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

European Broadcasting Union



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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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Founded in September 1993, the DVB Project is a market-led consortium of public and private sector organizations in the television industry. Its aim is to establish the framework for the introduction of MPEG-2 based digital television services. Now comprising over 200 organizations from more than 25 countries around the world, DVB fosters market-led systems, which meet the real needs, and economic circumstances, of the consumer electronics and the broadcast industry.

1 Scope

The present document is an addendum to TS 102 034 [4] concerning Broadcast Content Guides (BCG). It provides specifications for the signalling and delivery of TV-Anytime information in DVB-IP services. The BCG addresses both Content on Demand and Live Content, whether the content is available as a DVB-IP service or as a pure DVB service.

It has been written to be compatible as much as possible with TS 102 323 [1], which specifies the signalling and delivery of TV-Anytime information in DVB transport streams.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- 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.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

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

- [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 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] "Simple Object Access Protocol (SOAP) 1.1" W3C Note 08 May 2000.
- [9] ISO/IEC 13818-1: "Information technology - Generic coding of moving pictures and associated audio information: Systems".
- [10] ISO/IEC 23001-1 (MPEG-B): "Information Technology - MPEG Systems Technology - 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] ISO 8601 (2004): "Data elements and interchange formats - Information interchange - Representation of dates and times".
- [14] IETF RFC 2616: "Hypertext Transfer Protocol - HTTP/1.1".

3 Definitions and abbreviations

3.1 Definitions

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

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

Content Provider: entity that owns or is licensed to sell content or content assets

NOTE: The user could be a person or a PVR or some other entity.

Delivery Network: network connecting the delivery network gateway 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-IP service: DVB service provided over IP or content on demand over IP

DVB service: as defined by DVB, "a sequence of programmes under the control of a broadcaster which can be broadcast as part of a schedule"

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 may have a common time base for synchronized presentation.

Service Provider (SP): entity providing a service to the end-user. In the context of the present document, SP will mean a Service Provider providing DVB-IP 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: A 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
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
MPEG	Moving Pictures Expert Group
RAR	Resolving Authority Record
RNT	RAR Notification Table
RTSP	Real Time Streaming Protocol
SD&S	Service Discovery and Selection
SOAP	Simple Object Access Protocol
SP	Service Provider
URL	Uniform Resource Locator
XML	eXtensible Markup Language

4 Delivery of BCG data

BCG data MAY be delivered in one of two ways:

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

The IPI-1 interface 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 47)
0xA4	TV-Anytime metadata index container (clause 9.2.2 of TS 102 323 [1], value "i" in table 47)
0xA5	Both TV-Anytime metadata data and index container (clause 9.2.2 of TS 102 323 [1], value "b" in table 47)
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 4.5.1.2.
- **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 = OCTET; any hex number from 0x00 to 0xff
SegmentId = 4*4 HEXDIG; any hex number from 0x0000 to 0xffff
SegmentItem = SegmentId 0*1('&'VersionNumber)
```

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

```
VersionNumber = OCTET; any hex number from 0x00 to 0xff
```

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=0xA4&Segment=0x0000 HTTP/1.1" CRLF
"Host: " host CRLF
```

The HTTP headers returned with the data shall be:

```
Content-encoding : x-bim
```

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 below 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

	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

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

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

NOTE: 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 present clause defines the options that are either mandatory, optional or not used for BCG information. The profile as specified in TS 102 323 [1], clause 8 shall apply unless explicitly stated below.

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

6.2 Summary

The fragments defined in TS 102 822-3-2 [2], clause 8.2 shall be used. The following clauses provide further details as needed.

6.3 ProgramInformation fragment

The ProgramInformation fragment shall be defined as in TS 102 323 [1], clause 8.3.

6.4 GroupInformation fragment

The GroupInformation fragment shall be defined as in TS 102 323 [1], clause 8.4.

6.5 Schedule fragment

The Schedule fragment shall be defined as in TS 102 323 [1], clause 8.5.

6.6 ServiceInformation fragment

Optional elements that are absent in a ServiceInformation element may be taken from SD&S information.

The Name element may be an empty element, in which case it shall be inferred from the SD&S information of that service.

If an optional field is not specified, its contents shall be inferred from the SD&S information of that service. If an optional field is specified both in the BCG and the SD&S information, then the field of the BCG shall be used.

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

The ServiceURL element shall be present and shall contain a valid DVB locator that refers to a service, using the syntax given in clause 8 of the present document.

6.7 OnDemandProgram 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, FirstAvailability and LastAvailability elements in the OnDemandProgram element are optional. If the PublishedDuration element is not present, the value may be found in the ProgramInformation fragment. If not present, it is undefined. If StartOfAvailability is not present, then the value of "now" is assumed. If EndOfAvailability is not present, then the value of "indefinitely" is assumed. These recommendations are summarized in table 5.

Table 5: Default values for onDemandProgram 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>
FirstAvailability	<i>Undefined</i>
LastAvailability	<i>Undefined</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. If the ProgramURL element is present, it shall contain a RTSP URL. The dialog with the RTSP server shall comply with TS 102 034 [4], clause 6.

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.

6.8 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.

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 shall be conformant to the DVB profile of the TVA MPEG-7 profile (BiM) 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 DVB locator extensions

For referencing a service or content using the triplet {original_network_id, transport_stream_id, service_id}, the DVB locator format of TS 102 323 [1], clause 6.4 shall be used taking the DVBTripлет information from the SD&S BroadcastDiscovery record.

The present document extends the DVB locator format defined in TS 102 323 [1] for referencing the location of a service or content directly from the BCG records. The following two ways are defined:

- For services and content items available through RTSP, the format for RTSP URL (RFC 2326 [12]) shall be used:
 - rtsp://<host>[:port] [/absolute_path]
- For services and content items available by joining a multicast session, the following format shall be used:
 - rtp://<host_address>[:port][;source_address]

where host_address is the multicast address of the service, and source_address is the optional address of the multicast source host.

The previous syntax shall be used to reference an item of content when using TVA_id and time_duration as specified in TS 102 323 [1], for instance:

- rtp://224.1.2.3:1234;;398298@2006-01-23T02:00:00Z/PT01H34M

where 398298 is the TVA_id.

Additionally, the signalling of availability start and end times for on-demand content shall use the following format:

- @<window_start>;<window_end>

where window_start and window_end are represented using ISO 8601 [13], for instance:

- rtsp://www.foo.com:9090/mycontent @2006-01-01T00:00:00Z;2006-01-31T23:59:59Z.

9 Usage of RTSP Methods

Where RTSP is used to access content on demand, the RTSP DESCRIBE (TS 102 034 [4], clause 6.3.1.2) and ANNOUNCE Methods (TS 102 034 [4], clause 6.3.1.1) shall use an XML complex structure of the TV-Anytime type BasicContentDescriptionType. The namespace shall be specified at the start of the XML document, with the default being as specified in TS 102 323 [1].

The data shall be carried in unicast mode, as defined in TS 102 034 [4], clause 5.4.2. Specifically, this type shall be encoded as defined in clause 7.2, encapsulated as defined in clause 7.1 and the HTTP headers shall be defined as in clause 4.1.2.2.2 of the present document. The use of this type shall comply with the profiling set out in TS 102 323 [1] and clause 6 of the present document.

History

Document history		
V1.1.1	November 2006	Publication