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Hybrid Broadcast Broadband TV Application Discovery over Broadband

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Foreword

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Modal verbs terminology

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

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Introduction

The versions ETSI TS 102 796 [1] published to date rely on signalling in the broadcast to start broadcast-related applications, through the Application Information Table (AIT). The present document defines a method for discovery of broadcast-related HbbTV[®] services via a broadband internet connection for settings where AIT signalling via the broadcast network is not available to the HbbTV[®] terminal.

The discovery method relies on retrieving or extracting a unique identifier for a broadcast channel and then starting a discovery process to find a server that can be contacted to retrieve an AIT over the broadband connection. The broadband-retrieved AIT would only be used if no AIT is available in the broadcast channel. The discovery process relies on the Internet's DNS system. In simplified form, the process works as follows:

- Extract a unique identifier from the broadcast channel. (The present document specifies how to do this for a terminal that receives a DVB signal).
- With the unique identifier, perform a DNS query to find (resolve) the AIT server.
- Ask the AIT server for an AIT that matches the broadcast channel.

- Using the AIT, retrieve the HbbTV® application.

This AIT retrieved over the broadband connection and the Application referenced in that AIT are not necessarily the same as the AIT that would be available in the broadcast and the associated HbbTV® Application. Generally, when no AIT is available in the broadcast, then neither would be event signalling, and the provider of the application may want to resort to alternative methods for providing event signalling to the HbbTV® application - and the application may have to be modified to accommodate this. The discovery method does not allow for application changes over time - e.g. when the program changes. If this behaviour is needed then the application will have to include the necessary logic. Entities relying on the functionality provided in the present document are advised to consider these limitations when writing their applications.

The method accounts for privacy concerns, and has been designed in such a way that no entity involved in the discovery process can learn the viewer behaviour of a user of a TV set equipped with this technology. This is the reason for the cache provisions in clause 5.7.

1 Scope

The present document augments clause 6 of ETSI TS 102 796 [1], which states that broadcast-related applications are signalled as part of the broadcast. It defines a method for discovery of HbbTV[®] applications in settings where AIT signalling via the broadcast network is not available to the terminal. In this situation, an HbbTV[®] terminal may discover broadcast-related HbbTV[®] services via a broadband internet connection.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 102 796: "Hybrid Broadcast Broadband TV".

NOTE 1: This document is also referred to as the Main HbbTV[®] Specification.

NOTE 2: Including the latest errata as published on <http://hbbtv.org/resource-library/#specifications>.

[2] ETSI TS 102 796 (V1.4.1): "BROADCAST Hybrid Broadcast Broadband TV".

NOTE: Including the latest errata as published on <http://hbbtv.org/resource-library/#specifications>.

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

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

[5] ETSI TS 102 034 (V1.5.1): "Digital Video Broadcasting (DVB); Transport of MPEG-2 TS Based DVB Services over IP Based Networks".

[6] ETSI TS 102 809 (V1.2.1): "Digital Video Broadcasting (DVB); Signalling and carriage of interactive applications and services in Hybrid Broadcast/Broadband environments".

[7] IETF RFC 2782: "A DNS RR for specifying the location of services (DNS SRV)".

[8] W3C Recommendation (Second Edition) (10 June 2008): "XML Signature Syntax and Processing".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 103 270 (V1.1.1): "RadioDNS Hybrid Radio; Hybrid lookup for radio services".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI TS 102 796 [1] and the following apply:

AIT Server: server that provides broadcast-related AIT(s) over broadband

authoritative FQDN: internet domain for a (HbbTV[®]) service provider

discovered AIT: Broadcast related AIT retrieved according to the present document

HbbTVDNS FQDN: internet domain constructed only for the purpose of querying DNS

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI TS 102 796 [1] apply.

4 Overview (informative)

The methodology is modelled after RadioDNS [i.1], using certain parameters provided in the broadcast for the identification of services. These could be digital parameters extracted from DVB Service Information, e.g. DVB-SI [3], or parameters encoded in a digital watermark that is inserted for the purpose of enabling this discovery method. The present document defines operation in the presence of DVB Service Information; other operation modes may be added in a future version.

The discovery method allows broadcasters to uniquely associate an AIT server with their channel and comprises discovering an authoritative FQDN for a TV service, including discovery using DNS queries to hbbtvdns.org, a root domain name server. Also defined is the methodology for discovery of an hbbtv-ait service record, which allows for construction of the (HTTPS) URL to retrieve an AIT from the broadcaster.

NOTE: It is possible for local markets to define a market-specific alternative to hbbtvdns.org; this is not further addressed in the present document.

The protocol for discovery and retrieval of an AIT for a single service follows a number of steps, as outlined below. Figure 1 illustrates the steps using the example of DVB-based parameters.

- The terminal queries the root domain name server using an HbbTVDNS FQDN constructed from information present in the broadcast (1). The root domain name server returns the authoritative FQDN for that service, if available (2).

- The terminal sends a DNS SRV query to the authoritative FQDN to locate the hbbtv-ait service, which can provide the AIT for the respective service (3). The authoritative FQDN returns the SRV record for the hbbtv-ait, if available (4).
- The terminal retrieves an XML-encoded AIT from the server using a URL constructed from the DNS SRV record as provided by the authoritative FQDN (5 and 6).
- When a broadcast service is selected from a service provider (broadcaster) that supports Application Discovery over Broadband, the terminal uses the AIT for that broadcast service and retrieves the application (7 and 8) if and when it cannot obtain an AIT from the broadcast signal.

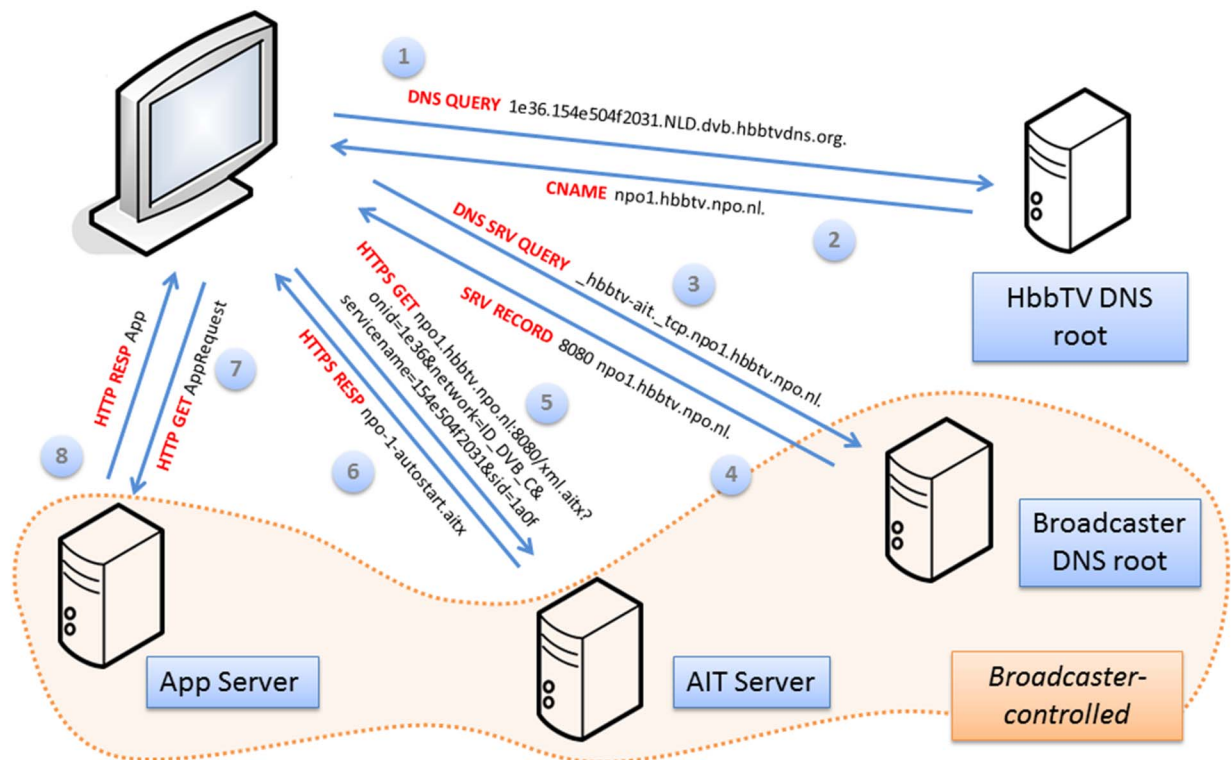


Figure 1: HbbTV® Application Discovery over Broadband in the presence of DVB Service Information

This mechanism has been designed to protect the privacy of the end user; it does not reveal information about user viewing behaviour to third parties involved in the discovery process. The DNS server may gain knowledge about (DVB) services that are available to a certain terminal but not which services are actually used. Further, the protocol is designed to let the terminal load AIT server URLs and AITs in its cache, so that it will not perform DNS queries or retrieve an AIT upon channel changes. The information that is potentially disclosed to channel providers (broadcasters) on using a Discovered AIT is comparable to what is disclosed when using an AIT signalled in the broadcast.

5 HbbTV® Application Discovery over Broadband

5.1 Introduction

This clause defines a method for discovery and signalling of broadcast-related applications, which are discovered and signalled via broadband, instead of being signalled as part of the broadcast channel as defined in clause 7.2.3.1 of ETSI TS 102 796 [1].

The structure of this clause reflects the fact that the present document defines generic methods as well as instantiations that map on specific ways in which identifiers can be extracted and used. The present version defines such a mapping for a terminal that receives a DVB signal. It is envisaged that a mapping will be added that relies on watermarking, to enable operation of terminals that do not receive the digital broadcast signal, for instance when the terminal is connected to a set top box with an HDMI cable. Mappings for non-DVB digital broadcasts can be added as well, but are not currently planned.

Terminals shall implement all of the mandatory requirements in the ETSI TS 102 796 [1], except where explicitly stated otherwise in the present document.

5.2 Retrieving a Discovered AIT

The terminal shall attempt to retrieve a Discovered AIT for each service in the terminal's service list, according to the process as described below. This process is independent from service selection by the user and shall be executed in the following cases:

- For each service in the terminal's service list, upon a power cycle (and hence no AITs are cached).
- For any service where the terminal detects a change in the service name.
- For any service that is added to the terminal's service list.
- For every service, when the terminal's country setting is changed.

Retrieval of a Discovered AIT shall be performed in the following way:

- The Authoritative FQDN shall be resolved as specified in clause 5.6, using Service Identification as specified in clause 5.4 and the HbbTV DNS FQDN construction as specified in clause 5.5.
- The Service Record shall be resolved as specified in clause 5.7.
- The Discovered AIT shall be retrieved as specified in clause 5.8.

5.3 Using a Discovered AIT

The terminal shall apply the lifecycle rules defined in clauses 6.2.2.2 and 6.2.2.3 of ETSI TS 102 796 [1] for broadcast-related applications where all references to AIT shall be replaced by Discovered AIT. In addition, if a Discovered AIT has been retrieved for the current service, it shall be used according to the following policy:

- 1) If the PMT of the broadcast service references a PID carrying a valid `application_signalling_descriptor`, and an AIT section for the HbbTV[®] `application_type` is receivable from that PID within 30 seconds, the AIT provided in the broadcast service shall be used.
- 2) If the PMT of the broadcast services does not reference a PID carrying a valid `application_signalling_descriptor`, and the terminal has successfully cached an AIT for this service using the Application Discovery over Broadband mechanism as a result of previously executing the relevant steps to acquire such an AIT, the Discovered AIT shall be used.
- 3) If the PMT of the broadcast service references a PID carrying a valid `application_signalling_descriptor`, but an AIT section for the HbbTV[®] `application_type` has not been observed after continuously monitoring the AIT PID for 30 seconds, and the terminal has successfully retrieved a Discovered AIT, the Discovered AIT shall be used.

Relying on implementation-dependent logic, a terminal may use a Discovered AIT sooner, for instance when no AIT has been observed on that particular service in the recent past.

5.4 Service Identification

5.4.1 Service Identification in the presence of DVB Service Information

Identification of a service is provided by a combination of DVB service parameters. The parameters are defined in table 1.

Table 1: HbbTVDNS parameters

Parameter	Description	Value
country	3-character country code as specified by the <code>Configuration.countryId</code> property in Open IPTV Forum Release 2 specification [4].	3-char string
servicename	The DVB service name bytes from the <code>service_name</code> field in the <code>service_descriptor</code> in the SDT for this service as defined in ETSI EN 300 468 [3], encoded as a string of two digit hex bytes.	Up to 256 two digit hex bytes
onid	The original network id for this service as defined in ETSI EN 300 468 [3] encoded as a string of two digit hex bytes.	4-digit lower case hex string

5.5 HbbTV® DNS FQDN Construction

5.5.1 HbbTV® DNS FQDN Construction in the presence of DVB Service Information

The terminal shall construct a HbbTV® DNS FQDN as follows:

```
<onid>.<servicename>.<country>.dvb.hbbtvdns.org
```

The terminal shall extract and re-encode all the bytes from the `service_name` field in the `service_descriptor` in the SDT as transmitted including any optional character selection byte. No character set processing or translation shall be performed. This shall be done regardless of what character sets a terminal supports.

Some examples of HbbTVDNS FQDNs constructed from broadcast parameters are shown in table 2.

Table 2: Examples of HbbTVDNS FQDN construction for HbbTV

Country	Servicename	Onid	HbbTVDNS FQDN
NLD	154e504f2031 ("NPO 1" with the 0x15 indicating UTF-8 character encoding as defined by ETSI EN 300 468 [3])	1e36	1e36.154e504f2031.NLD.dvb.hbbtvdns.org
DEU	10415244 ("ARD" with the 0x10 indicating ISO/IEC 8859-5 character encoding as defined by ETSI EN 300 468 [3]).	2345	2345.10415244.DEU.dvb.hbbtvdns.org

5.6 Resolution of Authoritative FQDN

The terminal shall perform a DNS request using the HbbTV DNS FQDN, to acquire the Authoritative FQDN. The response to this request contains a single CNAME record containing the Authoritative FQDN of the service provider. If no CNAME is returned, then a broadband-discoverable AIT service has not been registered.

EXAMPLE: Consider a TV service identified by the HbbTVDNS FQDN:

```
1e36.154e504f2031.NLD.dvb.hbbtvdns.org
```

A DNS lookup will yield the following lookup result:

```
1e36.154e504f2031.NLD.dvb.hbbtvdns.org. IN CNAME npo1.hbbtv.npo.nl.
```

Therefore, for this service, the Authoritative FQDN is:

```
npo1.hbbtv.npo.nl
```

5.7 Resolution of Service Record

The terminal shall make a DNS SRV query according to the procedures specified in IETF RFC 2782 [7] and using the Authoritative FQDN to receive its service records. The DNS service query shall be compiled as follows:

```
_hbbtv-ait._tcp.<Authoritative FQDN>
```

The response to this request contains one or more service records containing the Authoritative FQDN of the service provider in the following format:

```
<priority> <weight> <port> <target>
```

If no record is returned, then the service has not been registered.

EXAMPLE: Consider a DNS SRV query using the authoritative FQDN as resolved via DNS resolution:

```
_hbbtv-ait._tcp.npo1.hbbtv.npo.nl
```

A DNS lookup will yield the following DNS service record lookup result:

```
0 100 8080 npo1.hbbtv.npo.nl.
```

5.8 AIT retrieval

5.8.1 AIT retrieval in the presence of DVB Service Information

The terminal shall retrieve the AIT by performing an HTTPS GET request to the following address:

```
https://<target>:<port>/xml.aitx?onid=<onid>&network=<network>&servicename=<servicename>&sid=<sid>
```

The requirements of clause 7.3.2.5 of ETSI TS 102 796 V1.4.1 [2] shall apply to AIT retrieval regardless of what is ETSI TS 102 796 [1].

The parameters that the terminal shall provide are shown in table 3.

Table 3: AIT request parameters

Parameter	Description	Value
onid	Original network ID, as provided in the SDT from DVB-SI, ETSI EN 300 468 [3].	4-digit lower case hex string
network	Identifies the broadcast delivery system. Values correspond to the value of the BroadcastSystemType as defined in clause 5.2.10 of ETSI TS 102 034 [5].	String
servicename	See table 1.	See table 1
sid	Service ID, as used in DVB-SI, ETSI EN 300 468 [3].	4-digit lower case hex string

The response to this request shall have the following MIME type: application/vnd.dvb.ait+xml and an XML AIT as payload. The AIT is contained in a single application discovery record.

EXAMPLE: Consider a DNS Service record as provided by DNS:

```
0 100 8080 npo1.hbbtv.npo.nl.
```

The URL to retrieve the AIT for this service is:

```
https://npol.hbbtv.npo.nl:8080/xml.aitx?onid=1e36&network=ID_DVB_C&
servicename=154e504f2031&sid=1a0f
```

5.9 Caching policy

The following caching rules shall apply:

- Retrieved AITs shall be cached.
- Cached AITs shall not be retained over a power cycle.
- The terminal shall cache AITs for at least 2 hours.

5.10 XML AIT for Broadcast-related broadband application discovery

The AIT for broadcast-related applications discovered over broadband shall be encoded in XML similarly to the way defined in ETSI TS 102 796 [1] for broadcast-independent applications. The XML file shall contain an ApplicationDiscovery record containing one or more <application> elements.

The semantics of the fields and elements in the XML AIT file shall be as defined in table 4. All entries which are identical to the contents as defined in table 7 "Contents of XML AIT for Broadcast-independent applications" of ETSI TS 102 796 [1] are marked as "Same as for broadcast-independent applications."

Table 4: Contents of XML AIT for Discovered Broadcast-related Applications

Field or element	Requirement on XML AIT file	Requirement on terminal
appName	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationIdentifier	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationDescriptor/type/OtherApp	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationDescriptor/controlCode	Mandatory.	Mandatory.
applicationDescriptor/visibility	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationDescriptor/serviceBound	Mandatory.	Mandatory.
applicationDescriptor/priority	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationDescriptor/version	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationDescriptor/mhpVersion	Shall be the same values as defined for the MPEG-2 encoding of the AIT in the row of table 5 "Supported application signalling features" from ETSI TS 102 796 [1] that corresponds to clause 5.2.5 of ETSI TS 102 809 [6].	As defined in table 7 "Contents of XML AIT for Broadcast-independent applications" of ETSI TS 102 796 [1].
applicationDescriptor/icon	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationDescriptor/storageCapabilities	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationTransport/	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationLocation/	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationBoundary/	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationSpecificDescriptor	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.
applicationUsageDescriptor	Same as for broadcast-independent applications.	Same as for broadcast-independent applications.

Clause 7.2.3.2 of ETSI TS 102 796 (V1.4.1) [2] defines how to signal parental rating information in the XML AIT - something not included in some earlier versions. When the solution defined in the present document is used in combination with ETSI TS 102 796 (V1.4.1) [2], or a more recent version of ETSI TS 102 796 [1], if the XML AIT for a Discovered broadcast-related application includes a parental rating then that rating shall be acted upon as defined in clause 6.2.2.10 of ETSI TS 102 796 (V1.4.1) [2]. Parental rating for Discovered broadcast-related applications is not supported when the solution defined in the present document is used with earlier versions of ETSI TS 102 796 [1].

Optionally XML DSIG [8] can be used to authenticate XML AITs and hence to enable terminals to reject XML AITs if (for example) DNS responses are being tampered with. Terminals not supporting this option shall silently ignore any *Signature* element that appears within the *ServiceDiscovery* element and process the XML AIT as if that information were not present.

NOTE: The present document does not define a trust hierarchy for authenticating XML AITs.

6 Other aspects (informative)

Please note that when the broadcast does not carry an AIT, then it is also unlikely that other broadcast-carried HbbTV[®] functions like application transport with DSM-CC, stream events, etc., will be available in the video broadcast. Methods and properties related to these functions will be handled the same way as in ETSI TS 102 796 [1].

Note also that HbbTV[®] applications that are discovered using the method described in the present document can be tailored to the discovery method, so that they can take into account - and work around - the inherent limitations of this method.

Annex A (informative): Change History

Date	Version	Information about changes
July 2016	0.75	Reformatted for ETSI template

History

Document history		
V1.1.1	September 2016	Publication