ETSI TS 102 542-2 V1.3.1 (2010-01)

Technical Specification

**Digital Video Broadcasting (DVB);
Guidelines for the implementation of
DVB-IPTV Phase 1 specifications;
Part 2: Broadband Content Guide (BCG) and
Content on Demand**

EBU·UER

DVB

**Digital Video
Broadcasting**
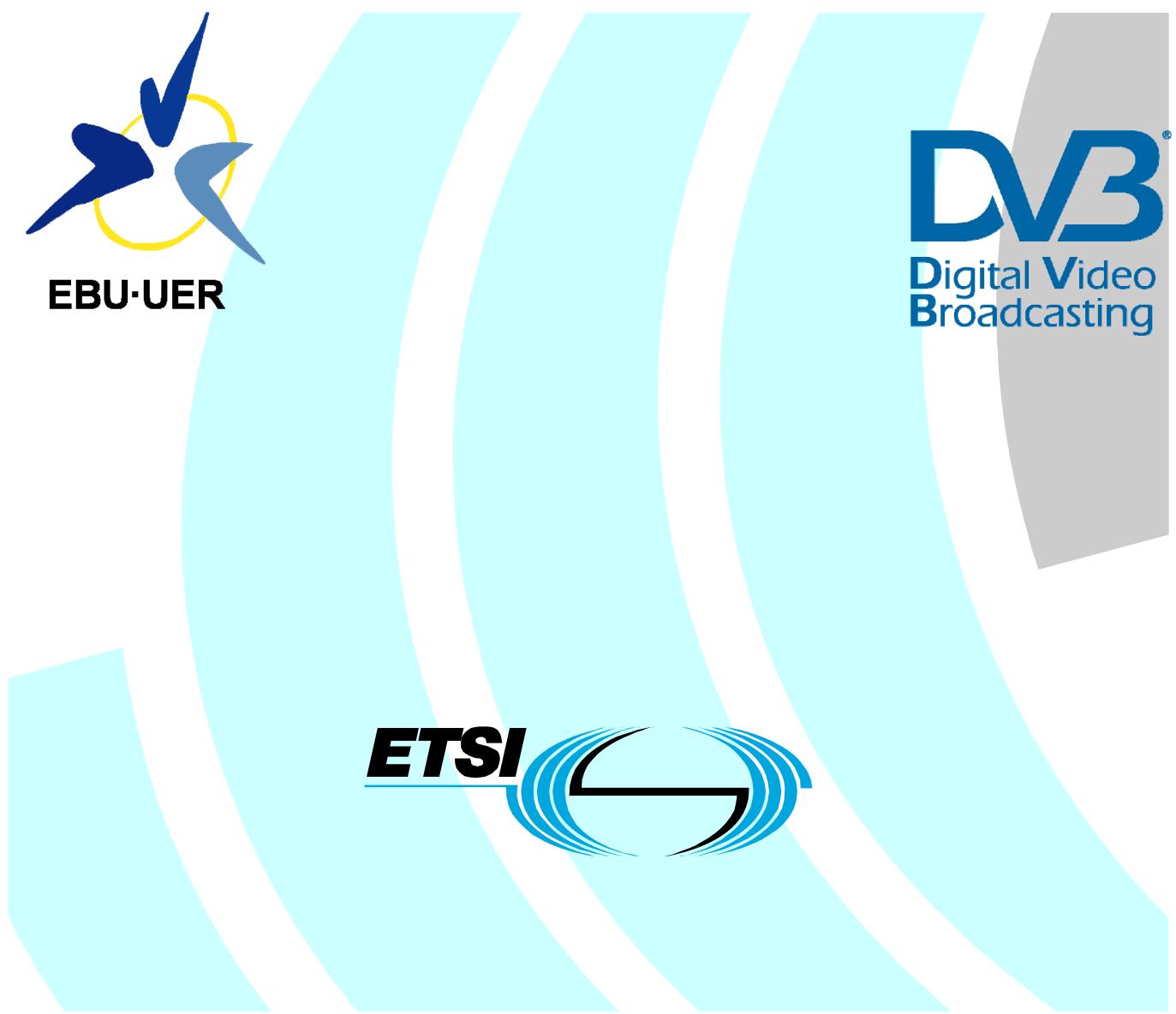
ETSI

Reference

RTS/JTC-DVB-269-2

Keywords

broadcasting, digital, DVB, IP, TV, video

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

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or
perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF).
In case of dispute, the reference shall be the printing on ETSI printers of the 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
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

ETSI

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document 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 (http://webapp.etsi.org/IPR/home.asp).

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.

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).

Please note that the present document is a revision to TR 102 542 [i.1], and has been converted to a Technical Specification (TS) because the language used in the document is akin to that of a Technical Specification (TS).

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

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.

The present document is part 2 of a multi-part deliverable. Full details of the entire series can be found in part 1, TS 102 542-1 [9].

1   Scope

The present document is designed as a companion document to help implement the DVB-IPTV Phase 1 version 4: Transport of MPEG2-TS Based DVB Services over IP Based Networks [1], which is referred to as the Handbook.

The present document deals with Broadband Content Guide (BCG) and Content on Demand. It presents the ways to discover BCG and Content on Demand, and how to connect to them. The present document is organized in separate sections in the order of the boot-up sequence of the HNED rather than in the same section structure as the Handbook. Each clause deals with a specific aspect of the DVB-IPTV technology, and offers explanations and examples not found in the Handbook. Additionally, it provides guidelines to implement the Broadband Content Guide (BCG) specification [3].

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.

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.

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 102 034 (V1.4.1): "Digital Video Broadcasting (DVB); Transport of MPEG-2 TS Based DVB Services over IP Based Networks".

   [2]   ETSI TS 101 154 (V1.8.1): "Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream".

   [3]   ETSI TS 102 539 (V1.2.1): "Digital Video Broadcasting (DVB); Carriage of Broadband Content Guide (BCG) information over Internet Protocol (IP)".

   [4]   ETSI TS 102 822-2 (V1.3.1): "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 2: System description".

   [5]   ETSI TS 102 822-3-2 (V1.3.1): "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 3: Metadata; Sub-part 2: System aspects in a uni-directional environment".

   [6]   ETSI TS 102 822-4 (V1.2.1): "Broadcast and On-line Services: Search, select, and rightful use of content on personal storage systems ("TV-Anytime"); Part 4: Content referencing".

[7]   ETSI TS 102 822-6-1 (V1.3.1): "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]   ETSI TS 102 323: "Digital Video Broadcasting (DVB); Carriage and signalling of TV-Anytime information in DVB transport streams".

[9]   ETSI TS 102 542-1: "Digital Video Broadcasting (DVB); Guidelines for the implementation of DVB-IPTV Phase 1 specifications; Part 1: Core IPTV Functions".

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.

[i.1]   ETSI TR 102 542: "Digital Video Broadcasting (DVB); Guidelines for DVB IP Phase 1 Handbook".

3   Abbreviations

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

BCG	Broadband Content Guide
BiM	Binary MPEG Format for XML
CRI	Content Reference Information
CRID	Content Reference Identifier
DVB	Digital Video Broadcasting
DVBSTP	DVB SD&S Transport Protocol
FEC	Forward Error Correction
HNED	Home Network End Device
HTTP	Hyper Text Transfer Protocol
IGMP	Internet Group Management Protocol
IP	Internet Protocol
IPTV	IP TeleVision
MPEG	Moving Picture Experts Group
MPTS	Multi Program Transport Stream
RAR	Resolving Authority Record
RET	RETransmission
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
SPTS	Single Program Transport Stream
TCP	Transmission Control Protocol
TLS	Transaction Layer Security
TS	Transport Stream
UDP	User Datagram Protocol
URL	Uniform Resource Locator
XML	eXtensible Markup Language

4   BCG Information Discovery

This clause explains how an HNED can get access to Broadband Content Guide (BCG) descriptions. BCG data are
TV-Anytime content guide descriptions, which are available on a given always-on bidirectional IP network.

4.1   Discovery of BCG Providers

Available BCG providers are discovered through the BCGDiscovery records in the SD&S information, as shown in the
following example.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<ServiceDiscovery xmlns="urn:dvb:metadata:iptv:sdns:2008-1"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <BCGDiscovery DomainName="bcgprovider1.com">
        <BCG Id="bcg1">
            <Name Language="eng">Provider1 BCG1</Name>
            <TransportMode>
                <HTTP Location="bcg.provider1.com/dvb/sdns/">
                    <PayloadId Id="a1">
                        <Segment ID="7b" Version="4"/>
                        <Segment ID="4d5" Version="17"/>
                        <Segment ID="1" Version="2"/>
                    </PayloadId>
                    <PayloadId Id="a2">
                        <Segment ID="0" Version="4"/>
                    </PayloadId>
                    <PayloadId Id="a3">
                        <Segment ID="0"/>
                    </PayloadId>
                    <PayloadId Id="a4">
                        <Segment ID="87" Version="71"/>
                    </PayloadId>
                    <PayloadId Id="a5">
                        <Segment ID="4"/>
                    </PayloadId>
                    <PayloadId Id="a6">
                        <Segment ID="42"/>
                    </PayloadId>
                    <PayloadId Id="a7">
                        <Segment ID="1"/>
                    </PayloadId>
                </HTTP>
                <DVBSTP Port="8207" Address="224.222.2.46"/>
                <HTTP Location="bcg.soap.provider1.com/dvb/sdns/" SOAP="true" />
            </TransportMode>
            <TargetProvider>sport.provider1.com</TargetProvider>
        </BCG>
        <BCG Id="bcg2">
            <Name Language="eng">Provider1 BCG2</Name>
            <TransportMode>
                <DVBSTP Port="5512" Address="224.235.32.4"/>
            </TransportMode>
            <TargetProvider>news.provider1.com</TargetProvider>
        </BCG>
    </BCGDiscovery>
</ServiceDiscovery>
```

The previous example provides BCG discovery information for "Provider1" and "Provider2". The BCG1 provides
content guide for content provider "sport-provider.com", and is transmitted over DVBSTP or HTTP. In the case of
HTTP, all PayloadIds are identified, with their segment (and optionally their version). Furthermore, the BCG1
advertises a SOAP server. The BCG2 is only retrievable via DVBSTP.

If multiple BCG records are available then one may be specified as preferred in the ServicesDescriptionLocation,
otherwise the choice is implementation dependent e.g. it may be based on user preference.

Note that updated versions of BCG records can be detected by the terminal using the same mechanisms as for SD&S
records, i.e. using the version field in DVBSTP header in the case of DVBSTP and the VersionNumber field in the URL
for the HTTP request in the case of HTTP.

4.2   Access to BCG Information

Access to BCG Information from a BCG provider is done in Push or Pull mode, and optionally using SOAP Queries.

4.2.1   DVBSTP and HTTP Mechanisms

For Push mode and HTTP Pull mode, BCG data are made available to HNEDs as BiM-encoded TV-Anytime fragments encapsulated in containers, as specified in TS 102 323 [8]. They can be transported in Push mode over DVBSTP or in Pull mode over HTTP.

4.2.1.1   Typical Flow Of Events

The following steps outline a typical flow of events from SD&S record via BCG to content acquisition if using the container-based delivery mechanism:

- Acquire BCG Discovery record(s) via SD&S.

- Select or choose the BCG provider and delivery mechanism to receive BCG information.

- Receive TV-Anytime metadata container:

    - Initialize the BiM decoder:

        - Get the DVB-TVA-init. An example DVB-TVA-init message can be found in TS 102 323 [8], annex C.

        - Get the TVAMain fragment, if the TVAMain fragment is not delivered use the default one as defined in table 53 of TS 102 323 [8].

    - Receive TV-Anytime metadata index container, if delivered.

    - Receive either all or required TV-Anytime metadata data container.

    - Present content information to user.

- User selects content for acquisition, e.g. recording:

    - In TV-Anytime content is referenced by the Content Reference Identifier (CRID).

- Use TV-Anytime content resolution to discover actual content location, see also clause 5 of TS 102 539 [3]:

    - Receive the Resolution Provider Notification Table (RNT).

    - Check RNT if it contains the suitable Resolving Authority Records (RAR) for the CRID.

    - Receive Content Reference Information (CRI structures).

    - Resolve CRID into content locator(s).

4.2.1.2   Example

The example in this clause provides some guidelines on the usage of the different BCG payload types using the container-based delivery mechanism. Table 4.1 from TS 102 539 [3] shows the various payload types composing the BCG.

Table 4.1

Payload ID value	Payload type carried
0xA1	DVB-TVA-init message (clause 7.3 of TS 102 539 [3])
0xA2	TVAMain fragment (clause 7.4 of TS 102 539 [3])
0xA3	TV-Anytime metadata data container (clause 9.2.2 of TS 102 323 [8]), value 'd' in Table 47)
0xA4	TV-Anytime metadata index container (clause 9.2.2 of TS 102 323 [8], value 'i' in Table 47)
0xA5	Both TV-Anytime metadata data and index container (clause 9.2.2 of TS 102 323 [8], value "b" in table 47)
0xA6	RNT (clause 5.1 of TS 102 539 [3]))
0xA7	CRI structure (clause 5.3 of TS 102 539 [3])
0xA8-0xAF	Reserved

The following TV-Anytime metadata document belongs to a broadcast service provider.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<tva:TVAMain xml:lang="eng" xmlns:tva="urn:tva:metadata:2005"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <tva:ProgramDescription>
    <tva:ProgramInformationTable>
      <tva:ProgramInformation programId="crid://cridauth.com/A" fragmentId="100">
        <tva:BasicDescription>
          <tva:Title>Sport Program 1</tva:Title>
          <tva:Synopsis length="short">This is the synopsis of a sport programme</tva:Synopsis>
          <tva:Duration>P0DT01H30M</tva:Duration>
        </tva:BasicDescription>
      </tva:ProgramInformation>
      <tva:ProgramInformation programId="crid://cridauth.com/B" fragmentId="101">
        <tva:BasicDescription>
          <tva:Title>Sport Program 2</tva:Title>
          <tva:Synopsis length="short">This is the synopsis of another sport program</tva:Synopsis>
          <tva:Duration>P0DT01H30M</tva:Duration>
        </tva:BasicDescription>
      </tva:ProgramInformation>
      <tva:ProgramInformation programId="crid://cridauth.com/C" fragmentId="102">
        <tva:BasicDescription>
          <tva:Title>Movie 1</tva:Title>
          <tva:Synopsis length="short">This is the synopsis of a movie</tva:Synopsis>
          <tva:Duration>P0DT01H30M</tva:Duration>
        </tva:BasicDescription>
        <tva:EpisodeOf crid="crid://cridauth.com/aseries"/>
      </tva:ProgramInformation>
      <tva:ProgramInformation programId="crid://cridauth.com/D" fragmentId="103">
        <tva:BasicDescription>
          <tva:Title>Movie 2</tva:Title>
          <tva:Synopsis length="short">This is the synopsis of another movie</tva:Synopsis>
          <tva:Duration>P0DT01H30M</tva:Duration>
        </tva:BasicDescription>
        <tva:EpisodeOf crid="crid://cridauth.com/aseries"/>
      </tva:ProgramInformation>
    </tva:ProgramInformationTable>
    <tva:GroupInformationTable>
      <tva:GroupInformation groupId="crid://cridauth.com/aseries"  fragmentId="501">
        <tva:GroupType xsi:type="tva:ProgramGroupTypeType" value="series"/>
        <tva:BasicDescription>
          <tva:Title>A series</tva:Title>
        </tva:BasicDescription>
      </tva:GroupInformation>
    </tva:GroupInformationTable>
    <tva:ProgramLocationTable>
      <tva:Schedule serviceIDRef="asportchannel.aprovider.com" start="2005-11-11T07:00:00+00:00"
end="2005-11-11T10:00:00+00:00" fragmentId="150">
        <tva:ScheduleEvent>
          <tva:Program crid="crid://cridauth.com/A"/>
          <tva:PublishedStartTime>2005-11-11T07:00:00Z</tva:PublishedStartTime>
          <tva:PublishedDuration>P0DT01H30M</tva:PublishedDuration>
        </tva:ScheduleEvent>
        <tva:ScheduleEvent>
          <tva:Program crid="crid://cridauth.com/B"/>
          <tva:PublishedStartTime>2005-11-11T08:30:00Z</tva:PublishedStartTime>
          <tva:PublishedDuration>P0DT01H30M</tva:PublishedDuration>
        </tva:ScheduleEvent>
```

```
        </tva:Schedule>
        <tva:Schedule serviceIDRef="amoviechannel.aprovider.com" start="2005-11-11T20:00:00+00:00"
end="2005-11-11T23:00:00+00:00" fragmentId="151">
          <tva:ScheduleEvent>
            <tva:Program crid="crid://cridauth.com/C"/>
            <tva:PublishedStartTime>2005-11-11T20:00:00Z</tva:PublishedStartTime>
            <tva:PublishedDuration>P0DT01H30M</tva:PublishedDuration>
          </tva:ScheduleEvent>
          <tva:ScheduleEvent>
            <tva:Program crid="crid://cridauth.com/D"/>
            <tva:PublishedStartTime>2005-11-11T21:30:00Z</tva:PublishedStartTime>
            <tva:PublishedDuration>P0DT01H30M</tva:PublishedDuration>
          </tva:ScheduleEvent>
        </tva:Schedule>
      </tva:ProgramLocationTable>
      <tva:ServiceInformationTable>
        <tva:ServiceInformation serviceId="asportchannel.aprovider.com" fragmentId="200">
          <tva:Name>A sport channel</tva:Name>
        </tva:ServiceInformation>
        <tva:ServiceInformation serviceId="amoviechannel.aprovider.com" fragmentId="201">
          <tva:Name>A movie channel</tva:Name>
        </tva:ServiceInformation>
      </tva:ServiceInformationTable>
    </tva:ProgramDescription>
</tva:TVAMain>
```

The example metadata document contains a ProgramInformation and ScheduleInformation fragments for two broadcast channels "A Sport Channel" and "A Movie Channel". The programmes on "A Movie Channel" are episodes of a series. This series is announced with the GroupInformation fragment.

Note that the example also contains a ServiceInformation fragments. Service information like a channel name may also be present in the SD&S BroadcastDiscovery record. In that case the HNED shall take the information from BCG (TS 102 539 [3] clause 6.6).

As defined in TS 102 539 [3], TV-Anytime metadata fragments are encoded with BiM and encapsulated in containers.

NOTE 1: Contrary to TS 102 323 [8], all BCG data is delivered inside a compression wrapper as a data delivery unit (TS 102 539 [3], clause 4.1).

For a real service the amount of metadata will be very large, i.e. the metadata will be delivered in multiple containers. Keeping program and schedule information from a single service and day in one container is an example strategy that is well suited for most EPG applications. Fragments from the ServiceInformationTable and the GroupInformationTable form separate containers in this example. For the metadata document from above this strategy results in a delivery in the following three containers:

Table 4.2

Container 1 A Sport Channel - 11.11.		Container 2 A Movie Channel - 11.11.		Container 3 Service Information	
Fragment id	Fragment Type	Fragment id	Fragment Type	Fragment id	Fragment Type
100	ProgramInformation	102	ProgramInformation	200	ServiceInformation
101	ProgramInformation	103	ProgramInformation	201	ServiceInformation
150	Schedule	151	Schedule	501	GroupInformation

Receiving and decoding all containers enables the HNED to provide the user with an EPG for all services. Assuming the user only wants to know what is on "A Sport Channel", the HNED may scan all containers for the required fragments. In a worst case scenario the HNED would have to download and decode all metadata containers.

A more efficient way in looking for particular metadata fragments can be achieved by using TV-Anytime metadata indices as defined by TS 102 323 [8]. Based on TS 102 822-3-2 [5] it provides a set of profiled indices supporting the most common usage scenarios. If indices are available the payload id for metadata indices is signalled in the SD&S BCG offering record. The index list structure shall be delivered with payload id 0xA4 and segment id 0.

For the example above it is recommended to add a "Schedule index by time and DVB service".

Table 4.3

Schedule Index by time and DVB Service			
Schedule@end	ServiceInformation@serviceId	Container Id	Fragment Id
2005-11-11T10:00:00+00:00	`asportchannel.aprovider.com`	1	150
2005-11-11T23:00:00+00:00	`amoviechannel.aprovider.com`	2	151

Using this index the HNED can easily determine all containers with schedules for a certain broadcast service and a given time window. A schedule fragment usually contains only start time and duration of scheduled programs. The description of a program that is contained in a ProgramInformation fragment is referenced from a schedule by its Content Reference Identifier (CRID). For detailed information on CRIDs refer to TS 102 323 [8], clause 6. A "ProgramInformation index by CRID" as shown in table 4.4 is recommended to identify containers carrying these fragments.

Table 4.4

ProgramInformation index by CRID		
ProgrammInformation@programId	Container Id	Fragment Id
crid://cridauth.com/A	1	100
crid://cridauth.com/B	1	101
crid://cridauth.com/C	2	102
crid://cridauth.com/D	2	103

If GroupInformation fragments are available as in the example a "GroupInformation index by CRID" is recommended.

Up to here this clause describes the usage of TV-Anytime metadata data and indices. The metadata allows announcing available conent to the user and it enables the user to search for specific content.

NOTE 2: For content acquisition the HNED should not use metadata (TS 102 323 [8], clause 8.5). For this purpose TV-Anytime proposes the content resolution service. For BCG content resolution is performed as defined by TS 102 539 [3], clause 5. For a detailed introduction to content resolution refer to TS 102 822-4 [6].

In general content resolution results in the actual locator(s) of a single program or a group of programs. Input to the content resolution process is a CRID of either a program described by a ProgramInformation fragment or a program group described by a GroupInformation fragment. A CRID of a program usually resolves into locator(s) and a CRID of a program group into CRID(s) of programs. However, the CRID of a program may also resolve into other CRID(s) (TS 102 822-4 [6], clause 8 and TS102 323 [8], table 28 note 1).

A CRID is created and maintained by a CRID authority. The content resolution information (CRI data) for a CRID authority is provided by a resolution provider. The Resolution Notification Table (RNT) signals resolution providers and CRID authorities.

Table 4.5 shows the information that is contained in a RNT for signalling a resolution provider who supports the CRID authority used in the examples above.

Table 4.5

Common Descriptors	(Empty)
Resolution Provider Loop	
Provider Name	aprovider.com
Descriptors	(Empty)
CRID Authority Loop	
Authority Name	CridAuth.com
Policy	CRIDs published by this CRID authority are permanent
Descriptors	
RAR over IP Descriptor	
First Valid Date	01.01.2005 00:00
Last Valid Date	01.01.2006 00:00
Weighting	1
CompleteFlag	1
URL	(Empty)

The policy of the CRID authority is to assign CRIDs permanently to content, i.e. a CRID is never reused for another piece of content. The CompleteFlag is set, i.e. the CRI data contains information on all CRIDs provided by the resolution provider for the CRID authority (TS 102 323 [8], clause 7.2.3). The empty URL in the RAR over IP descriptor indicates that the resolution information is transmitted along with all other BCG containers (TS 102 539 [3], clause 5.2), i.e. the CRI data can be found with payload ID 0xA7 using either the pull or push delivery mode as signalled in the BCG offering record. The container carrying the cri_index structure has a segment id of 0.

Table 4.6 shows resolution information for all CRID(s) used in the examples above.

Table 4.6

CRID	Status	CRID(s) Locator(s)	Acquisition directive	Resolution Complete	Re-Resolution Date
crid://cridauth.com/A	Resolved	dvb://1.1.1;AA@2005-11-11... dvb://1.2.2;EE@2005-11-10...	Any	Yes	-
crid://cridauth.com/B	Resolved	dvb://1.1.1;BB@2005-11-11...	Any	Yes	-
crid://cridauth.com/C	Resolved	dvb://1.2.2;CC@2005-11-11...	Any	Yes	-
crid://cridauth.com/D	Resolved	dvb://1.2.2;DD@2005-11-11...	Any	Yes	-
crid://cridauth.com/aSeries	Resolved	crid://cridauth.com/A crid://cridauth.com/B	All	No	2005-11-12

The resolution of "crid://cridauth.com/A" shows an alternative location of the same content that is broadcasted earlier, i.e. the HNED may choose either of the locations for recording. The CRID of the series resolves into two CRIDs of programs that could be inferred also from the metadata, but additionally it signals that resolution is not yet complete and more episodes will follow. The HNED should perform a new resolution for this CRID on 2005-11-12.

> NOTE: To detect changes of the actual start time of a program the HNED should monitor updates in the CRI data. For a detailed description on "Accurate recording" refer to TS 102 539 [3], clause 11.

4.2.2 SOAP Query Mechanism

The following clause defines some guidelines for the usage of the BCG SOAP query mechanism. This mechanism is used as defined by TV-Anytime in the system specification (TS 102 822-2 [4]) and more specifically in the bi-directional specification (TS 102 822-6-1 [7]). As such the ETSI specifications should be referred to for more detailed guidelines.

4.2.2.1 Typical Flow Of Events

In order to use the SOAP query mechanism the following steps outline a typical flow of events from SD&S record to BCG acquisition:

- Acquire BCG record(s) via SD&S.

- Use the HTTP@Location URL, where the HTTP@SOAP is "true", to discover the location of a BCG provider.

- Send a describe_get_Data SOAP request to the BCG provider.

- Check response to ensure provider has required capabilities.

- Send a get_Data SOAP request to the BCG provider.

If the capabilities of the BCG providers are not suitable (e.g. a required table is not available) then a describe_get_Data may be performed on the next BCG provider until a suitable provider is found. It may be that the data required might be stored across a range of BCG providers in which case multiple queries to multiple providers may be required to satisfy a particular request.

4.2.2.2   Protocol stack

Figure 4.1 outlines the protocols required to deliver a BCG using the SOAP Query mechanism.
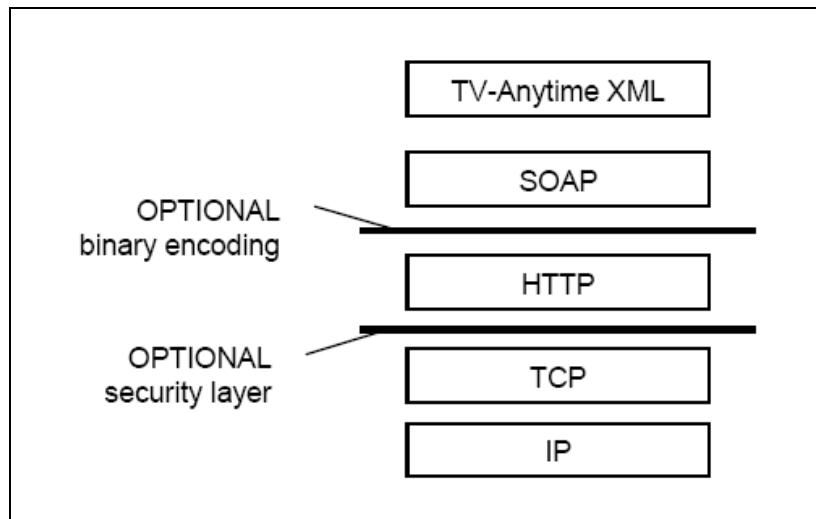

Figure 4.1: BCG over SOAP Protocol Stack

For further details on the specific usage of SOAP see TS 102 822-6-1 [7], clause 6.1 SOAP. HTTP v1.1 shall be supported as specified in TS 102 539 [3].

As can be seen in figure 4.1 both encoding and security are optional. For the case of encoding the standard HTTP encoding negotiation should be used (Accept-Encoding header). Servers should always support no encoding to ensure interoperability. If TLS is used for security, then this can be indicated via the HTTP@Location URL SD&S entry (the one with the HTTP@SOAP set to "true").

Although security may be used for retrieving metadata it is a particular issue for the submit data method, due to the need to ensure privacy of user specific data. In addition, a user should be involved in the decision as to whether to enable the submission of either anonymous or user specific data. This can be a trade-off between offering a personalized service versus user anonymity.

The protocols used require that polling be used by a client to check for metadata updates. Selection of the polling interval should be tuned to provide a balance between speed of update versus Server load.

4.2.2.3   Examples

The query mechanism contains a large degree of flexibility, thus enabling a BCG client to create either simple or complex queries in order to restrict the size of metadata response. The granularity required depends on the application and on resource limitations. Therefore a small number of possible request and response examples are provided.

In all examples the SOAP and HTTP wrappers are omitted for clarity.

Example 1 is an example response to a describe_get_Data request. The request is not shown as it is simply an empty describe_get_Data SOAP method request. The response provides a description of the BCG provider along with its capabilities, such as domain, table types and specific fields supported.

Example 1 describe_Get_Data response

```
<describe_get_Data_Result xmlns="urn:tva:transport:2005" xmlns:tva="urn:tva:metadata:2005"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" serviceVersion="1">
    <Name>Metadata Service</Name>
    <Description>A metadata service</Description>
    <AuthorityList>
        <Authority>domain1.co.uk</Authority>
    </AuthorityList>
    <AvailableTables xmlns:tvaf="urn:tva:transport:fieldIDs:2005">
        <Table xsi:type="ProgramInformationTable" canQuery="tvaf:CRID  tvaf:Synopsis tvaf:Title
tvaf:Keyword  tvaf:Genre"/>
        <Table xsi:type="ServiceInformationTable" canQuery=" tvaf:serviceID tvaf:Name
tvaf:ServiceURL"/>
        <Table xsi:type="ProgramLocationTable" canQuery="tvaf:CRID tvaf:serviceIDRef  tvaf:start
tvaf:end tvaf:PublishedStartTime tvaf:PublishedDuration">
            <AvailableLocations>
                <ServiceURL>dvb://1.1.1.1</ServiceURL>
            </AvailableLocations>
        </Table>
    </AvailableTables>
</describe_get_Data_Result>
```

Example 2 is an example query and response using the get_Data method. The query requests ProgramInformation for all programmes with a specific title ("Film1"). The test condition is omitted as equals is the default.

Example 2: Title Query

```
<QueryConstraints>
    <BinaryPredicate fieldID="tvaf:Title" fieldValue="Film1"/>
</QueryConstraints>
<RequestedTables>
<Table type="ProgramInformationTable"/>
</RequestedTables>
```

Example 3: Title Query Response

```
<tva:TVAMain xml:lang="eng" xmlns:tva="urn:tva:metadata:2005"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <tva:ProgramDescription>
        <tva:ProgramInformationTable>
            <tva:ProgramInformation programId="crid://123">
                <tva:BasicDescription>
                    <tva:Title>Film1</tva:Title>
                    <tva:Synopsis length="short">A film</tva:Synopsis>
                    <tva:Genre href="urn:tva:metadata:cs:ContentCS:2005:3.4.6">
                        <tva:Name>Action</tva:Name>
                    </tva:Genre>
                </tva:BasicDescription>
            </tva:ProgramInformation>
        </tva:ProgramInformationTable>
    </tva:ProgramDescription>
</tva:TVAMain>
```

Example 4 is another example query and response using a get_Data request. The query requests all of the programmes broadcast by a particular service available over a 2 hour period. Although the Server performs the query across all possible data the required response data is restricted to only those tables requested, in this case the ProgramInformation and ProgramLocation tables. An exception to this is that a ServiceInformation table is always returned if there is reference to a service in the response e.g. in the ProgramLocation table.

Example 4: Query For Programmes Over A Two Hour Period

```xml
<QueryConstraints>
<PredicateBag type="AND">
    <BinaryPredicate fieldID="tvaf:PublishedTime" fieldValue="2006-11-01T12:00:00Z"
test="greater_than_or_equals"/>
    <BinaryPredicate fieldID="tvaf:PublishedTime" fieldValue="2006-11-01T14:00:00Z"
test="less_than_or_equals"/>
    <BinaryPredicate fieldID="tvaf:ServiceURL" fieldValue="dvb://1.1.1.1"/>
    </PredicateBag>
</QueryConstraints>
<RequestedTables>
    <Table type="ProgramInformationTable"/>
    <Table type="ProgramLocationTable"/>
</RequestedTables>
```

Example 5: Query Response

```xml
<tva:TVAMain xml:lang="eng" xmlns:tva="urn:tva:metadata:2005"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <tva:ProgramDescription>
        <tva:ProgramInformationTable>
            <tva:ProgramInformation programId="crid://124">
                <tva:BasicDescription>
                    <tva:Title>Title1</tva:Title>
                    <tva:Synopsis length="short">A film</tva:Synopsis>
                    <tva:Genre href="urn:tva:metadata:cs:ContentCS:2005:3.4.6">
                        <tva:Name>Action</tva:Name>
                    </tva:Genre>
                </tva:BasicDescription>
            </tva:ProgramInformation>
            <tva:ProgramInformation programId="crid://125">
                <tva:BasicDescription>
                    <tva:Title>Title2</tva:Title>
                    <tva:Synopsis length="short">A Soap Opera</tva:Synopsis>
                    <tva:Genre href="urn:tva:metadata:cs:ContentCS:2005:3.4.2.1">
                        <tva:Name>Soap opera</tva:Name>
                    </tva:Genre>
                </tva:BasicDescription>
            </tva:ProgramInformation>
        </tva:ProgramInformationTable>
        <tva:ProgramLocationTable>
            <tva:Schedule serviceIDRef="service1" start="2006-11-01T00:00:00Z" end="2006-11-
01T23:59:59Z">
                <tva:ScheduleEvent>
                    <tva:Program crid="crid://124"/>
                    <tva:PublishedStartTime>2006-11-01T12:00:00Z</tva:PublishedStartTime>
                    <tva:PublishedDuration>PT01H30M00S</tva:PublishedDuration>
                </tva:ScheduleEvent>
                <tva:ScheduleEvent>
                    <tva:Program crid="crid://125"/>
                    <tva:PublishedStartTime>2006-11-01T13:30:00Z</tva:PublishedStartTime>
                    <tva:PublishedDuration>PT00H30M00S</tva:PublishedDuration>
                </tva:ScheduleEvent>
            </tva:Schedule>
        </tva:ProgramLocationTable>
        <tva:ServiceInformationTable>
            <tva:ServiceInformation serviceId="service1">
                <tva:Name>service1</tva:Name>
                <tva:ServiceURL>dvb://1.1.1.1</tva:ServiceURL>
            </tva:ServiceInformation>
        </tva:ServiceInformationTable>
    </tva:ProgramDescription>
</tva:TVAMain>
```

5 Connection to the Content

At this step, the HNED has collected the XML files that contains the content description (SD&S or BCG structures). The HNED can then connect to the content. This will involve different mechanisms whether the content is live broadcast or on-demand.

5.1 Connection to Live Content

Live content is typically described using SD&S metadata, but it can also be exposed using BCG metadata.

5.1.1 Connection possibilities

A Live TV service may be accessed by an individual HNED in the following ways:

- Using **IGMP** (Internet Group Management Protocol):
  In this case, the HNED has collected a Multicast IP address for this Live TV service. To display this Live TV channel, the HNED sends an IGMP Report request to this Multicast IP address in order to subscribe to this multicast group. Multicast Content Services use IGMP version 3 with Source Specific Multicast. This allows significant scalability and implementers should note that the previous version of IGMP is not allowed (see clause 7.3 of TS 102 542-1 [9] for details).

- Using **RTSP** (Real Time Streaming Protocol):
  In this case, the HNED has collected a RTSP URL for this Live TV service. This RTSP URL gives all the information necessary to issue the appropriate RTSP method. Parameters required for the IGMP message will be acquired via the SETUP method from RTSP.

5.1.2 Live Content exposed with BCG

Within the BCG, the locator is carrying the connection information, be it multicast or RTSP. See [3], clause 8 for details on the locators defined for BCG.

As an alternative, the ScheduledEventType.ProgramURL can carry such locator. In this case, note that the locator resolved from the CRID has to be considered as the most accurate locator for the service.

5.2 Connection to Content on Demand

Content on Demand shall be exposed thanks to the Broadband Content Guide. RTSP shall be used to access the content. As for the Live Content exposed by the BCG, the locator is carrying the connection information. See [3], clause 8 for details on the locators defined for BCG.

As an alternative, the OnDemandProgramType.ProgramURL can carry such locator. In this case, note that the locator resolved from the CRID has to be considered as the most accurate locator for the service.

5.3 RTSP Connection Management

5.3.1 RTSP with BCG

This clause will present call flows for RTSP session management as announced from the BCG metadata. The first example will be the simplest one, with only one RTSP address. The second example will involve FEC and RET flows that also need their own RTSP sessions.

5.3.1.1   RTSP Session with one media flow

The following service is announced via the BCG:

```
<?xml version="1.0" encoding="UTF-8"?>
<tva:TVAMain xml:lang="eng" xmlns:tva="urn:tva:metadata:2005"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <tva:ProgramDescription>
        <tva:ProgramInformationTable>
            <tva:ProgramInformation programId="crid://cridauth.com/A" fragmentId="100">
                <tva:BasicDescription>
                    <tva:Title>Sport Program 1</tva:Title>
                    <tva:Synopsis length="short">
                        This is the synopsis of a sport programme
                    </tva:Synopsis>
                    <tva:Duration>P0DT01H30M</tva:Duration>
                </tva:BasicDescription>
                <tva:Attributes>
                    <AudioAttributes>
                        <Coding href="urn:mpeg:mpeg7:cs:AudioCodingFormatCS:2001:3.2">
                         <Name>MPEG-1 Audio Layer II</Name>
                        </Coding>
                        <NumOfChannels>2</NumOfChannels>
                    </AudioAttributes>
                    <VideoAttributes>
                        <Coding href="urn:mpeg:mpeg7:cs:VisualCodingFormatCS:2001:2.2.2">
                         <Name>MPEG-2 Video Main Profile @ Main Level</Name>
                        </Coding>
                    </VideoAttributes>
                </tva:Attributes>
            </tva:ProgramInformation>
        </tva:ProgramInformationTable>
        <tva:ProgramLocationTable>
            <tva:OnDemandProgram>
                <tva:Program crid="crid://cridauth.com/A"/>
                <tva:ProgramURL>rtsp://ondemand.provider1.com/movie</tva:ProgramURL>
            </tva:OnDemandProgram>
        </tva:ProgramLocationTable>
    </tva:ProgramDescription>
</tva:TVAMain>
```

NOTE 1: The tva:ProgramLocationTable is carrying in this example the tva:ProgramURL, which is optional. This
URL carries the direct link to the RTSP URL. This RTSP URL can also be retrieved by resolving the
CRID (see clause 7), which is always considered as the most accurate locator information.

The following shows an example of message exchange between the HNED and the RTSP server. At first, the HNED
MUST send a RTSP DESCRIBE to retrieve information about the service. This RTSP DESCRIBE is useful because the
TVA metadata available through the BCG do not carry any information on the transport layer of the content (if it is
UDP or RTP, if there is FEC or retransmission available with the content).

```
DESCRIBE rtsp://ondemand.provider1.com/movie RTSP/1.0
CSeq: 1
Accept: text/xml
```

The DESCRIBE response from the server includes an XML structure that is the CoDAnnounceDescribe XML structure.

```
RTSP/1.0 200 OK
Cseq: 1
Content-length: 391
Content-Type: text/xml
Content-Encoding: UTF-8

<?xml version="1.0" encoding="UTF-8"?>
<CoDAnnounceDescribe
xmlns="urn:dvb:ipisdns:2006"
xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
Streaming="RTP">
    <ContentDescription>
        <tva:Title>Sport Program 1</tva:Title>
        <tva:Synopsis length="short">
            This is the synopsis of a sport programme
        </tva:Synopsis>
```

```
        <tva:Duration>P0DT01H30M</tva:Duration>
    </ContentDescription>
</CoDAnnounceDescribe>
```

NOTE 2:   In this example, there is no RTSPControlURL attribute since there is only one flow. The global RTSP
          URL is used for all messages (SETUP, PLAY …).

The HNED perform a SETUP for this service. In this example, only one SETUP is necessary since only one media flow
is sent on the network (the MPEG2-TS stream).

```
SETUP rtsp://ondemand.provider1.com/movie RTSP/1.0
CSeq: 2
Transport: RTP/AVP;unicast;client_port=8888-8889
```

```
RTSP/1.0 200 OK
Cseq: 2
Session: 12345678;timeout=60
Transport: RTP/AVP;unicast;client_port=8888-8889;source=67.89.12.34;server_port=5502-5503
```

Then the HNED sends the PLAY message to the server.

```
PLAY rtsp://ondemand.provider1.com/movie RTSP/1.0
CSeq: 3
Session: 12345678
```

```
RTSP/1.0 200 OK
Cseq: 3
Session: 12345678
RTP-Info: url=rtsp://ondemand.provider1.com/movie;seq=11223344;rtptime=10203040
```

5.3.1.2   RTSP Sessions with multiple media flows

The following service is announced via the BCG:

```
<?xml version="1.0" encoding="UTF-8"?>
<tva:TVAMain xml:lang="eng" xmlns:tva="urn:tva:metadata:2005"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <tva:ProgramDescription>
        <tva:ProgramInformationTable>
            <tva:ProgramInformation programId="crid://cridauth.com/A" fragmentId="100">
                <tva:BasicDescription>
                    <tva:Title>Sport Program 1</tva:Title>
                    <tva:Synopsis length="short">
                        This is the synopsis of a sport programme
                    </tva:Synopsis>
                    <tva:Duration>P0DT01H30M</tva:Duration>
                </tva:BasicDescription>
                <tva:Attributes>
                    <AudioAttributes>
                        <Coding href="urn:mpeg:mpeg7:cs:AudioCodingFormatCS:2001:3.2">
                         <Name>MPEG-1 Audio Layer II</Name>
                        </Coding>
                        <NumOfChannels>2</NumOfChannels>
                    </AudioAttributes>
                    <VideoAttributes>
                        <Coding href="urn:mpeg:mpeg7:cs:VisualCodingFormatCS:2001:2.2.2">
                         <Name>MPEG-2 Video Main Profile @ Main Level</Name>
                        </Coding>
                    </VideoAttributes>
                </tva:Attributes>
            </tva:ProgramInformation>
        </tva:ProgramInformationTable>
        <tva:ProgramLocationTable>
            <tva:OnDemandProgram>
                <tva:Program crid="crid://cridauth.com/A"/>
                <tva:ProgramURL>rtsp://ondemand.provider1.com/movie</tva:ProgramURL>
            </tva:OnDemandProgram>
```

```
        </tva:ProgramLocationTable>
    </tva:ProgramDescription>
</tva:TVAMain>
```

NOTE 1: The tva:ProgramLocationTable is carrying in this example the tva:ProgramURL, which is optional. This
URL carries the direct link to the RTSP URL. This RTSP URL can also be retrieved by resolving the
CRID (see clause 7), which is always considered as the most accurate locator information.

The following shows an example of message exchange between the HNED and the RTSP server. At first, the HNED
MUST send a RTSP DESCRIBE to retrieve information about the service. This RTSP DESCRIBE is useful because the
TVA metadata available through the BCG do not carry any information on the transport layer of the content (if it is
UDP or RTP, if there is FEC or retransmission available with the content).

```
DESCRIBE rtsp://ondemand.provider1.com/movie RTSP/1.0
CSeq: 1
Accept: text/xml
```

The DESCRIBE response from the server includes an XML structure that is the CoDAnnounceDescribe XML structure.

```
RTSP/1.0 200 OK
Cseq: 1
Content-length: 391
Content-Type: text/xml
Content-Encoding: UTF-8

<?xml version="1.0" encoding="UTF-8"?>
<CodAnnounceDescribe
xmlns="urn:dvb:ipisdns:2006"
xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
Streaming="RTP"
RTSPControlURL="rtsp://ondemand.provider1.com/movie?Media">
    <ContentDescription>
        <tva:Title>Sport Program 1</tva:Title>
        <tva:Synopsis length="short">
            This is the synopsis of a sport programme
        </tva:Synopsis>
        <tva:Duration>P0DT01H30M</tva:Duration>
    </ContentDescription>
    <FECInfo FECMaxBlockSizePackets="8" FECMaxBlockSizeTime="100" FECOTI="MDBjMTA1MDE=">
        <FECBaseLayer MaxBitrate="200"
                      RTSPControlURL="rtsp://ondemand.provider1.com/movie?FecBase" />
        <FECEnhancementLayer MaxBitrate="200"
                             RTSPControlURL="rtsp://ondemand.provider1.com/movie?FecEnhancement" />
    </FECInfo>
</CoDAnnounceDescribe>
```

NOTE 2: In this example, there are some FEC layers available for the content. Thus some RTSPControlURL
attributes are needed, since each flow (media, FEC) is setup separately.

The HNED perform then several SETUP for this service: one SETUP is needed for each flow, i.e. one for the media
flow (using the RTSPControlURL of the media flow), and one for each FEC layer (using the RTSPControlURL of the
FEC layers). If the HNED does not want to connect to a flow, it will not issue the corresponding SETUP command. In
this example, the HNED will only connect to the media flow and to the FEC Base layer.

```
SETUP rtsp://ondemand.provider1.com/movie?Media RTSP/1.0
CSeq: 2
Transport: RTP/AVP;unicast;client_port=8888-8889
```

```
RTSP/1.0 200 OK
Cseq: 2
Session: 12345678;timeout=60
Transport: RTP/AVP;unicast;client_port=8888-8889;source=67.89.12.34;server_port=5502-5503
```

```
SETUP rtsp://ondemand.provider1.com/movie?FecBase RTSP/1.0
CSeq: 3
Session: 12345678
Transport: RTP/AVP;unicast;client_port=8890-8891
```

```
RTSP/1.0 200 OK
Cseq: 3
Session: 12345678;timeout=60
Transport: RTP/AVP;unicast;client_port=8890-8891;source=67.89.12.34;server_port=8210-8211
```

Then the HNED sends the PLAY message to the server. Only one PLAY is needed for both flows.

```
PLAY rtsp://ondemand.provider1.com/movie RTSP/1.0
CSeq: 4
Session: 12345678
```

```
RTSP/1.0 200 OK
Cseq: 4
Session: 12345678
RTP-Info: url=rtsp://ondemand.provider1.com/movie?Media;seq=11223344;rtptime=10203040,
url=rtsp://ondemand.provider1.com/movie?FecBase;seq=55667788;rtptime=50607080
```

5.4   Transport of the stream

The video content is streamed using an MPEG-2 transport stream, as defined in TS 101 154 [2], which is then encapsulated in RTP/UDP or directly in UDP. Usually a Single Program Transport Stream (SPTS) is used as only the bandwidth for the selected content is needed. However Multi Program Transport Streams (MPTS) are not out ruled.

The information if RTP/UDP or UDP encapsulation is used is provided by the BCG locator for multicast services and by the RTSP transport header for unicast services:

- A BCG locator with the syntax "rtp://…." indicates RTP/UDP encapsulation.

- A BCG locator with the syntax "udp://…." indicates direct UDP encapsulation.

A RTSP transport header of "RTP/AVP/UDP" indicates RTP/UDP encapsulation. A RTSP transport header of either "MP2T/H2221/UDP" or "RAW/RAW/UDP" indicates direct UDP encapsulation.

History

Document history		
V1.1.1	November 2006	Published as TR 102 542
V1.2.1	April 2008	Published as TS 102 542
V1.3.1	January 2010	Publication