

# ETSI TS 102 796 V1.5.1 (2018-09)



## Hybrid Broadcast Broadband TV

**PREVIEW**  
iTech STANDARD  
(standards.itech.ai)  
Full standard:  
<https://standards.itech.ai/catalog/standards/sist/f4718832-8918-4aba-88a0-8d6f22a5dd13/etsi-ts-102-796-v1.5.1-2018-09>

# EBU

OPERATING EUROVISION

---

**Reference**

RTS/JTC-049

---

**Keywords**

broadcasting, DVB, HTML, internet, multimedia

**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

---

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2018.

© European Broadcasting Union 2018.

All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

**3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**oneM2M** logo is protected for the benefit of its Members.

**GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

# Contents

Intellectual Property Rights .....	13
Foreword.....	13
Modal verbs terminology.....	13
Introduction .....	14
1 Scope .....	16
2 References .....	16
2.1 Normative references .....	16
2.2 Informative references.....	19
3 Definitions and abbreviations.....	21
3.1 Definitions.....	21
3.2 Abbreviations .....	22
4 Overview .....	25
4.1 Applications .....	25
4.2 Architecture (informative).....	26
4.2.1 Introduction.....	26
4.2.2 System overview.....	26
4.2.3 Functional terminal components.....	27
4.3 Terminal capabilities and extensions.....	29
4.4 Specification overview .....	29
4.5 Referenced W3C Specifications.....	31
5 User experience (informative).....	31
5.0 Introduction .....	31
5.1 Visual appearance of interactive applications .....	31
5.1.1 Balance of video and application .....	31
5.1.2 Service selection and event change.....	32
5.2 User input .....	33
5.3 Access to interactive applications .....	34
5.3.1 Overview of ways of access.....	34
5.3.2 Inaccessibility of applications.....	35
5.3.3 Starting broadcast-related autostart applications .....	35
5.3.3.1 Possible states of an autostart application .....	35
5.3.3.2 "Red Button" applications.....	36
5.3.4 Starting digital teletext applications.....	36
5.3.5 Starting broadcast-independent applications .....	37
5.4 Exiting and hiding broadcast-related applications.....	38
5.5 Companion Screens.....	38
5.6 User interface issues.....	39
5.6.1 Advertising broadcast applications .....	39
5.6.2 Co-existence with CI and CI Plus MMI.....	39
5.6.3 Encrypted channels.....	39
6 Service and application model .....	39
6.1 Application model .....	39
6.2 Application lifecycle .....	40
6.2.1 Introduction.....	40
6.2.2 Starting and stopping applications .....	40
6.2.2.1 Summary (Informative).....	40
6.2.2.2 Behaviour when selecting a broadcast service .....	41
6.2.2.3 Behaviour while a broadcast service is selected.....	43
6.2.2.4 Time-shifting behaviour .....	45
6.2.2.5 Simultaneous broadcast/broadband/CI Plus application signalling.....	45
6.2.2.5.1 Priority.....	45
6.2.2.5.2 Not currently operational broadband connection.....	45

6.2.2.5.3	Currently operational broadband connection and error accessing initial page .....	46
6.2.2.5.4	Not currently operational CI Plus protocol.....	46
6.2.2.5.5	Currently operational CI Plus connection and error accessing file system.....	46
6.2.2.5.6	Application launch failure .....	46
6.2.2.6	Broadcast-independent applications.....	46
6.2.2.6.1	Lifecycle issues .....	46
6.2.2.6.2	Launch context signalling (informative) .....	47
6.2.2.7	Access to broadcast resources while presenting broadband-delivered A/V .....	49
6.2.2.8	Behaviour on encrypted broadcast services .....	49
6.2.2.9	Applications launched from non-HbbTV <sup>®</sup> application environments.....	49
6.2.2.10	Parental ratings.....	50
6.2.2.11	Other general behaviour .....	50
6.2.3	Application lifecycle example (informative) .....	51
6.3	Application boundary .....	52
6.3.1	Introduction.....	52
6.3.2	Origin.....	52
6.3.3	Application boundary definition .....	53
7	Formats and protocols .....	54
7.1	General formats and protocols.....	54
7.1.1	Graphic formats .....	54
7.1.2	Audio description.....	54
7.2	Broadcast-specific format and protocols .....	54
7.2.1	System, video, audio and subtitle formats .....	54
7.2.2	Protocol for application transport .....	54
7.2.3	Signalling of applications .....	56
7.2.3.1	Broadcast signalling .....	56
7.2.3.2	Broadcast-independent application signalling .....	58
7.2.4	Synchronization .....	60
7.2.5	DSM-CC carousel.....	60
7.2.5.1	Mounting related constraints .....	60
7.2.5.2	Initial carousel mounting .....	61
7.2.5.3	Subsequent carousel mountings (during the lifecycle of an application) .....	61
7.2.5.4	Constraints .....	61
7.2.6	Data services.....	61
7.2.7	File system acceleration.....	62
7.2.7.1	Introduction.....	62
7.2.7.2	HbbTV <sup>®</sup> stored groups descriptor .....	62
7.2.7.3	Group location descriptor .....	63
7.2.7.4	Group Manifest file name .....	63
7.2.7.5	File groups referenced by multiple carousels.....	63
7.2.7.6	The use_version flag .....	63
7.2.8	Protocol for download .....	64
7.3	Broadband-specific format and protocols.....	64
7.3.1	System, video and audio formats .....	64
7.3.1.1	General requirements .....	64
7.3.1.2	Systems layers.....	66
7.3.1.3	Video.....	67
7.3.1.4	Audio.....	68
7.3.1.5	Subtitles.....	68
7.3.1.5.1	TTML based subtitles.....	68
7.3.1.5.2	Broadcast subtitles.....	70
7.3.2	Protocols .....	70
7.3.2.1	Protocols for streaming .....	70
7.3.2.2	Protocols for download .....	71
7.3.2.3	Void.....	71
7.3.2.4	HTTP User-Agent header .....	71
7.3.2.5	HTTP Redirects.....	71
7.3.2.6	HTTP Caching .....	72
7.3.2.7	Simultaneous HTTP connections .....	72
8	Browser application environment .....	72

8.1	DAE specification usage .....	72
8.2	Defined JavaScript APIs .....	72
8.2.1	Acquisition of DSM-CC stream events .....	72
8.2.1.1	Adding and removing stream event listeners .....	72
8.2.1.2	DSM-CC StreamEvent event .....	74
8.2.2	Carousel objects access with XMLHttpRequest .....	74
8.2.3	APIs for media synchronization.....	75
8.2.3.1	Introduction (Informative) .....	75
8.2.3.2	The MediaSynchroniser embedded object .....	77
8.2.3.2.0	General .....	77
8.2.3.2.1	Properties.....	77
8.2.3.2.2	Methods .....	80
8.2.3.2.3	DOM2 events .....	85
8.2.3.2.4	Error codes .....	85
8.2.3.3	The CorrelationTimestamp class.....	86
8.2.3.3.1	General .....	86
8.2.3.3.2	Properties.....	87
8.2.4	APIs for automatic deletion of downloaded content.....	87
8.2.5	APIs for obtaining the LCN of a service.....	87
8.2.6	Companion Screen discovery APIs .....	88
8.2.6.1	HbbTVCSManager embedded object .....	88
8.2.6.2	DiscoveredTerminal class .....	91
8.2.6.3	DiscoveredCSLauncher class .....	92
9	System integration.....	93
9.1	Mapping from APIs to protocols.....	93
9.1.1	Unicast streaming .....	93
9.1.1.1	General streaming requirements.....	93
9.1.1.2	HTTP streaming .....	93
9.1.1.3	Media player implementations and API behaviour.....	93
9.1.2	Unicast content download.....	93
9.1.3	Seek accuracy .....	93
9.2	URLs .....	95
9.3	Other file formats .....	97
9.3.1	Stream event .....	97
9.3.2	MPEG DASH event integration.....	97
9.3.2.1	General .....	97
9.3.2.2	HTML5 media element .....	97
9.4	Presentation of adaptive bitrate content.....	99
9.4.1	General.....	99
9.4.2	Behaviour for HTML5 media objects.....	99
9.4.3	Behaviour for the A/V Control object .....	100
9.5	Downloading content via FDP .....	101
9.5.1	Download registration.....	101
9.5.2	Single file with multiple URLs .....	101
9.5.3	Properties of the Download object.....	102
9.5.4	Download state diagram .....	102
9.6	Media element integration.....	104
9.6.1	General.....	104
9.6.2	Resource management .....	104
9.6.3	Transition behaviour .....	105
9.6.4	Reporting and control of buffering .....	105
9.6.5	Distinguishing multiple media tracks (informative) .....	106
9.6.6	Controls attribute .....	106
9.6.7	DRM .....	106
9.6.8	Parental Rating Errors.....	107
9.6.9	Downloaded Content .....	107
9.6.10	Video presentation .....	107
9.6.11	getStartDate method .....	107
9.6.12	End of stream indication .....	107
9.7	Synchronization.....	108
9.7.1	Synchronization and video objects .....	108

9.7.1.1	video/broadcast object.....	108
9.7.1.2	HTML5 media element.....	109
9.7.1.3	A/V Control object.....	110
9.7.2	Tolerance.....	111
9.7.3	Timeline availability.....	112
9.7.4	Minimum synchronization accuracy.....	112
9.8	Reliability and resilience.....	112
10	Capabilities.....	114
10.1	Display model.....	114
10.2	Terminal capabilities and functions.....	114
10.2.1	Minimum terminal capabilities.....	114
10.2.2	User input.....	118
10.2.2.1	Key events.....	118
10.2.2.2	Mouse and wheel events.....	120
10.2.3	Terminal functions.....	120
10.2.3.1	Favourites and bookmarks.....	120
10.2.3.2	Streaming and Download.....	121
10.2.3.3	PVR.....	121
10.2.3.4	Download via broadcast using FDP.....	121
10.2.4	HbbTV <sup>®</sup> reported capabilities and option strings.....	121
10.2.5	Void.....	126
10.2.6	Parental access control.....	126
10.2.6.1	Broadcast channel.....	126
10.2.6.2	Broadband delivered content.....	126
10.2.6.3	Downloaded content.....	127
10.2.6.4	PVR.....	127
10.2.6.5	Synchronization and parental access control.....	128
10.2.7	Component selection.....	128
10.2.7.1	General.....	128
10.2.7.2	Component selection by the terminal.....	130
10.2.7.3	Component selection by the application.....	131
10.2.7.4	Single decoder model.....	132
10.2.7.5	Multi-decoder model.....	132
10.2.8	Multi-stream media synchronization.....	132
10.2.8.1	General.....	132
10.2.8.2	Synchronization using gen-locked STC.....	134
10.2.8.3	Other synchronization cases.....	134
10.2.8.4	Supported combinations.....	135
10.2.9	Inter-device media synchronization.....	136
10.2.9.1	General.....	136
10.2.9.2	Master terminal.....	136
10.2.9.3	Slave terminal.....	137
10.2.10	Application to media synchronization.....	137
10.2.11	Combining audio from memory and broadcast audio / video.....	137
11	Security.....	138
11.1	Application and service security.....	138
11.2	TLS and Root Certificates.....	138
11.2.1	TLS support.....	138
11.2.2	Cipher suites.....	139
11.2.3	Root certificates.....	140
11.2.4	Signature algorithms.....	140
11.2.5	Key sizes and elliptic curves.....	140
11.2.6	Backward compatibility.....	141
11.3	TLS client certificates.....	141
11.4	CI Plus.....	141
11.4.1	CI Plus communication.....	141
11.4.2	IP delivery Host player mode.....	142
11.4.2.1	Error handling in "IP delivery Host player mode".....	142
11.4.2.2	DRM metadata source.....	142
11.4.3	Auxiliary file system.....	142

11.4.4	Virtual channel.....	143
11.4.5	IP Delivery CICAM player mode.....	143
11.5	Protected content via broadband.....	143
11.6	Protected content via download.....	143
11.7	Terminal WebSocket service endpoints.....	144
11.8	Cookie storage.....	144
12	Privacy.....	144
12.0	Overview.....	144
12.1	Terminal privacy features.....	144
12.1.1	Tracking preference expression (DNT).....	144
12.1.1.0	Background.....	144
12.1.1.1	Principles.....	145
12.1.1.2	Expressing a tracking preference.....	145
12.1.1.2.1	Expression format.....	145
12.1.1.2.2	DNT header field for HTTP requests.....	145
12.1.2	Third party cookies.....	146
12.1.3	Blocking tracking websites.....	146
12.1.4	Persistent storage.....	146
12.1.5	Distinctive identifiers.....	146
12.2	Respecting privacy in applications.....	147
13	Media synchronization.....	148
13.1	General (informative).....	148
13.2	Architecture (informative).....	148
13.2.1	General.....	148
13.2.2	Multi-stream synchronization.....	148
13.2.3	Inter-device synchronization.....	150
13.2.4	Master media and other media.....	153
13.3	Media synchronization states and transitions.....	154
13.3.1	States overview (informative).....	154
13.3.2	Multi-stream synchronization.....	155
13.3.3	Becoming a master terminal.....	156
13.3.4	Ceasing to be a master terminal.....	156
13.3.5	Becoming a slave terminal.....	157
13.3.6	Ceasing to be a slave terminal.....	157
13.3.7	Transient errors.....	157
13.3.8	Permanent errors.....	158
13.4	Timelines and timestamping.....	158
13.4.1	Reference point for timestamping.....	158
13.4.2	Supported timelines and their selection.....	159
13.4.3	Synchronization timeline.....	160
13.4.3.1	Timelines for the MediaSynchroniser API.....	160
13.4.3.2	Synchronization timeline for Inter-device synchronization.....	161
13.5	Buffer for media synchronization.....	161
13.5.1	General.....	161
13.5.2	Media synchronization buffering cases.....	161
13.5.3	Media synchronization buffer model.....	162
13.6	Content Identification Information service endpoint.....	163
13.6.1	General.....	163
13.6.2	CSS-CII service endpoint (master terminal).....	163
13.6.3	Use of CSS-CII service endpoint (slave terminal).....	165
13.7	Wall clock synchronization.....	166
13.7.1	General.....	166
13.7.2	Wall clock properties.....	166
13.7.3	WC-Server (master terminal).....	167
13.7.4	WC-Client (slave terminal).....	167
13.8	Timeline Synchronization service endpoint.....	168
13.8.1	General.....	168
13.8.2	CSS-TS service endpoint (master terminal).....	169
13.8.2.1	General.....	169
13.8.2.2	Synchronization timeline availability.....	169

13.8.2.3	Frequency of control timestamp messages.....	169
13.8.2.4	Controlling timing of presentation .....	170
13.8.3	SC function (slave terminal) .....	171
13.8.3.1	General .....	171
13.8.3.2	Setup-data message .....	172
13.8.3.3	Sending Actual, Earliest and Latest Presentation Timestamps .....	172
13.8.3.4	Value of Actual, Earliest and Latest Presentation Timestamps.....	172
13.8.3.5	Adjusting timing of presentation in response to Control Timestamps .....	174
13.9	Trigger Events .....	174
13.10	Sequence diagrams for timeline synchronization (Informative).....	175
13.10.1	General.....	175
13.10.2	Initiation of timeline synchronization .....	175
13.10.3	Protocols interactions for beginning inter-device synchronization .....	177
13.10.4	Termination of timeline synchronization.....	178
13.10.5	Detailed protocol interaction (HTML5 media element presenting ISOBMFF as master media) .....	179
13.10.6	Detailed protocol interaction (A/V Control object presenting DASH as master media) .....	182
13.10.7	Detailed protocol interaction (video/broadcast object as master media) .....	185
13.10.8	Detailed protocol interaction (two media objects at the slave terminal) .....	189
13.11	Application to media synchronization .....	192
13.11.1	General.....	192
13.11.2	Reading the media playback position of media objects .....	193
13.11.3	Reading the media playback position of the MediaSynchroniser object .....	193
14	Companion screens.....	194
14.1	Introduction .....	194
14.2	Description of framework (informative) .....	194
14.2.1	Supported features .....	194
14.2.2	Model.....	195
14.2.2.1	Launching a companion screen application .....	195
14.2.2.2	Application to application communication .....	196
14.2.2.3	Remotely launching HbbTV <sup>®</sup> applications.....	197
14.3	Requirements for launching a CS application from an HbbTV <sup>®</sup> application.....	198
14.3.1	Support for 'launching a CS application from an HbbTV <sup>®</sup> application' .....	198
14.3.2	The Launcher application .....	198
14.4	Launching a CS application from an HbbTV <sup>®</sup> application .....	199
14.4.1	CS OS identification .....	199
14.4.1.1	General (informative).....	199
14.4.1.2	Syntax and semantics .....	199
14.4.1.3	Hints on how to derive the CS OS identifier on Android <sup>™</sup> (informative).....	201
14.4.1.4	Hints on how to derive the CS OS identifier on iOS <sup>™</sup> (informative).....	201
14.4.2	Payload format for Install and Launch operations .....	202
14.4.2.1	Permissible Operations.....	202
14.4.2.2	JSON payload format.....	203
14.4.2.2.1	Introduction .....	203
14.4.2.2.2	Install operation .....	203
14.4.2.2.3	Launch operation .....	204
14.4.2.2.4	JSON payload schema.....	204
14.4.2.2.5	Handling Special Characters in URLs (Informative).....	205
14.5	Application to application communications .....	206
14.5.1	General.....	206
14.5.2	Service endpoints provided by the terminal.....	207
14.5.3	Handling of new connections from clients .....	208
14.5.4	Connection pairing.....	209
14.5.5	Paired connections .....	211
14.6	Launching an HbbTV <sup>®</sup> application from a CS application .....	212
14.6.1	Introduction.....	212
14.6.2	Launching an HbbTV <sup>®</sup> application protocol .....	212
14.6.3	Providing HbbTV <sup>®</sup> user agent .....	214
14.7	Discovering terminals and their service endpoints.....	215
14.7.1	Introduction.....	215



14.7.2	Terminal and service endpoint discovery .....	215
14.7.3	Discovery example (informative) .....	216
14.7.3.1	DIAL Service Discovery .....	216
14.7.3.2	DIAL Rest Service .....	217
14.8	Cross-Origin support .....	218
<b>Annex A (normative): OIPF specification profile .....</b>		<b>219</b>
A.1	Detailed section-by-section definition for volume 5 .....	219
A.2	Modifications, extensions and clarifications to volume 5 .....	236
A.2.1	Resource management .....	236
A.2.2	Void .....	237
A.2.3	Void .....	237
A.2.4	Extensions to the video/broadcast object .....	237
A.2.4.1	State machine and related changes .....	237
A.2.4.2	Access to the video/broadcast object .....	239
A.2.4.3	Support for quiet service selection .....	239
A.2.4.3.1	Quiet service selection .....	239
A.2.4.3.2	Changes to the video/broadcast object .....	242
A.2.4.4	Definition of "delivery system descriptor" .....	242
A.2.4.5	Other modifications to the video/broadcast object .....	243
A.2.4.6	Support for creating audio and video components .....	243
A.2.4.7	Extensions to video/broadcast for time-shift .....	244
A.2.4.7.1	General .....	244
A.2.4.7.2	Constants .....	245
A.2.4.7.3	Properties .....	245
A.2.4.7.4	Methods .....	246
A.2.4.7.5	Events .....	248
A.2.4.8	Extensions to video/broadcast for recording .....	249
A.2.4.8.1	General .....	249
A.2.4.8.2	Properties .....	250
A.2.4.8.3	Methods .....	251
A.2.5	Extensions to the A/V Control object .....	251
A.2.5.1	New queue method .....	251
A.2.5.2	State machine and related changes .....	252
A.2.5.3	Support for TTML subtitles .....	253
A.2.5.4	Support for media synchronization with subtitle-only streams .....	253
A.2.5.5	Using an A/V Control object to play downloaded content .....	254
A.2.5.6	Extension to PlayStateChange event .....	254
A.2.5.7	Other modifications to the A/V Control object .....	254
A.2.6	HTML Profile .....	255
A.2.6.1	Void .....	255
A.2.6.2	MIME type and DOCTYPE .....	255
A.2.6.3	Void .....	256
A.2.6.4	Browser History .....	256
A.2.6.5	Attribute reflection for visual embedded objects .....	256
A.2.7	Extensions to the oipfObjectFactory object .....	256
A.2.8	Void .....	256
A.2.9	Access to EIT Schedule Information .....	256
A.2.10	Correction to the application/oipfDownloadManager object .....	257
A.2.11	Extensions to the Download class .....	257
A.2.12	HTML5 media element mapping .....	257
A.2.12.0	General .....	257
A.2.12.1	Inband VideoTracks, AudioTracks and TextTracks .....	257
A.2.12.2	Out-of-band text tracks .....	259
A.2.12.3	Modifications to clause 8.4.6 .....	259
A.2.13	Extensions to the AVSubtitleComponent class .....	260
A.2.14	Modifications to clause H.2 "Interaction with the video/broadcast and A/V Control objects" .....	260
A.2.15	Extensions to the OIPF-defined capability negotiation mechanism .....	261
A.2.16	Graphics performance .....	264
A.2.17	Notification of change of components .....	265
A.2.18	Clarification regarding the reserve() method of the application/oipfDownloadManager object .....	265

A.2.19	Correction to the registerDownloadURL() method .....	265
A.2.20	Extensions to the Configuration class .....	266
A.2.20.1	Extensions to Represent Subtitle Presentation .....	266
A.2.20.2	Extensions for time-shift .....	267
A.2.20.3	Extensions to represent audio description presentation .....	267
A.2.20.4	Extensions for access to network IDs .....	267
A.2.20.5	Extensions for distinctive identifiers .....	267
A.2.21	Void .....	269
A.2.22	Modifications to clause 8.4.2 .....	269
A.2.23	AVAudioComponent .....	269
A.2.24	Modifications to clause 7.10.1.1 and references to it .....	269
A.2.25	Modifications to content download descriptor and content access streaming descriptor .....	270
A.2.26	Correction to the ApplicationPrivateData class .....	271
A.2.27	Extensions to the application/oiptDrmAgent embedded object .....	271
A.2.28	Clarification of encoding of DVB-SI parental ratings .....	272
A.2.29	Security .....	272
A.2.29.1	Risk of tampering with data returned by APIs .....	272
A.3	Modifications, extensions and clarifications to volume 5a .....	272
A.3.0	General .....	272
A.3.1	Additional support for TextTracks and Cues .....	273
A.3.2	Additional support for getStartDate in HTML5 media elements .....	273
A.3.3	Event model .....	273
A.3.4	Resize event .....	273
A.3.5	HTML5 recommendation .....	274
A.3.6	Support for volume controls .....	274
A.3.7	Support for multiple audio tracks .....	274
A.3.8	Fonts .....	274
A.3.9	Support for high resolution graphics .....	274
A.3.10	Web Audio API .....	275
A.3.11	Encrypted media extensions .....	276
A.3.12	CSS .....	276
A.3.13	Mixed content .....	276
A.4	Modifications, extensions and clarifications to volume 7 .....	276
A.4.1	Processing of the CI parental_control_info message .....	276
<b>Annex B (normative):</b>	<b>Support for protected content delivered via broadband .....</b>	<b>278</b>
B.1	Introduction .....	278
B.2	Common Encryption for ISOBMFF .....	278
B.3	Clear key encryption .....	278
B.4	Encrypted media extensions with DRM (informative) .....	278
B.5	Signalling and playing protected content (informative) .....	279
B.5.1	Signalling in the MPD .....	279
B.5.2	Information in the content .....	279
B.5.2.1	Initialization Vector .....	279
B.5.2.2	Key ID .....	280
B.5.2.3	'pssh' box .....	280
<b>Annex C (informative):</b>	<b>Support for analogue broadcasting networks .....</b>	<b>281</b>
C.1	Scope .....	281
C.2	AIT retrieval and monitoring .....	281
C.3	Tuning to a new channel .....	281
C.4	Other aspects .....	282
<b>Annex D (informative):</b>	<b>Server root certificate selection policy .....</b>	<b>283</b>
D.1	Introduction .....	283

D.2	Background .....	283
D.3	Policy.....	283
<b>Annex E (normative): Profiles of MPEG DASH.....</b>		<b>285</b>
E.1	Introduction (informative).....	285
E.2	Requirements relating to the MPD.....	285
E.2.1	Profile definition .....	285
E.2.2	Numerical requirements .....	285
E.2.3	Metadata requirements .....	285
E.2.4	Role Related requirements .....	286
E.2.5	Audio Channel Configuration requirements.....	286
E.2.6	Content protection signalling .....	286
E.3	Restrictions on content .....	286
E.3.1	Restrictions on file format.....	286
E.3.1.1	ISO Base Media File Format .....	286
E.3.2	Restrictions on adaptation sets .....	286
E.4	Requirements on terminals.....	286
E.4.1	DASH profile support .....	286
E.4.2	Transitions between representations.....	287
E.4.2.1	Video tracks .....	287
E.4.2.2	Audio tracks.....	288
E.4.3	Buffering .....	288
E.4.4	ISO File Format support.....	288
E.4.5	MPD Anchors.....	288
E.4.6	Adaptation .....	288
<b>Annex F (informative): DRM Integration.....</b>		<b>290</b>
F.1	Introduction .....	290
F.2	General issues.....	290
F.3	DRM Agent API.....	290
F.4	Content via the A/V Control object.....	290
F.5	Content via the HTML5 media element.....	291
<b>Annex G (informative): Implementer guidelines for media synchronization .....</b>		<b>292</b>
G.1	General .....	292
G.2	Managing delay throughout distribution network .....	292
G.3	Managing multiple content timelines .....	293
G.4	Synchronization with no buffer in the HbbTV <sup>®</sup> terminal .....	293
G.4.0	General .....	293
G.4.1	Inter-device media synchronization with the HbbTV <sup>®</sup> terminal as master with no buffer.....	294
G.4.2	Multi-stream (Intra-device) media synchronization with no buffer for broadcast within the HbbTV <sup>®</sup> terminal .....	294
<b>Annex H (normative): HbbTV<sup>®</sup> File Delivery Protocol (FDP).....</b>		<b>296</b>
H.1	High-level principles of FDP (informative) .....	296
H.2	Encapsulation and signalling.....	296
H.2.1	DVB signalling.....	296
H.2.2	Encapsulation of FDP in Data Pipes .....	296
H.2.3	File identification .....	297
H.2.4	Referring to files using URLs.....	297

H.3	File segmentation and broadcasting .....	297
H.3.1	File segmentation .....	297
H.3.2	Message sequence .....	298
H.3.3	Repeated broadcasts of file segments.....	299
H.3.4	File segment recovery .....	299
H.4	Syntax and semantics of FDP messages.....	299
H.4.1	Message types .....	299
H.4.2	Initialization Message.....	300
H.4.3	Data Message .....	302
H.4.4	Termination Message .....	303
<b>Annex I (informative): Push-VoD services.....</b>		<b>304</b>
I.1	Introduction .....	304
I.2	Level of trust .....	304
I.3	Protocols.....	304
I.3.1	Broadcast protocol.....	304
I.3.2	Download protocol.....	304
I.3.3	Sources .....	304
I.4	Application features .....	304
I.4.1	Overview on application features .....	304
I.4.2	Hard disk space reservation.....	305
I.4.3	Hard disk deallocation.....	305
I.5	Content management.....	306
I.5.1	Content schedule .....	306
I.5.2	Play-out .....	306
I.6	Playback .....	306
<b>Annex J (informative): Advert insertion guidance for content providers.....</b>		<b>307</b>
<b>Annex K (normative): Mapping between HTML5 video element and CICAM player mode.....</b>		<b>309</b>
K.1	Introduction (informative).....	309
K.2	Determining when to use CICAM player mode.....	311
K.3	Starting CICAM player .....	311
K.4	During CICAM player use .....	311
K.5	Stopping CICAM player use .....	312
K.6	Play to end of content.....	312
K.7	Errors.....	313
K.8	Play speed.....	313
K.9	Random access .....	313
K.10	Tracks .....	314
K.11	No mapping possible.....	314
<b>Annex L (normative): Deprecated features .....</b>		<b>315</b>
L.1	Introduction .....	315
L.2	CSS3 directional focus navigation .....	315
	History .....	316

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

---

# Foreword

This Technical Specification (TS) has been produced by Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECTrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

European Broadcasting Union  
CH-1218 GRAND SACONNEX (Geneva)  
Switzerland  
Tel: +41 22 717 21 11  
Fax: +41 22 717 24 81

---

# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.