

  - At the moment when the condition starts to apply, if an application signalled with a `HowRelated@href` attribute set to `urn:dvb:metadata:cs:LinkedApplicationCS:2019:2` is already running then it shall continue to run without interruption and shall be sent a `ChannelChangeSucceeded` event whose channel argument corresponds to the selected DVB-I service.

  - At the moment when the condition ceases to apply, if an application signalled with a `HowRelated@href` attribute set to `urn:dvb:metadata:cs:LinkedApplicationCS:2019:2` is running and is permitted to continue running then it shall continue to run without interruption and shall be sent a `ChannelChangeSucceeded` event whose channel argument corresponds to the selected DVB-I service.

  - An application to which the above requirements shall register to receive `ChannelChangeSucceeded` events.

3) Clause A.2.26 is renamed “Modifications and extensions to the ApplicationPrivateData class”, the current contents become a new clause A.2.26.1 and a new clause A.2.26.2 is added as follows.

A.2.26.2 Extension

Terminals that support integration with DVB-I as defined in annex O shall support the following additional property in this class.

`String applicationHowRelatedHref`	
Description	If the application is running at the present time due to being signalled in DVB-I (see annex O) then this property shall return the `HowRelated@href` attribute reflecting the reason why the application is currently running (which may not be the reason the application was started). For example, an application that was started due to being signalled with `HowRelated@href` of `urn:dvb:metadata:cs:LinkedApplicationCS:2019:1.1` but was allowed to continue running when the current time became outside of the scheduled hours for all service instances, due to additionally being signalled with `HowRelated@href` of `urn:dvb:metadata:cs:LinkedApplicationCS:2019:2`, would have this property return `urn:dvb:metadata:cs:LinkedApplicationCS:2019:2.Undefined` shall be returned for applications running at the present time for a reason other than being signalled in DVB-I.

71 Annex O.7 Capabilities - Application controlling media presentation - Application Does not inherit media presentation

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14292				Y	Other

In clause O.7, the first bullet point is amended as shown underlined.

> The key events VK_STOP, VK_PLAY, VK_PAUSE, VK_PLAY_PAUSE, VK_FAST_FWD, VK_REWIND and VK_RECORD shall always be available to linked applications <u>(that do not inherit media presentation)</u> that are controlling media presentation without requiring the application to be activated first.

72 DVB-I Annex O: no mapping to Service Level Parental Rating

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14319				Y	Inconsistency

In Table O.4, clause O.6.2.2, change the last row as shown underlined (note this includes a change from #13794 above).

parentalRatings	<u>If present,</u> ProgramInformation / BasicDescription/ParentalGuidance. <u>Otherwise, if present, Service/ParentalRating.</u> If the minimumAge is not 255 then the "scheme" in the ParentalRating class shall be "dvb-si".

73 Configuration.preferredUILanguage47 referenced by solution to #12890 but not added

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other
14328				Y	Error

The following property is added to clause A.2.20.6.

`readonly String preferredUILanguage47`
A comma-separated set of languages to be used for the user interface of a service, in order of preference. Each language shall be indicated by its language code as defined according to IETF BCP47 - IETF RFC 5646 [23]. The indicated set of languages and the order of preference shall be consistent with those found in the `preferredUILanguage` property.

Issue Number	Applicable Specification Version				Category
	2.0.1	2.0.2	2.0.3	2.0.4	Ambiguity / Editorial / Error / Implementation / Inconsistency / Other

Bookmarks

The following are included only to avoid breaking cross-references in text included elsewhere in the present document. The numbers are generated automatically and will be different in the present document from any other document, this difference should be ignored.

[3] Open IPTV Forum Release 2 specification, volume 5 (V2.3): "Declarative Application Environment".

[4] ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

[5] ETSI TS 103 770: "Digital Video Broadcasting (DVB); Service Discovery and Programme Metadata for DVB-I".

[6] W3C® Recommendation (28 October 2014): "HTML5 - A vocabulary and associated APIs for HTML and XHTML".

[7] IETF RFC 4648: "The Base16, Base32, and Base64 Data Encodings".

[8] W3C® Recommendation (2 May 2008): "Canonical XML Version 1.1".

[9] CSA ISO/IEC 23009-1 (4th Edition): "Information technology - Dynamic adaptive streaming over HTTP (DASH) - Part 1: Media presentation description and segment formats".

[10] CTA Specification: "Web Application Video Ecosystem - Web Media API Snapshot 2021". CTA-5000-D.

[11] ETSI TS 102 851: "Digital Video Broadcasting (DVB); Uniform Resource Identifiers (URI) for DVB Systems".

[12] ETSI TS 102 809 (V1.3.1): "Digital Video Broadcasting (DVB); Signalling and carriage of interactive applications and services in Hybrid broadcast/broadband environments".

[13] ETSI TS 102 034: "Digital Video Broadcasting (DVB); Transport of MPEG-2 TS Based DVB Services over IP Based Networks".

[14] IETF RFC 6455: "The WebSocket Protocol".

[15] W3C® Candidate Recommendation (20 September 2012): "The WebSocket API".

9.9.5 Request capability negotiation

[16] ISO/IEC 14496-30 (2018): "Information technology - Coding of audio-visual objects -- Part 30: Timed text and other visual overlays in ISO base media file format".

[17] W3C® Draft Community Group Report (9 June 2022): "Page Lifecycle".

[18] ISO 639-1 (2002): "Codes for the representation of names of languages - Part 1: Alpha-2 code".

[19] ISO 639-2 (1998): "Codes for the representation of names of languages - Part 2: Alpha-3 code".

[20] ISO/IEC 23001-7:2016: "Information technology - MPEG systems technologies - Part 7: Common encryption in ISO base media file format files".

[21] W3C® Recommendation (28 October 2014): "HTML5 - A vocabulary and associated APIs for HTML and XHTML".

[22] ETSI TS 103 205 (V1.2.1): "Digital Video Broadcasting (DVB); Extensions to the CI Plus™ Specification".

[23] IETF RFC 5646 BCP 47: "Tags for Identifying Languages", Phillips, A., Ed., and M. Davis, Ed. September 2009.

Table 2: Key events and their status

Table O.1: Property mapping for Channel objects corresponding to a service in a DVB-I service list

6 Service and application model

6.2.2.2 Behaviour when selecting a broadcast service

6.2.2.3 Behaviour while a broadcast service is selected

6.2.2.6 Broadcast-independent applications

6.2.2.11 Other general behaviour

7.3.1.1 General requirements

7.3.1.5.1 TTML based subtitles

7.2.3.1 Broadcast signalling

7.2.3.2 Broadcast-independent application signalling

9.9.2 The Web Socket Server

A.2.4.1 State machine and related changes

A.2.4.3 Support for quiet service selection

A.2.12.2 Out-of-band text tracks

Annex B (normative): Support for protected content delivered via broadband

B.3Clear key encryption

L.5 AVComponent and sub-classes

Annex N (normative): Electronic attachments

Annex O (normative): HbbTV® and DVB-I

O.73.1 The video/broadcast object

O.74 Service and application model

O.74.2 The Channel class