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Technical Specification

Digital Video Broadcasting (DVB); Carriage of Broadband Content Guide (BCG) information over Internet Protocol (IP)



Reference

RTS/JTC-DVB-280

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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.

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The Digital Video Broadcasting Project (DVB) is an industry-led consortium of broadcasters, manufacturers, network operators, software developers, regulatory bodies, content owners and others committed to designing global standards for the delivery of digital television and data services. DVB fosters market driven solutions that meet the needs and economic circumstances of broadcast industry stakeholders and consumers. DVB standards cover all aspects of digital television from transmission through interfacing, conditional access and interactivity for digital video, audio and data. The consortium came together in 1993 to provide global standardisation, interoperability and future proof specifications.

1 Scope

The present document specifies the signalling and the transport of TV-Anytime information over an always-on bi-directional IP network. The specification allows for metadata describing Live Media Broadcast, Content on Demand and Content Download Services delivered over any type of network using DVB specifications (e.g. DVB-T, DVB-S, DVB-IPTV). It can be used to develop a Broadband Content Guide, i.e. a content guide that is delivered over an always-on bi-directional IP network.

The present document is an addendum to TS 102 034 [4].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

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NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI TS 102 323: "Digital Video Broadcasting (DVB); Carriage and signalling of TV-Anytime information in DVB transport streams".
- [2] ETSI TS 102 822-3-2: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 3: Metadata; Sub-part 2: System aspects in a uni-directional environment".
- [3] ETSI TS 102 822-3-1: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 3: Metadata; Sub-part 1: Phase 1 - Metadata schemas".
- [4] ETSI TS 102 034: "Digital Video Broadcasting (DVB) Transport of MPEG-2 TS Based DVB Services over IP Based Networks".
- [5] IETF RFC 1950: "ZLIB Compressed Data Format Specification version 3.3".
- [6] IETF RFC 1951: "DEFLATE Compressed Data Format Specification version 1.3".
- [7] ETSI TS 102 822-6-1: "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 6: Delivery of metadata over a bi-directional network; Sub-part 1: Service and transport".
- [8] W3C Note (08 May 2000): "Simple Object Access Protocol (SOAP) 1.1".

- [9] ISO/IEC 13818-1: "Information technology - Generic coding of moving pictures and associated audio information: Systems".
- [10] ISO/IEC 23001-1: "Information technology - MPEG systems technologies - Part 1: Binary MPEG format for XML".
- [11] ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".
- [12] IETF RFC 2326: "Real Time Streaming Protocol (RTSP)".
- [13] Void.
- [14] IETF RFC 2616: "Hypertext Transfer Protocol - HTTP/1.1".
- [15] ETSI TS 102 851: "Digital Video Broadcasting (DVB); Uniform Resource Identifiers (URI) for DVB Systems".
- [16] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".
- [17] IETF RFC 4907: "Architectural Implications of Link Indications".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Content Download Service (CDS): service that provides download delivery of content items to the local storage of the HNED

NOTE: The consumption is independent of the delivery.

Content on Demand (CoD): program provided at the request of the end user for direct consumption (real-time streaming)

content provider: entity that owns or is licensed to sell content or content assets

Delivery Network (DN): network connecting the Delivery Network Gateway (DNG) and service providers

Delivery Network Gateway (DNG): device that is connected to one or multiple delivery networks and one or multiple home network segments

DVB-IPTV service: one or more programmes under the control of a service provider delivered over IP

NOTE: The programmes can be made available either as part of a schedule or on demand and either for direct consumption (Live Media Broadcast or Content on Demand Services) or for local storage (CDSs).

event: grouping of elementary broadcast data streams with a defined start and end time belonging to a common service

EXAMPLE: First half of a football match, News Flash, first part of an entertainment show.

Home Network End Device (HNED): device that is connected to a home network and which typically terminates the IP based information flow (sender or receiver side)

package: collection of DVB services marketed as a single entity

program: collection of program elements

NOTE: Program elements may be elementary streams. Program elements need not have any defined time base; those that do, have a common time base and are intended for synchronized presentation. Taken from ISO/IEC 13818-1 [9].

Service Provider (SP): entity providing a service to the end-user

NOTE: In the context of the present document, SP will mean a Service Provider providing DVB-IPTV services.

SP offering: set of streams or services a Service Provider proposes to the end-user

Transport Stream: data structure defined in ISO/IEC 13818-1 [9]

TS Full SI: transport stream with embedded service information as defined by DVB in EN 300 468 [11] with the exception of the network information table NIT

NOTE: This table may be omitted as it has no meaning in the context of IP services.

TS - Optional SI: transport stream with MPEG PSI (PAT and PMT tables) as defined in ISO/IEC 13818-1 [9]

NOTE: All other MPEG-2 and DVB tables are optional.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BCG	Broadband Content Guide
BiM	Binary format for Multimedia description streams
CDS	Content Download Service
CoD	Content on Demand
CRI	Content Referencing Information
CRID	Content Reference IDentifier
DNG	Delivery Network Gateway
DVB	Digital Video Broadcasting
DVBSTP	DVB SD&S Transport Protocol
HNED	Home Network End Device
HTTP	Hyper Text Transfer Protocol
IMI	Instant Metadata Identifier
IP	Internet Protocol
IPI	Internet Protocol Infrastructure
IPTV	Internet Protocol TV
LMB	Live Media Broadcast
MBwTM	Media Broadcast with Trick Modes
MPEG	Moving Pictures Expert Group
NIT	Network Information Table
PAT	Program Association Table
PMT	Program Map Table
PSI	Program Specific Information
RAR	Resolving Authority Record
RNT	RAR Notification Table
RTP	Real-time Transport Protocol
RTSP	Real Time Streaming Protocol
SD&S	Service Discovery and Selection
SOAP	Simple Object Access Protocol
SP	Service Provider
SSM	Source Specific Multicast
UDP	User Datagram Protocol
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
XML	eXtensible Markup Language

4 Delivery of BCG data

BCG data may be delivered in the following ways:

- Container-based:
 - via IP multicast (i.e. pushed);
 - via IP unicast (i.e. pulled).
- Query:
 - via IP unicast.

The IPI-1 interface as defined in TS 102 034 [4] shall support the container-based mechanism, both via multicast and unicast. It may additionally support the query mechanism.

On all networks there shall be at least one BCG provider that supports the container based download mechanism. Additionally, this provider may support the query mechanism.

For clarification, the query mechanism is optional for both Service Providers and HNEDs.

The container based download mechanism uses the Data Delivery Unit, as specified in clause 4.1.1.3, delivered via the mechanisms specified in clause 4.2.

The query mechanism is specified in clause 4.3.

4.1 Container-Based Delivery

4.1.1 Definitions

4.1.1.1 Container

A container shall carry either a RNT, one or more CRI structures or metadata. Each container is distinguished by a unique identifier, which is the `container_id`. Table 1 shows the clauses in the present document where the container format, according to each type of data carried, is defined.

Table 1: Container Format Definitions

Type of data carried	Container Format Definition
RNT	Clause 5.1 in the present document
CRI structures	TS 102 323 [1], clause 7.3.1.3
Metadata	TS 102 323 [1], clause 9.3

The type of data that the container carries determines the scope and format of the structure values.

4.1.1.2 Compression wrapper

The `compression_wrapper` allows a container to be carried in a compressed or uncompressed format. The syntax of the `compression_wrapper` is defined in table 21, clause 7.3.1.5 of TS 102 323 [1]. The `compression_wrapper` shall always be present, whether or not the container is compressed.

The semantics of the fields of table 21, clause 7.3.1.5 of TS 102 323 [1] are modified as follows:

- **container()**: See clause 4.1.1.1 for the definition of the container structure.

NOTE: This definition differs from TS 102 323 [1], where the compression wrapper may contain CRI structures only.

- **compression_structure:** This shall contain a container (see clause 4.1.1.1) encoded as a Zlib stream (as defined in RFC 1950 [5]). When present, the Zlib stream shall have its compression method nibble set to "1000", indicating use of the Deflate compression algorithm as specified in RFC 1951 [6].

4.1.1.3 Data Delivery Unit

A Data Delivery Unit is a container, as defined in clause 4.1.1.1, within a compression wrapper as defined in clause 4.1.1.2.

4.1.2 Transport

4.1.2.1 SD&S Information Data Types

In addition to the Payload ID values defined in TS 102 034 [4], table 1, clause 5.2.2.1, the values defined in table 2 shall be used for the BCG Data Delivery Units.

Table 2: BCG Payload ID values

Payload ID value	Payload type carried
0xA1	DVB-TVA-init message (clause 7.3 in the present document)
0xA2	TVAMain fragment (clause 7.4 in the present document)
0xA3	TV-Anytime metadata data container (clause 9.2.2 of TS 102 323 [1], value "d" in table 50)
0xA4	TV-Anytime metadata index container (clause 9.2.2 of TS 102 323 [1], value "i" in table 50)
0xA5	Both TV-Anytime metadata data and index container (clause 9.2.2 of TS 102 323 [1], value "b" in table 50)
0xA6	RNT (clause 5.1 in the present document)
0xA7	CRI structure (clause 5.3 in the present document)
0xA8-0xAF	Reserved

4.1.2.2 Transport mechanisms

This clause specifies the protocols that are used to transport the BCG information. Two mechanisms are defined, one for multicast and one for unicast.

The protocol DVB SD&S Transport Protocol (DVBSTP), as specified in clause 5.4.1 of TS 102 034 [4], shall be used to transport BCG information over multicast.

The protocol HTTP [14] shall be used to transport BCG information over unicast.

The two transport mechanisms shall be interchangeable in all steps and carry the same content encoded in the same way.

4.1.2.2.1 Protocol for Multicast Delivery of BCGs

For the push model delivery of BCGs, the protocol DVBSTP, as defined in TS 102 034 [4], clause 5.4.1.2, shall be used to transmit Data Delivery Units, as defined in clause 4.1.1.3 of the present document. Additional semantics are defined for the following fields:

- **Payload ID:** The Payload ID shall be encoded as specified in table 2 of the present document.
- **Segment ID:** If the Payload ID value is 0xA3, 0xA4 or 0xA5, then this field has the semantics of the container_id defined in TS 102 822-3-2 [2], clause 4.5.1.3. If the Payload ID value is 0xA7 then this field has the semantics of the container_id defined in TS 102 323 [1], clause 7.3.1.1.
- **Segment Version:** If the Payload ID value is 0xA3, 0xA4 or 0xA5, then this field has the semantics of a container version identifier defined in TS 102 822-3-2 [2], clause 4.5.2.
- **Compression (Compr):** Additional compression values are defined in table 3.

The field value of "001" is used to signal the encoding defined in the present document, which will be either BiM [10] for XML data or a specific binary representation for non XML data (RNT, CRI, etc.). Use of other values in the compression field is not defined.

Table 3: Additional Compression Values

Compression value	Meaning	Total Segment Size Meaning
001	Either BiM or the specific binary representation defined in the present document	Transmitted Size

4.1.2.2.2 Protocol for Unicast Delivery of BCGs

In the pull model of delivery of BCGs, the HTTP [14] protocol shall be used for all communication between the HNED and the BCG server(s).

When the HNED requests BCG information, it shall use the format defined in TS 102 034 [4], clause 5.4.2. The Payload ID values used shall be as defined in table 2 of the present document. The segmentID values shall have the same semantics as defined in TS 102 034 [4], clause 5.4.1.2. The BCG server(s) shall return Data Delivery Units, as defined in clause 4.1.1.3 of the present document.

When the HNED requests BCG information, it shall use the following format:

```
"GET /dvb/sdns/bcg_request HTTP/1.1" CRLF
"Host: " host CRLF
```

The bcg_request shall comply with the following format:

```
bcg_request = bcg?Payload="PayloadId"&Segment="SegmentItem"
```

where:

```
PayloadId      = 2 HEXDIG; any hex number from 00 to ff
SegmentId      = 4 HEXDIG; any hex number from 0000 to ffff
SegmentItem    = SegmentId 0*1('&Version='VersionNumber)
```

SegmentItem is a SegmentId with an optional field for the version number.

```
VersionNumber = 2 HEXDIG; any hex number from 00 to ff
```

For example, the following request can be constructed to request the index list structure (see TS 102 323 [1], clause 9.2.2):

```
"GET /dvb/sdns/bcg?Payload=A4&Segment=0000 HTTP/1.1" CRLF
"Host: " host CRLF
```

The HTTP headers returned with the data shall be:

```
Content-encoding : x-dvb-bcg-ip
```

4.2 Query mechanism

The query mechanism for BCG acquisition is described in this clause.

When the query mechanism is used, it shall be implemented according to TS 102 822-6-1 [7] and the requirements described in this clause. TS 102 822-6-1 [7] describes four SOAP methods. The version of SOAP [8] used shall be 1.1.

Table 4 shows the status of these methods within the present document.

Table 4: Requirements for Service Providers and HNEDs relating to SOAP methods as defined in TS 102 822-6-1 [7]

	Service Provider	HNED
get_Data	M	M
describe_Get_Data	M	M
submit_Data	O	O
describe_Submit_Data	O (if submit_Data not supported) M (if submit_Data supported)	O

5 Content Resolution

Content resolution is performed as in TS 102 323 [1], with the following additional constraints.

5.1 RNT (Resolution Provider Notification Table)

This table shall be carried inside a Data Delivery Unit, as defined in clause 4.1.1.3 of the present document.

The syntax and semantics of table 1 of clause 5.2.2 of TS 102 323 [1] shall be used, but deleting all the fields preceding the common_descriptors_length field, except the last 4 reserved bits. This removes all references to table sections, context_id and context_id_type, which are not relevant to the present document

5.2 RAR over IP descriptor

The RAR over IP descriptor defined in TS 102 323 [1], clause 5.3.6 shall have the following additional semantics:

- **url_length:** The length of the URL. A length of 0 can be used to indicate that the CRI structures shall be transmitted via the URL that is currently used.
- **url_char:** If present, this field shall contain a URL. The rules governing the encoding of an URL shall be as defined in clause 6.2 of TS 102 323 [1].

5.3 CRI structures

CRI structures are used to resolve a CRID into one or more locator(s) or CRID(s).

The format of CRI structures defined in TS 102 323 [1], clause 7.3.1.3 shall be used.

The URI compliant string, DVB binary locator, Scheduled decomposed binary locator, On-demand decomposed binary locator and Extended On-demand decomposed binary locator shall be supported, as defined in TS 102 323 [1], clause 7.3.2.3. The specific syntax and usage of the locator for a DVB-IPTV service shall be as defined in clause 8 of the present document.

This structure shall be carried inside a Data Delivery Unit, as defined in clause 4.1.1.3 of the present document.

The container carrying the cri_index structure, which is the first structure required by the receiver, shall have its Segment ID set to 0x0000, as specified by TS 102 323 [1], clause 7.3.1.1.

6 Profile of TV-Anytime Metadata for BCG

6.1 Introduction

TS 102 822-3-2 [2] provides several options for how to structure descriptions of program, group and location information. The profile as specified in TS 102 323 [1], clause 8 shall apply for the BCG. Table 45 of [1] lists all the supported metadata fragments. BCG specific usage of some of the fragments is defined in the clauses below.

NOTE: The present document does not provide any profiling for metadata delivered by other means.

6.2 Void

6.3 Schedule fragment

The ProgramURL element may be present, to provide an indication of the expected Live Media Broadcast service location as defined in clause 8.

6.4 ServiceInformation fragment

If an optional field is not specified in the BCG ServiceInformation Fragment of a Live Media Broadcast service, the corresponding information shall be inferred from the SD&S Broadcast Discovery Record information of that service if provided. If an optional field is specified both in the BCG and the SD&S information, then the field of the BCG shall be used.

The reference between the ServiceInformation Fragment and the SD&S Broadcast Discovery Record is provided by the serviceId of the ServiceInformation fragment which shall be equal to the textual identifier, the concatenated ServiceName and service provider DomainName of the corresponding SD&S Broadcast Discovery Record, as defined in clauses 5.2.1.2 and 5.2.6.2 of TS 102 034 [4]. This ensures a unique mapping between SD&S and BCG records for a service. For instance, if the ServiceName of a service from the Service Provider "sport-provider.com" is "extreme-sport" in SD&S, the serviceId in BCG shall also be "extreme-sport.sport-provider.com".

The Name element (mandatory at BCG level) may be an empty element, in which case it shall be inferred from the SD&S information of that service, i.e. the SI Name defined in clause 5.2.6.2.2 of TS 102 034 [4]. If the Name element (mandatory at BCG level) is filled, then this field shall be used.

If the Logo element is present, it shall contain a URL that points to an image file.

6.5 OnDemandProgram fragment

If the Instance Description field is present, its elements shall override the matching elements defined in the corresponding Program Information fragment.

The DeliveryMode, PublishedDuration, StartOfAvailability, EndOfAvailability, FirstAvailability, LastAvailability, ImmediateViewing, Content version, ExpiryTime and EarlyPayout elements in the OnDemandProgram element are optional. If they are not present the default values defined in table 5 shall be used.

Table 5: Default values for onDemandProgram elements

Element	Default values
DeliveryMode	<i>Streaming</i>
PublishedDuration	The value of the ProgramInformation fragment, if present, else <i>undefined</i>
StartOfAvailability	<i>Now</i>
EndOfAvailability	<i>Indefinitely</i>
FirstAvailability	<i>Undefined</i>
LastAvailability	<i>Undefined</i>
ImmediateViewing	<i>False</i>
ContentVersion	<i>0</i>
ExpiryTime	<i>Indefinitely</i>
EarlyPayout	<i>False</i>

The Program element shall be present and shall contain a CRID that can be found in the ProgramInformationTable and this CRID should also be present in the CRI.

The ProgramURL element may be present to provide the location as defined in clause 8.

The CRI shall be considered the authoritative source of CRID to location information.

The InstanceMetadataId (IMI) may be present and when present the same IMI shall be available in the CRI.

NOTE: The CRI can return a "not yet resolvable" flag in case the location is not yet available, but will be provided later. In this case it is recommended that the "StartOfAvailability" element is sent.

6.6 Purchase Information fragment

The PurchaseInformation fragment shall be defined as in TS 102 822-3-2 [2], clause 4.3.1.10 and TS 102 822-3-1 [3], clause 6.3.4 (complex type PurchaseItemType), with the following recommendations:

- A purchaseList element shall contain at least one PurchaseItem or PurchaseIdRef.
- Exactly one of the price attributes unit or currency shall be present.
- If a PurchaseIdRef is used, it shall contain a reference to a Purchase element that can be found in the TransactionInformationTable.

If the PricingServerURL is used, the returned information shall be a Data Delivery Unit containing a PricingInformation fragment.

6.7 PushDownloadProgram fragment

If the Instance Description field is present, its elements shall override the matching elements defined in the corresponding Program Information fragment.

The PublishedDuration, StartOfAvailability, EndOfAvailability, Content version and ExpiryTime elements in the OnDemandProgram element are optional. If they are not present the default values defined in table 6 shall be used.

Table 6: Default values for PushDownloadProgram elements

Element	Default values
PublishedDuration	The value of the ProgramInformation fragment, if present, else <i>undefined</i>
StartOfAvailability	<i>Now</i>
EndOfAvailability	<i>Indefinitely</i>
ContentVersion	<i>0</i>
ExpiryTime	<i>Indefinitely</i>

The ProgramURL element shall be present to provide the location of the download session description as defined in clause 8. CRID resolution shall not be performed.

7 TV-Anytime Fragments

7.1 Fragment encapsulation

TV-Anytime fragments shall be delivered in Data Delivery Units, as defined in clause 4.1.1.3 of the present document, i.e. they shall be carried in containers within a compression wrapper and delivered either using HTTP or DVBSTP.

7.2 Fragment encoding

TV-Anytime fragments shall be encoded with BiM [10], as defined in TS 102 323 [1], clause 9.4.

7.3 DVB-TVA-init message

The DVB-TVA-init message for the decoding of the TVA metadata fragment stream shall be conformant to the DVB profile of the TVA MPEG-7 profile as defined in TS 102 323 [1], clause 9.4.2.1.

The DVB-TVA-init message shall be delivered, as defined in table 2 of the present document, using the Payload ID value 0xA1.

7.4 TVAMain fragment

The TVAMain fragment, defined in TS 102 822-3-2 [2] contains the initial description of a TV-Anytime document. The transmission of this fragment is optional, as specified in TS 102 323 [1], clause 9.4.2.2.

If transmitted, the TVAMain fragment shall be delivered as defined in table 2 of the present document, using the Payload ID value 0xA2.

If not transmitted, the default TVMain fragment shall be used by the HNED, as specified in TS 102 323 [1], clause 9.4.2.2.

8 Locator and Program URL usage

Locators as part of CRI, and ProgramURLs as part of instance description metadata are used to reference DVB-IPTV services from the BCG. This clause defines the locator and ProgramURL formats for the different DVB-IPTV services defined in TS 102 034 [4].

8.1 Live Media Broadcast (LMB)

LMB services can be referenced via:

- the ProgramURL of the ScheduleEventType or BroadcastEventType instance metadata;
- the URI compliant string locator;
- the DVB binary locator; or
- the Scheduled decomposed binary locator.

The URI references to LMB services (as used by ProgramURL, URI compliant string locator and Scheduled decomposed binary locator) shall support:

- the DVB URI scheme as defined in TS 102 851 [15], clause 6.4;
- the DVB-MCAST URI scheme as defined in clause A.1; or
- the RTSP URI scheme as defined in clause A.2.

For referencing a LMB service announced via a SD&S BroadcastDiscovery record as defined in TS 102 034 [4], clause 5.2.6.2 one of the following reference schemes shall be used:

- the DVB triplet information (original network ID, transport stream ID and service ID); or
- the textual service identifier (concatenated service name and domain name);

of the broadcast channel as provided in the SD&S BroadcastDiscovery record.

DVB triplet information can be provided by the DVB Binary locator or the DVB URI. Textual service identifier information can be provided by the DVB URI.

8.2 Media Broadcast with Trick Modes (MBwTM)

MBwTM services can be referenced:

- via the ProgramURL of the ScheduleEventType or BroadcastEventType instance metadata;
- the URI compliant string locator;
- the DVB binary locator; or
- the Scheduled decomposed binary locator.

The URI references to MBwTM services (as used by ProgramURL, URI compliant string locator and Scheduled decomposed binary locator) shall support:

- the DVB URI scheme as defined in TS 102 851 [15], clause 6.4; or
- the RTSP URI scheme as defined in clause A.2.

For referencing a MBwTM service announced via a SD&S BroadcastDiscovery record as defined in TS 102 034 [4], clause 5.2.6.2 one of the following reference schemes shall be used:

- the DVB triplet information (original network ID, transport stream ID and service ID); or
- the textual service identifier (concatenated service name and domain name);

of the broadcast channel as provided in the SD&S BroadcastDiscovery record.

DVB triplet information can be provided by the DVB Binary locator or the DVB URI. Textual service identifier information can be provided by the DVB URI.

8.3 Content on Demand (CoD)

Streaming CoD services can be referenced via:

- the ProgramURL of the OnDemandProgramType instance metadata;
- the URI compliant string locator;
- the On-demand decomposed binary locator; or
- the Extended On-demand decomposed binary locator.

The URI references to streaming CoD services (as used by ProgramURL, URI compliant string locator, On-demand decomposed binary locator and Extended On-demand decomposed binary locator) shall support the RTSP URI scheme as defined in clause A.2.

8.4 Pull Content Download

Pull Content download services can be referenced via:

- the ProgramURL of the OnDemandProgramType instance metadata;
- the URI compliant string locator; or
- the Extended On-demand decomposed binary locator.

The URI references to Pull Content download services (used by ProgramURL, URI compliant string locator and Extended On-demand decomposed binary locator) shall support the URI schemes for referencing download session descriptions as defined in TS 102 034 [4], clause 10.3.2.

8.5 Push Content Download

Push Content download services can be referenced via:

- the ProgramURL of the PushDownloadProgramType instance metadata.

CRID resolution and CRI locators are not supported for Push Content download services.

The URI reference to Push Content download services (used by ProgramURL) shall support the URI schemes for referencing download session descriptions as defined in TS 102 034 [4], clause 10.3.2.

Annex A (normative): URI schemes

This annex describes DVB specific URI schemes and scheme extensions used in locators and ProgramURLs as defined in clause 8.

A.1 DVB-MCAST URI scheme for DVB services in a MPEG-2 TS delivered over IP Multicast

The basic DVB-MCAST URI scheme defined in TS 102 034 [4], clause G.3.1 is extended in order to reference specific program events in a MPEG-2 transport stream delivered over IP multicast.

The MPEG-2 transport stream can be delivered directly via UDP or via UDP and RTP as defined in TS 102 034 [4], clause 7.1. The transport is indicated by the payload parameter. A payload type of 'mp2t' indicates direct UDP transport while a payload type of 'mp2t/rtp' indicates a RTP over UDP transport.

If only the multicast address information (source host, multicast address and port) are provided the MPEG-2 transport stream is referenced without providing information on specific services within the transport stream. The dvb-service parameter set provides information on the specific DVB service within the MPEG-2 transport stream and reuses syntax structures from the DVB URI defined in TS 102 851 [15]. If dvb-service parameters are not provided the HNED shall decide from the context in which the URI is used and the DVB Service Information (DVB-SI) [11] within the transport stream which components of the transport stream it has to access.

The URI scheme is defined as follows:

```
"dvb-mcast://" [ src-host "@" ] mcast-addr ":" port "?payload=" ("mp2t"|"mp2t/rtp") ["&dvb-service="
[service_id "." component_set ["$"dvb_carousel_id]] [dvb_event_constraint]] [path-absolute]]
```

```
src-host           = source host (for source specific multicast)
mcast-addr         = multicast address
port               = port number
service_id         = as defined in TS 102 851 [15], clause 6.1
component_set      = as defined in TS 102 851 [15], clause 6.1
dvb_carousel_id    = as defined in TS 102 851 [15], clause 6.1
dvb_event_constraint = as defined in TS 102 851 [15], clause 6.4.1
path-absolute      = as defined in RFC 3986 [16], for the usage see TS 102 851 [15], clause 6.2
```

The mcast-addr shall specify the multicast address the client has to join and the port shall specify the UDP destination port where to receive the multicast data stream.

The src-host is an optional syntax element referring to the unicast IP address of the source of the multicast data. This is only meaningful in case Source Specific Multicast (SSM) as defined in RFC 4907 [17] is supported.

A.2 RTSP URI scheme for DVB services in a MPEG-2 TS delivered over IP sessions controlled by RTSP

The RTSP URI as defined in RFC2326 [12] is extended in order to reference specific components (e.g. services, program events) in a MPEG-2 transport stream delivered over IP and controlled by RTSP [12].

The URI scheme is defined as follows:

```
"rtsp://" host [":" port] [path-absolute] ["#dvb-service=" [service_id [". "component_set
["$"dvb_carousel_id]] [dvb_event_constraint]] [path-absolute]]
```

host	= host domain name or IP address as defined in RFC3986 [16]
port	= port number as defined in RFC3986 [16]
path-absolute	= absolute path as defined in RFC3986 [16]; for the usage within the dvb-service fragment part see TS 102 851 [15], clause 6.2
service_id	= as defined in TS 102 851 [15], clause 6.1
component_set	= as defined in TS 102 851 [15], clause 6.1
dvb_carousel_id	= as defined in TS 102 851 [15], clause 6.1
dvb_event_constraint	= as defined in TS 102 851 [15], clause 6.4.1

The host, port and path-absolute parts of the URI reference a MPEG-2 transport stream. These are the standard parts of a RTSP URI and shall be used by RTSP to setup and control the MPEG-2 transport stream delivery session as defined in TS 102 034 [4], clause 6.

For enabling the reference to specific components within the received (and possibly stored) MPEG-2 transport stream, the usage of DVB service specific parameters in the fragment part of the URI is specified above. These parameters reuse syntax structures from the DVB URI defined in TS 102 851 [15]. The fragment part of the URI is not used by RTSP and not sent from the HNED to the RTSP server for the MPEG-2 transport stream delivery session setup and control. It is only used by the HNED to access locally the specific component within the MPEG-2 transport. If DVB service specific parameters are not provided in the fragment part of the URI the HNED shall decide from the context in which the URI is used and the DVB Service Information (DVB-SI) [11] within the transport stream which components of the transport stream it has to access.

Annex B (informative): Bibliography

- ISO 8601 (2004): "Data elements and interchange formats - Information interchange - Representation of dates and times".

History

Document history		
V1.1.1	November 2006	Publication
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