



OIPF

Feature Package

Additional Features to Support STB-less IPTV

[V1.1] – [2015-10-23]

Open IPTV Forum, HbbTV Association

Open IPTV Forum

<http://www.oipf.tv>

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Foreword

Feature Packages complement the Releases of OIPF Specifications. After creating two major releases (Release 1 and Release 2) of OIPF Specifications, OIPF started to publish new and additional functionality in “Feature Packages”.

This 1.1 version is an update of the original and first version, published in 2014 by the Open IPTV Forum, OIPF. In 2014, OIPF transferred its technical activities to the HbbTV Association, and this update was produced by HbbTV, working under the transfer agreement between HbbTV and OIPF. This agreement enables HbbTV to use and update OIPF’s specifications.

Such Feature Packages are documented as deltas on Release 2. In this specific case, the delta is against Release 2.3. Feature Packages may at some point be rolled into a new version of the OIPF Solution specifications, but no plans to do so exist at the time of publication of this document.

Introduction

This Feature Package (FP) provides additions to the OIPF specifications, Release 2.3, to enable Set Top Box-less IPTV in a fully standardized manner. The FP consists of two parts:

- The changes with respect to the individual parts of the OIPF Specification (**this document**)
- An **Implementation Guideline** [GUIDELINE] that gives a Normative “recipe” for implementing IPTV without a Set Top Box based on the OIPF specifications as extended by this Feature Package. This Implementation Guideline provides for two use cases:
 - Operation with a Conditional Access Module
 - Operation without a Conditional Access Module.

The Implementation Guideline provides a well-defined interoperability point for IPTV without a Set Top Box, while not precluding other implementations of the OIPF specifications as amended by this Feature Package. Also, nothing in this FP, neither technical nor otherwise, precludes implementation on STBs.

1 References

1.1 Normative References

1.1.1 Standard References

[CI+1.3]	CI Plus LLP, "CI Plus Specification" V1.3, January 2011
[CI+1.4]	Digital Video Broadcasting, "Extensions to the CI Plus Specification", ETSI TS 103 205 v1.1.1, March 2014
[CEA]	CEA, CEA-2014-A, (Including the August 2008 Errata) "Web-based Protocol Framework for Remote User Interface on UPnP Networks and the Internet (Web4CE)", August 2008

1.1.2 Open IPTV Forum References

[OIPF_DAE2]	Open IPTV Forum, "Release 2 Specification, Volume 5 - Declarative Application Environment" V2.3, January 2014
[OIPF_DAE2-WEB]	Open IPTV Forum, "Release 2 Specification, Volume 5a – Web Standards TV Profile" V2.3, January 2014
[OIPF_PROT2]	Open IPTV Forum, "Release 2 Specification, Volume 4 - Protocols" V2.3, January 2014
[OIPF_HAS2]	Open IPTV Forum, "Release 2 Specification, Volume 2a – HTTP Adaptive Streaming" V2.3, January 2014
[OIPF_OVIEW2]	Open IPTV Forum, "Release 2 Specification, Volume 1 - Overview" V2.3, January 2014
[OIPF_ARCH2]	Open IPTV Forum, "Release 2 Specification – Functional Architecture" V2.3, January 2014
[OIPF_META2]	Open IPTV Forum, "Release 2 Specification, Volume 3 - Metadata" V2.3, January 2014
[GUIDELINE]	Open IPTV Forum, "Implementation Guideline for STB-less IPTV" V1.1, October 2015

1.2 Informative References

[RFC2119]	IETF, RFC 2119, "Key words for use in RFCs to Indicate Requirement Levels"
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2 Conventions and Terminology

2.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except “Introduction”, are normative, unless they are explicitly indicated to be informative.

2.2 Terminology

2.2.1 Definitions

In addition to the Definitions provided in [OIPF_OVIEW2], the current Feature Package defines the following terms:

<empty>

2.2.2 Abbreviations

In addition to the Abbreviations provided in [OIPF_OVIEW2], the following abbreviations are used in this Volume.

Acronym	Explanation
APDU	Application Protocol Data Unit
CA	Conditional Access
CAM	Conditional Access Module
CI (plus)	Common Interface (plus)
DAE	Declarative Application Environment (see reference [OIPF_DAE2])
DASH	Dynamic Adaptive Streaming over HTTP
DRM	Digital Rights Management
DSLAM	Digital Subscriber Line Access Module
EPG	Electronic Programming Guide
FCC	Fast Channel Change
HbbTV	Hybrid Broadcast Broadband Television
LSC	Low Speed Communication (Channel)
NIT	Network Information Table
nPVR	Network-PVR
OSDT	Online Service Description Table
PVR	Personal Video Recorder
RET	Retransmission
SDT	Service Description Table
STB	Set Top Box
(MPEG-2) TS	(MPEG-2) Transport Stream

3 Architecture

The OIPF Architecture document [OIPF_ARCH2] describes high level service provider discovery and service discovery procedures. This section includes some revisions to the Service Discovery procedures to accommodate the requirements of this Feature Package.

The following changes are applied to the architecture [OIPF_ARCH2]:

In section 3.2.2, add following abbreviation

OSDT	Online Service Description Table
------	----------------------------------

In section 5.3.1.1 Open IPTV Terminal Functional Entity (OITF), apply underlined changes.

IPTV Service Discovery: Function for discovering IPTV Service Providers and related services. It applies to both the unmanaged and the managed models. Note that different aspects of DVB SD&S [Ref4] may apply to the different models.

In section 6.2 IPTV Service Discovery and Selection, apply (underlined) changes:

The IPTV Service Discovery is a mechanism to enable an ITF to discover IPTV Service Providers and IPTV services provided by a specific IPTV Service Provider. The procedures of IPTV Service Discovery consists of the following three steps which are consistent with DVB IP Service Discovery and the discovery information is based on DVB IP SD&S records for both managed network and unmanaged network.

Step 1. Determination of the IPTV Service Provider Discovery entry points.

This procedure is the bootstrap of IPTV Service Discovery, where the ITF finds the entry point(s) of the IPTV Service Provider Discovery or IPTV Service Discovery functional entity. The mechanisms to determine the entry point(s) can be different between the managed and the unmanaged models. For example, in case of the managed model, the Network Attachment functional entity can provide the IP address to start the IPTV Service Provider Discovery phase.

Step 2. IPTV Service Provider Discovery.

This is the procedure where the ITF retrieves the information about each IPTV Service Provider. This information is located at the Service Provider Discovery functional entity, addressed by the IPTV Service Provider Discovery entry point(s) found as a result of step 1. This information can be provided either as a web page or based on XML data, such as a DVB-IP Service Provider(s) Discovery Record. It includes the names of IPTV Service Provider(s) and related attributes (e.g. a logo image of the IPTV Service Provider, the means to retrieve IPTV Service Discovery information, etc.). This information will be used by the ITF to perform IPTV Service Provider selection.

If the entry point(s) found as a result of step 1 is an IPTV Service Discovery entry point, this step 2 is skipped.

Step 3. IPTV Service Discovery.

After selecting one IPTV Service Provider from the list obtained in step 2, this procedure allows the ITF to get information about IPTV Services offered by the selected IPTV Service Provider. This information is located at the Service Discovery functional entity. In this step, the term “services” includes linear TV, CoD, nPVR, etc. The IPTV Service Discovery information can be provided either as a web page or as an XML record, such as a DVB-IP Offering record with needed extensions (including the start-up URL for DAE, entry point for the DVB-IP Broadband Content Guide Record and so on) or an OSDT.

Note that in the case of 1-to-1 relationship between the Service Platform Provider and the IPTV Service Provider, the IPTV Service Provider Discovery phase (Step 2) would return a single record; therefore, in such a deployment, the subscriber does not have to select the Service Provider and Step 1 could directly provide the address of the IPTV Service Discovery functional entity.

Note that step 2 and step 3 can be repeated without necessarily performing step 1.

When the Service Discovery and Selection Information changes, the IPTV Service Provider Discovery FE or IPTV Service Discovery FE should inform the ITF about this change

The sequence in Figure 6-1 shows a high level call flow for IPTV Service Discovery followed by call flows for IPTV service access, such as retrieving documents for DAE and retrieving content guide metadata. Each call flow can include an optional authentication step to avoid unauthorized access to the IPTV services.

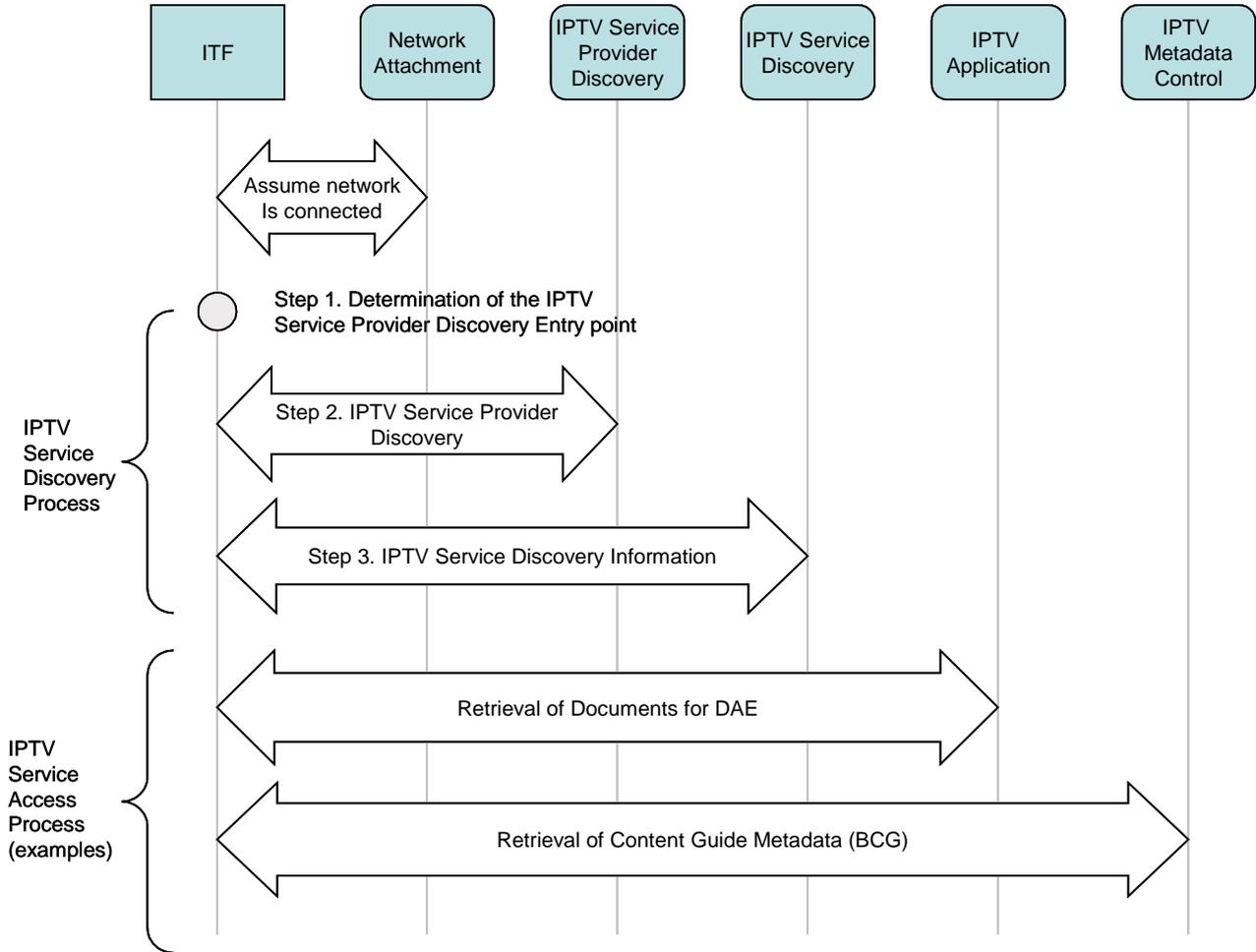


Figure 6-1: High level steps in Service Discovery and Service Access

In section 6.2.1.1 High Level Procedure, apply (underlined) changes:

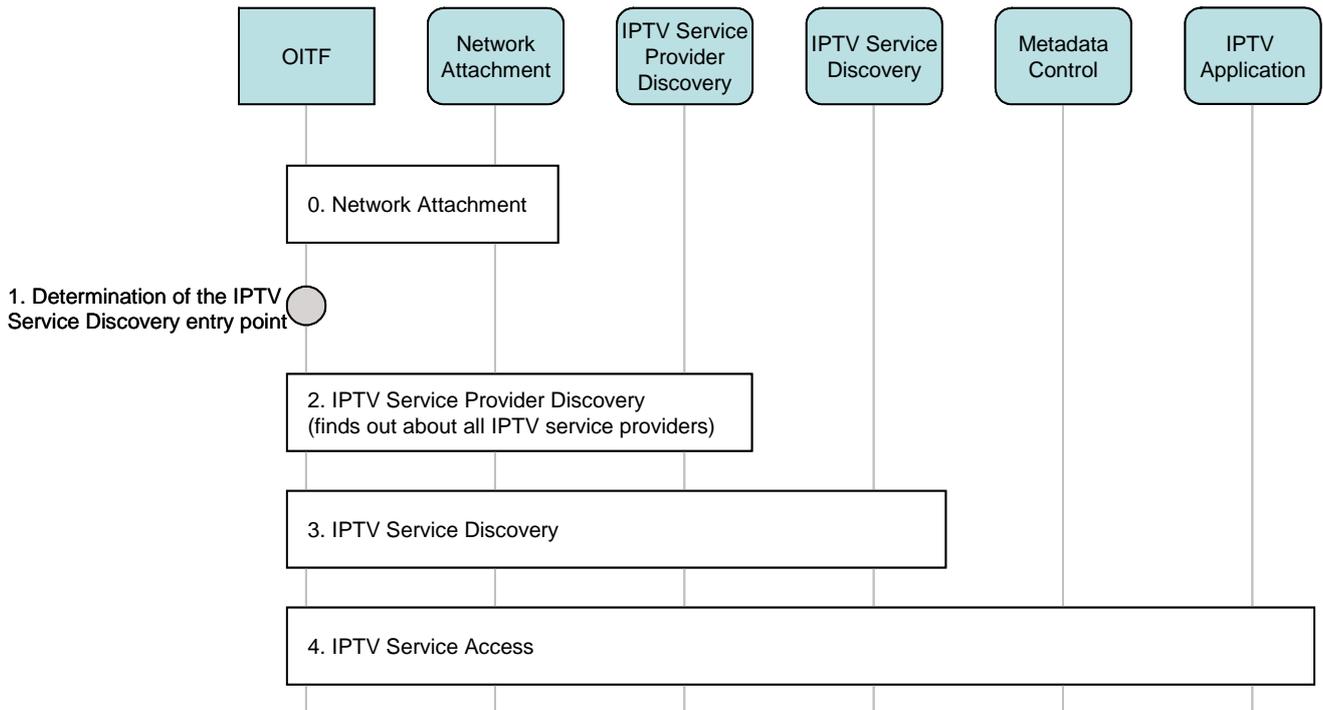


Figure 6-2: High level steps for Service Discovery and Service Access for unmanaged networks

The IPTV Service Discovery and IPTV Service Access procedures for an unmanaged network comprise a number of steps, as shown in Figure 6-2:

1. Determination of the IPTV Service Provider Discovery entry point
2. IPTV Service Provider Discovery
3. IPTV Service Discovery
4. IPTV Service Access (e.g. Access to the Content Guide – via metadata or web page)

These steps are described in detail below.

0. Attachment to the network, where the OITF obtains connectivity to the unmanaged network through the WAN Gateway
1. Determination of an IPTV Service Provider Discovery entry point. This is an internal process in the OITF.
2. If the entry point is an entry point to a Service Provider Discovery, the ~~The~~ OITF initiates the IPTV Service Provider Discovery using this entry point. In this step, the IPTV Service Provider Discovery functional entity provides the list of IPTV Service Providers and information that is used in the next step (e.g. IPTV Service Provider name, IP address, protocols to be used).
If the entry point is an entry point to a Service Discovery, this step is skipped.
3. The OITF initiates the IPTV Service Discovery. In this phase the OITF selects an IPTV Service Provider and obtains the list of IPTV services available from that specific IPTV Service Provider
4. The OITF can select and access an IPTV service, e.g. access the Content Guide.

Rename the title of section “6.1.1.2 Determination of the IPTV Service Provider Discovery entry points” in 6.1.1.2 Determination of the IPTV Service Provider Discovery entry points and apply (underlined) changes:

For unmanaged networks, the OITF determines the entry point(s) with the following options. There is no priority order for these options.

- **Manual**

The End User manually enters a URL or an IP address/port. The OITF should provide a means to allow users to enter an entry point easily, e.g. bookmark, or default URL and the means by which this is achieved is OITF vendor dependent.

- **Pre-Configured**

Optionally, all the necessary information can be pre-configured in the OITF.

- **DHCP Configuration**

Optionally, the OITF retrieves provider discovery entry points via DHCP configuration parameters. This would be provided by the ISP to which the residential network connects.

- **DNS resolution**

Optionally, the OITF retrieves discovery entry points via DNS SRV resolution. This would be provided by the ISP to which the residential network connects.

- **CI+**

Optionally, the OITF retrieves discovery entry points from the CSPG-CI+.

In case the entry point is an IPTV Service Discovery entry point, the IPTV Service Provider Discovery step is skipped.

In section 6.1.1.4 IPTV Service Discovery, apply (underlined) changes:

The Service Discovery Record can be delivered via HTTP(S) as XML data (either DVB-IP SD&S Record or OSDT) or as a Web Page.

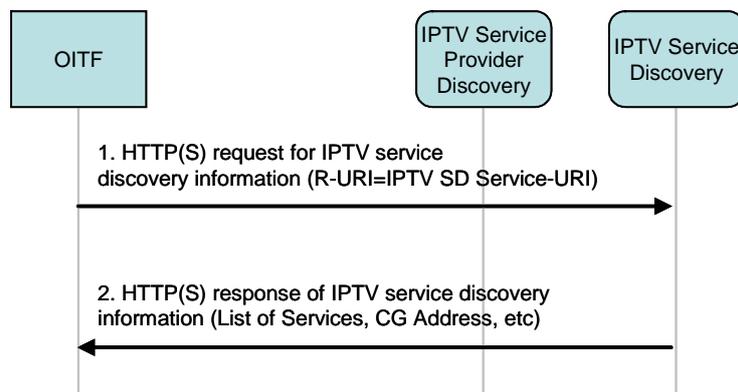


Figure 6-4: IPTV Service Discovery for unmanaged networks

4 Solution

No changes to this functionality are required for this Feature Package.

4.1 Media Formats

No changes to this functionality are required for this Feature Package.

4.2 HTTP Adaptive Streaming

No changes to this functionality are required for this Feature Package.

4.3 Content Metadata

The following changes are applied to [OIPF_META2]:

Add a reference in section 1.1 Normative reference in [OIPF_META2]

[CI+1.4]	Digital Video Broadcasting, DVB A165, "Extensions to the CI Plus Specification", September 2013
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In section 2.2.2.2 Metadata Formats, apply underlined changes

The Open IPTV Forum metadata is based on the following specifications:

....

Online Service Description Table (OSDT)

The OSDT is a set of data related to Service Discovery. This metadata allows the OITF to retrieve information to select Linear TV services (i.e. multicast address, channel name, ...). OSDT is defined in [CI+1.4].

In section 3 Metadata content , apply underlined changes

This clause defines the Open IPTV Forum extensions to the SD&S and BCG schemas and the AV classification schemes. Please refer to the SD&S [SDNS] and BCG [BCG] specifications for the base schemas. No extensions to OSDT are defined.

In section 4.1 Metadata Delivery Mechanism, apply underlined changes

This clause explains how SD&S, OSDT and BCG XML metadata is carried over the network.

OSDT SHALL be delivered using HTTP or HTTPS.

Delivery of SD&S and BCG metadata SHALL be as described in the respective SD&S [SDNS] and BCG [BCG] specifications, with the following extensions.

4.4 Protocols

The following changes are applied to [OIPF_PROT2]:

Add a reference in section 1.1 Normative reference in [OIPF_PROT2]

[CI+1.4]	Digital Video Broadcasting, DVB A165, "Extensions to the CI Plus Specification", September 2013
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Apply following changes (underlined (new) or struck (removed)) to section 5.4.1.2. Protocol over UNIS-19 for the Unmanaged Model and Non-native HNI-IGI

The OITF ~~retrieves the Service Provider Discovery entry point and~~ uses the entry point to the Service Provider Discovery Functional Entity to retrieve a list of IPTV service providers using HTTP for that purpose. ~~The IPTV Service Providers list SHALL be delivered as SD&S records or DAE applications.~~

~~When an IPTV service provider discovery entry point is selected,~~ The Service Provider Discovery information SHALL be delivered as Service Discovery and Selection (SD&S) records or as DAE applications. This information is provided by the Service Platform Provider.

When SD&S records are used, the HTTP protocol conforming to ETSI TS 102 034 [TS102034] Section 5.4.2 SHALL be used for the transport of IPTV Service Provider Discovery Information. The data delivered SHALL conform to ETSI TS 102 034 [TS102034] Section 5.2.5, with the extension defined in [OIPF_META2].

When DAE applications are used, the HTTP protocol and data formats SHALL conform to Section 5.3.1.1.6 of Open IPTV Forum Solution Specification Volume 5 - Declarative Application Environment [OIPF_DAE2]. In case of DHCP or DNS-SRV Service Provider Discovery, as defined respectively in section 12.1.1.1.3 and section 16.1, the HTTP GET URL shall be built from the discovered DAE Service Provider Discovery Entry point function host address or domain name by requesting the root resource path '/'.

Apply following changes (underlined (new) or struck (removed)) to section 5.4.2.2. Protocol over UNIS-15

The OITF uses the entry points to the Service Discovery Functional Entity, i.e. the Service Provider Discovery entry point or the entry points provided in the Service Provider Discovery information, to retrieve Service Discovery information using HTTP. The Service Discovery information SHALL be delivered as Service Discovery and Selection (SD&S) records or as an Online Service Description Table (OSDT). This information is provided by the Service Platform Provider.

When SD&S records are used, ~~The~~ protocol used on UNIS-15 for the transport IPTV Service Discovery information SHALL be HTTP conforming to ETSI TS 102 034 [TS102034] Section 5.4.2. ~~The IPTV Service Discovery information delivered via this protocol~~ The data delivered SHALL conform to ETSI TS 102 034 [TS102034] Section 5.2.6 with the extension defined in [OIPF_META2]

When OSDT is used, the protocol used SHALL be HTTP or HTTPS. In case of CI+ based discovery, the request shall be an HTTP or HTTPS GET build from the URI provided by the CI+ as defined in [CI+1.4], section 15.4. In case of DHCP or DNS-SRV Service Provider Discovery, as defined respectively in section 12.1.1.1.3 and section 16.1, the HTTP GET URL shall be built from the discovered OSDT Service Discovery Entry point function host address or domain name by requesting following resource path '/osdt.xml'. The data delivered on UNIS-15 for the IPTV Service Discovery information SHALL conform to [CI+1.4] section 15.4.

Apply following changes (underlined (new) or struck (removed)) to section 12.1.1.1.3 Option 124/125

The OITF SHALL send a Vendor-Identifying Vendor Class option 124 as specified in RFC 3925 [DHCP-VND] when it requests a DHCP lease from the WAN Gateway. The option is specified with an enterprise-number and the vendor-class-data identifier as "OITF_IPTV".

The DHCP server delivers the Service Provider Discovery entry point and the FCC/RET server location via Vendor-Identifying Vendor-Specific Information DHCP option 125 as defined in RFC 3925 [DHCP-VND].

In this specification, the Service Provider Discovery entry points used are either:

The FQDN/IP address of the IG, as per Annex F.1, "OITF Start up High Level Procedure" acting as a Service Provider Discovery Functional Entity , or

The FQDN/IP address of the Service Provider Discovery Functional Entity (SP Discovery FE) or Service Discovery Functional Entity, as per Section 6.1.3.1., "~~Service Provider Discovery~~".

Format of DHCP payload

The format of the vendor-specific binary buffer containing addresses returned by the DHCP server is a list of sub-options starting with sub-option number (one byte), sub-option length (one byte) and sub-option value (list of bytes).

The following vendor-specific sub-options are defined:

- Sub-Option: IPTV-ENTRYPOINT: Code=0x01. This option carries either an IP Address or a fully-qualified domain name, as determined by a one byte “enc” field is used to indicate the type of encoding.
 - o If the “enc” field has a value of 0x01, then this indicates an IP Address. The “enc” field is followed by 4 bytes corresponding to the IP Address. This value is used for the SD&S Service Provider Discovery Entry point function.
 - o If the “enc” field has a value of 0x02, then this indicates a FQDN (Fully-Qualified Domain Name). This value is used for the SD&S Service Provider Discovery Entry point function.
 - o If the “enc” field has a value of 0x03, then this indicates an IP Address. The “enc” field is followed by 4 bytes corresponding to the IP Address. This value is used for the OSDT Service Discovery Entry point function.
 - o If the “enc” field has a value of 0x04, then this indicates a FQDN (Fully-Qualified Domain Name). This value is used for the OSDT Service Discovery Entry point function.
 - o If the “enc” field has a value of 0x05, then this indicates an IP Address. The “enc” field is followed by 4 bytes corresponding to the IP Address. This value is used for the DAE Service Provider Discovery Entry point function.
 - o If the “enc” field has a value of 0x06, then this indicates a FQDN (Fully-Qualified Domain Name). This value is used for the DAE Service Discovery Entry point function.
 - o The code of 0xFF is used to indicate end of the buffer.
- Sub-Option: FCC/RET server location: Code=0x02. This option carries either a comma delimited list of IP Addresses or a comma delimited list of fully-qualified domain names, as determined by a one byte “enc” field is used to indicate the type of encoding.
 - o If the “enc” field has a value of 0x01, then this indicates a list of comma-delimited IP Addresses.
 - o If the “enc” field has a value of 0x02, then this indicates a list of comma-delimited FQDNs (Fully-Qualified Domain Name).
 - o The code of 0xFF is used to indicate end of the buffer.
 - o In either case, the servers SHALL be in the order of priority from first to last server to connect to.
- In conformance with [ref], the values for the FCC/RET server location(s) retrieved with DHCP are overruled by the SD&S elements “/BroadcastDiscovery/ServiceList/SingleService/ServiceLocation/IPMulticastAddress/Server-based LMB Enhancement Service/RTCPReporting@DestinationAddress” providing the address of the FCC/RET server per each channel, when present.

Note: for this release it is not defined how to configure the DHCP server on the WAN gateway for FCC/RET server location.

The value for the Service Provider Discovery Entry point server location(s) retrieved with DHCP is overruled by the DNS SRV resolution as described in section 16.1

Add section 16. DNS SRV and sub-section 16.1 Protocols for Service Provider Discovery entry point retrieval:

Section 16 DNS SRV

This section defines the protocol for the use of DNS-SRV over the following reference points:

- UNIS-X

Section 16.1: Protocols for Service Provider Discovery entry point retrieval

Before retrieving the Service Provider Discovery entry point via DNS SRV, an OITF is REQUIRED to have completed Network Attachment and is REQUIRED to have obtained the addresses of one or more DNS servers.

Service Discovery via DNS SRV allows OITF terminals to obtain the location of the Service Provider Discovery Functional Entity or the Service Discovery Functional Entity and to subsequently obtain a list of available Service Providers and Services.

Upon being triggered to start the Service Discovery process, an OITF configured to use DNS SRV for Service Provider Discovery entry point retrieval SHALL send a DNS query for the wanted service names `_oipf-sdns-iptv`, `_oipf-dae-iptv` or `_oipf-osdt-iptv` according to [RFC2782]. The protocol used will be `tcp`. The domain name used will be the domain name maintained by DVB for Service Discovery purposes. This domain name is set to `services.dvb.org`. The full DNS query shall therefore be `_oipf-sdns-iptv._tcp._services.dvb.org`, `_oipf-dae-iptv._tcp._services.dvb.org`, `_oipf-osdt-iptv._tcp._services.dvb.org`.

The DNS SRV-based Service Provider Discovery entry point retrieval mechanism described here assumes that the OITF, during Network Attachment, is configured with a DNS server configured to return a DNS SRV record containing the IP address of the IPTV Service Provider entry point whenever the previously described DNS query is received.

Upon receiving a response, the OITF SHALL use the IP address in the received DNS SRV record as entry point for:

- an SD&S Service Provider Discovery Functional Entity for `oipf-sdns-iptv._tcp._services.dvb.org` service name.
- an IPTV Application Function, for `eoipf-dae-iptv._tcp._services.dvb.org` service name.
- an OSDT IPTV Service Discovery Functional Entity for `oipf-osdt-iptv._tcp._services.dvb.org` service name.

Apply following changes (underlined (new) or struck (removed)) to section 5.4.1.2 Protocol over UNIS-19 and Non-native HNI-IGI

When an IPTV service provider discovery entry point is selected, Service Provider Discovery information SHALL be delivered as Service Discovery and Selection (SD&S) records; as OSDT table or as DAE applications. This information is provided by the Service Platform Provider.

Replace the text in section 5.4.2.2 Protocol over UNIS-15 with the following text

If the Service Provider Discovery Information is delivered as SD&S record:

- The protocol used on UNIS-15 for the transport IPTV Service Discovery information SHALL be HTTP conforming to TS 102 034 [TS102034] section 5.4.2.
- The IPTV Service Discovery information delivered via this protocol SHALL conform to TS 102 034 [TS102034] section 5.2.6 with the extension defined in [OIPF_META2].

If the Service Provider Discovery Information is delivered as an OSDT table:

- The IPTV Service Discovery information delivered via this protocol SHALL conform to [CI+ 1.4].

4.5 Declarative Application Environment

CI+ 1.4 has defined the new OSDT format for conveying IPTV Channel Lists. There are a number of places where [OIPF_DAE2] should be extended to allow for this new method. For example, current DAE Channel objects only allow types `ID_IPTV_SDS` and `ID_IPTV_URI`. A new Channel format type `ID_IPTV OSDT` needs to be added.

Add a reference in section 1.1 Normative reference in [OIPF_DAE2]

[CI+1.4]	Digital Video Broadcasting, DVB A165, "Extensions to the CI Plus Specification", September 2013
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Apply following changes (underlined (new) or struck (removed)) to section 7.13.1.3: Methods

Channel <code>createChannelObject</code>(Integer <code>idType</code>, Integer <code>onid</code>, Integer <code>tsid</code>, Integer <code>sid</code>, Integer <code>sourceID</code>, String <code>ipBroadcastID</code>)		
Description	<p>Creates a Channel object of the specified <code>idType</code>. The Channel object can subsequently be used by the <code>setChannel()</code> method to switch a tuner to this channel, which may or may not be part of the channel list in the OITF. The resulting Channel object represents a locally defined channel which, if not already present there, does not get added to the channel list accessed through the Channel Config class (see section 7.13.9).</p> <p>If the channel of the given <code>idType</code> cannot be created or the given (combination of) arguments are not considered valid or complete, the method SHALL return <code>null</code>.</p> <p>If the channel of the given type can be created and arguments are considered valid and complete, then either:</p> <ol style="list-style-type: none"> 1. If the channel is in the channel list then a new object of the same type and with properties with the same values SHALL be returned as would be returned by calling <code>getChannelWithTriplet()</code> with the same parameters as this method. 2. Otherwise, the method SHALL return a Channel object whereby at a minimum the properties with the same names are given the same value as the given arguments of the <code>createChannelObject()</code> method. The values specified for the remaining properties of the Channel object are set to <code>undefined</code>. 	
Arguments	<i>idType</i>	The type of channel, as indicated by one of the <code>ID_*</code> constants defined in section 7.13.11.1.
	<i>onid</i>	The original network ID. Optional argument that SHALL be specified when the <code>idType</code> specifies a channel of type <code>ID_DVB_*</code> , <code>ID_IPTV_URI</code> , or <code>ID_ISDB_*</code> and SHALL otherwise be ignored by the OITF.
	<i>tsid</i>	The transport stream ID. Optional argument that MAY be specified when the <code>idType</code> specifies a channel of type <code>ID_DVB_*</code> , <code>ID_IPTV_URI</code> , or <code>ID_ISDB_*</code> and SHALL otherwise be ignored by the OITF.
	<i>sid</i>	The service ID. Optional argument that SHALL be specified when the <code>idType</code> specifies a channel of type <code>ID_DVB_*</code> , <code>ID_IPTV_URI</code> , or <code>ID_ISDB_*</code> and SHALL otherwise be ignored by the OITF.
	<i>sourceID</i>	The <code>source_ID</code> . Optional argument that SHALL be specified when the <code>idType</code> specifies a channel of type <code>ID_ATSC_T</code> and SHALL otherwise be ignored by the OITF.
	<i>ipBroadcastID</i>	The DVB textual service identifier of the IP broadcast service, specified in the format " <code>ServiceName.DomainName</code> " when <code>idType</code> specifies a channel of type <code>ID_IPTV_SDS</code> or <code>ID_IPTV OSDT</code> , or the URI of the IP broadcast service when <code>idType</code> specifies a channel of type <code>ID_IPTV_URI</code> . Optional argument that SHALL be specified when the <code>idType</code> specifies a channel of type <code>ID_IPTV_SDS</code> , <code>ID_IPTV OSDT</code> or <code>ID_IPTV_URI</code> and SHALL otherwise be ignored by the OITF.

Apply following changes (underlined (new) or ~~struck (removed)~~) to section 7.13.1.3: Methods

void setChannel (Channel channel, Boolean trickplay, String contentAccessDescriptorURL)	
Description	<p>Requests the OITF to switch a (logical or physical) tuner to the channel specified by <code>channel</code> and render the received broadcast content in the area of the browser allocated for the <code>video/broadcast</code> object.</p> <p>If the <code>channel</code> specifies an <code>idType</code> attribute value which is not supported by the OITF or a combination of properties that does not identify a valid channel, the request to switch channel SHALL fail and the OITF SHALL trigger the function specified by the <code>onChannelChangeError</code> property, specifying the value 0 (“Channel not supported by tuner”) for the <code>errorState</code>, and dispatch the corresponding DOM event (see below).</p> <p>If the <code>channel</code> specifies an <code>idType</code> attribute value supported by the OITF, and the combination of properties defines a valid channel, the OITF SHALL relay the channel switch request to a local physical tuner that is currently not in use by another <code>video/broadcast</code> object and that can tune to the specified channel. If no tuner satisfying these requirements is available (i.e. all physical tuners that could receive the specified channel are in use), the request SHALL fail and OITF SHALL trigger the function specified by the <code>onChannelChangeError</code> property, specifying the value ‘2’ (“tuner locked by other object”) for the <code>errorState</code> and dispatch the corresponding DOM event (see below). If multiple tuners satisfying these requirements are available, the OITF selects one.</p> <p>If the <code>channel</code> specifies an IP broadcast channel, and the OITF supports <code>idType ID_IPTV_SDS</code>, <code>ID_IPTV OSDT</code> or <code>ID_IPTV_URI</code>, the OITF SHALL relay the channel switch request to a logical ‘tuner’ that can resolve the URI of the referenced IP broadcast channel. If no logical tuner can resolve the URI of the referenced IP broadcast channel, the request SHALL fail and the OITF SHOULD trigger the function specified by the <code>onChannelChangeError</code> property, specifying the value 8 (“cannot resolve URI of referenced IP channel”) for the <code>errorState</code>, and dispatch the corresponding DOM event.</p> <p>The optional attribute <code>contentAccessDescriptorURL</code> allows for the inclusion of a Content Access Streaming Descriptor (the format of which is defined in Annex E.2) to provide additional information for dealing with IPTV broadcasts that are (partially) DRM-protected. The descriptor may for example include Marlin action tokens or a <code>previewLicense</code>. The attribute SHALL be <code>undefined</code> or <code>null</code> if it is not applicable. If the attribute <code>contentAccessDescriptorURL</code> is present, the <code>trickplay</code> attribute shall take a value of either <code>true</code> or <code>false</code>.</p> <p>If the Transport Stream cannot be found, either via the DSD or the (ONID,TSID) pair, then a call to <code>onChannelChangeError</code> with <code>errorstate=5</code> (“unknown channel”) SHALL be triggered, and the corresponding DOM event dispatched.</p> <p>If the OITF succeeds in tuning to a valid transport stream but this transport stream does not contain the requested service in the PAT, the OITF SHALL remain tuned to that location and SHALL trigger a call to <code>onChannelChangeError</code> with <code>errorstate=12</code> (“specified channel not found in transport stream”), and dispatch the corresponding DOM event.</p> <p>If, following this procedure, the OITF selects a tuner that was not already being used to display video inside the <code>video/broadcast</code> object, the OITF SHALL claim the selected tuner and the associated resources (e.g., decoding and rendering resources) on behalf of the <code>video/broadcast</code> object.</p> <p>If all of the following are true:</p> <ul style="list-style-type: none"> • the <code>video/broadcast</code> object is successfully switched to the new channel • the <code>channel</code> is a locally defined channel (created using the <code>createChannelObject</code>

	<p>method)</p> <ul style="list-style-type: none"> the new channel has the same tuning parameters as a channel already in the channel list in the OITF the <code>idType</code> is a value other than <code>ID_IPTV_URI</code> <p>then the result of this operation SHALL be the same as calling <code>setChannel</code> with the channel argument being the corresponding channel object in the channel list, such that:</p> <ul style="list-style-type: none"> the values of the properties of the <code>video/broadcast</code> object <code>currentChannel</code> SHALL be the same as those of the channel in the channel list any subsequent call to <code>nextChannel</code> or <code>prevChannel</code> SHALL switch the tuner to the next or previous channel in the favourite list or channel list as appropriate, as described in the definitions of these methods <p>Otherwise, if any of the above conditions is not true, then:</p> <ul style="list-style-type: none"> the values of the properties of the <code>video/broadcast</code> object <code>currentChannel</code> SHALL be the same as those provided in the channel argument to this method, updated as defined in section 8.4.3 the channel is not considered to be part of the channel list <p>the resulting current channel after any subsequent call to <code>nextChannel ()</code> or <code>prevChannel ()</code> is implementation dependent, however all appropriate functions SHALL be called and DOM events dispatched. The OITF SHALL visualize the video content received over the tuner in the area of the browser allocated for the <code>video/broadcast</code> object. If the OITF cannot visualize the video content following a successful tuner switch (e.g., because the channel is under parental lock), the OITF SHALL trigger the function specified by the <code>onChannelChangeError</code> property with the appropriate <code>channel</code> and <code>errorState</code> value, and dispatch a corresponding DOM event (see below). If successful, the OITF SHALL trigger the function specified by the <code>onChannelChangeSucceeded</code> property with the given <code>channel</code> value, and also dispatch a corresponding DOM event.</p>	
Arguments	<p><i>channel</i></p>	<p>The channel to which a switched is requested.</p> <p>If the <code>channel</code> object specifies a <code>ccid</code>, the <code>ccid</code> identifies the channel to be set. If the channel does not specify a <code>ccid</code>, the <code>idType</code> determines which properties of the channel are used to define the channel to be set, for example, if the channel is of type <code>ID_IPTV_SDS</code>, <code>ID_IPTV OSDT</code> or <code>ID_IPTV_URI</code>, the <code>ipBroadcastID</code> identifies the channel to be set.</p> <p>If null, the <code>video/broadcast</code> object SHALL transition to the unrealized state and release any resources used for decoding video and/or audio. A <code>ChannelChangeSucceeded</code> event SHALL be generated when the operation has completed.</p>
	<p><i>trickplay</i></p>	<p>Optional flag indicating whether resources SHOULD be allocated to support trick play. This argument provides a hint to the receiver in order that it may allocate appropriate resources. Failure to allocate appropriate resources, due to a resource conflict, a lack of trickplay support, or due to the OITF ignoring this hint, SHALL have no effect on the success or failure of this method. If trickplay is not supported, this SHALL be indicated</p>

		<p>through the failure of later calls to methods invoking trickplay functionality.</p> <p>The <code>timeShiftMode</code> property defined in section 7.13.2.2 shall provide information as to type of trickplay resources that should be allocated.</p> <p>If argument <code>contentAccessDescriptorURL</code> is included then the <code>trickplay</code> argument SHALL be included.</p>
	<code>contentAccessDescriptorURL</code>	Optional argument containing a Content Access Streaming descriptor (the format of which is defined in Annex E.2) that can be included to provide additional information for dealing with IPTV broadcasts that are (partially) DRM-protected. The argument SHALL be <code>undefined</code> or <code>null</code> if it is not applicable.

Apply following changes (underlined (new) or struck (removed)) in section 7.13.9 The `ChannelConfig` class

<p>Elements <code><video_broadcast type="ID_IPTV_SDS"></code> and/or <code><video_broadcast type="ID_IPTV OSDT"></code> are is set as defined in section 9.3.6</p>		<code>createChannelList()</code>
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Add the following method to section 7.13.9.2: *Methods*

ChannelList <code>createChannelListFromUri(Integer idType, String uri)</code>	
Creates a <code>ChannelList</code> object by retrieving and parsing either an SD&S Broadcast Discovery Record or an OSDT file from the specified URI. Channels in the returned channel list SHALL be included in the channel list that can be retrieved via calls to <code>getChannelConfig()</code> .	
<i>idType</i>	Type of record <code>uri</code> is pointing to. If the <code>idType</code> is equal to <code>ID_IPTV_SDS</code> , the file retrieved from <code>uri</code> is parsed as a SD&S Broadcast Discovery Record. If <code>idType</code> is equal to <code>ID_IPTV OSDT</code> , the file retrieved from <code>uri</code> is parsed as an OSDT file.
<i>uri</i>	Resource locator in form of a URI. If the string starts with 'http://' or 'https://', the OITF SHALL retrieve the resource via HTTP GET. If the string does not start with 'http://' or 'https://', this method SHALL return <code>null</code> . If the <code>idType</code> is equal to <code>ID_IPTV_SDS</code> , the retrieved file SHALL be parsed as an SD&S Broadcast Discovery Record. If the <code>idType</code> is equal to <code>ID_IPTV OSDT</code> , the retrieved file SHALL be parsed as XML-encoded OSDT. If the retrieved file is not a valid SD&S Broadcast Discovery Record or OSDT, this method SHALL return <code>null</code> .

Add the following row the table in section 7.13.11.1 *Constants*

<code>ID_IPTV OSDT</code>	42	Used in the <code>idType</code> property to indicate an IP broadcast channel identified through CI+ 1.4 OSDT by a DVB textual service identifier specified in the format "ServiceName.DomainName" as value for property <code>ipBroadcastID</code> with <code>ServiceName</code> and <code>DomainName</code> as defined in [CI+1.4].
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Apply following changes (underlined (new) or ~~struck (removed)~~) to section 7.13.11.2: Properties

readonly Integer majorChannel
The major channel number, if assigned. Value undefined otherwise. Typically used for channels of type ID_ATSC_* or for channels of type ID_DVB_*, <u>ID_IDTV_OSDT</u> or ID_IPTV_SDS in markets where logical channel numbers are used.

Add the following text and table to section 8.4.3: Channel

For channels of type ID_IPTV_OSDT:

Property name	Source	Comment
channelType	Assigned by the terminal.	Assigned by the OITF based on the value signalled in OSDT/IPServiceList/IPService/ServiceType. Otherwise, or if not known, set to undefined .
idType	Assigned by the terminal or by the application.	Assigned by the OITF to ID_IPTV_OSDT if the channel was discovered using an OSDT file, or assigned by the application using the value passed in the createChannelObject() method.
ccid	Assigned by the terminal.	Unique identifier for the channel
tunerID	Assigned by the terminal.	Unique identifier for the tuner if relevant or set to undefined
onid	Assigned by the terminal.	Assigned by the OITF to the value signalled in OSDT/IPServiceList/IPService/DVBTriplet@OrigNetId
nid	Assigned by the terminal.	Implementation dependent.
tsid	Assigned by the terminal.	Assigned by the OITF to the value signalled in OSDT/IPServiceList/IPService/DVBTriplet@TsId
sid	Assigned by the terminal.	Assigned by the OITF to the value signalled in OSDT/IPServiceList/IPService/DVBTriplet@ServiceId
sourceID	Assigned by the terminal.	Takes the value undefined
freq	Assigned by the terminal.	Takes the value undefined
cni	Assigned by the terminal.	Takes the value undefined
name	Assigned by the terminal.	Assigned by the OITF from OSDT/IPServiceList/IPService/ServiceName
majorChannel	Assigned by the terminal.	Assigned by the OITF from OSDT/IPServiceList/IPService/LCN/LCN

Property name	Source	Comment
minorChannel	Assigned by the terminal.	Takes the value <code>undefi ned</code>
dsd	Assigned by the terminal.	Takes the value <code>undefi ned</code>
favourite	Assigned by the terminal.	
favIDs	Assigned by the terminal.	
locked	Assigned by the terminal.	
manualBlock	Assigned by the terminal.	
ipBroadcastID	Assigned by the terminal or by the application.	Assigned by the OITF from OSDT/IPServiceList/IPService/ServiceName
channelMaxBitRate	Assigned by the terminal.	Takes the value <code>undefi ned</code>
channelTTR	Assigned by the terminal.	Takes the value <code>undefi ned</code>
recordable	Assigned by the terminal.	Takes the value <code>undefi ned</code>
longName	Assigned by the terminal.	Assigned by the OITF from OSDT/IPServiceList/IPService/ServiceName
description	Assigned by the terminal.	Takes the value <code>undefi ned</code>
authorized	Assigned by the terminal.	Assigned by the OITF to the value signalled in OSDT/IPServiceList/IPService/LCN/Subscribed
genre	Assigned by the terminal.	Assigned by the OITF to the value signalled in OSDT/IPServiceList/IPService/ServiceGenre
hidden	Assigned by the terminal or by the application.	Assigned by the OITF to the value signalled in OSDT/IPServiceList/IPService/LCN/Visible
logoURL	Assigned by the terminal.	If the OSDT/IPServiceType includes a BCG offering, set by the OITF to the value of the first Logo element that is a child of the BCG ServiceInformation element describing the channel, when this element specifies the URL of an image. Otherwise, takes the value <code>undefi ned</code>
isHD	Assigned by the terminal.	Assigned by the OITF depending on the values in OSDT/IPServiceList/IPService/ContentAttributes/VideoAttributes

Property name	Source	Comment
		Otherwise, or if not known, set to undefined.
i s3D	Assigned by the terminal.	Assigned by the OITF depending on the values in OSDT/IPServiceList/IPService/ContentAttributes/VideoAttributes Otherwise, or if not known, set to undefined.

Add the following row the table in section 9.2 Default UI profiles

" +IPTV_0SDT"	<video_broadcast type="ID_IPTV_0SDT" scaling="arbitrary">true</video_broadcast>
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4.6 Procedural Application Environment

No changes to this functionality are required for this Feature Package.

4.7 Authentication, Content Protection and Service Protection

No changes to this functionality are required for this Feature Package.

5 Implementation Guideline

For document management purposes, the implementation guideline is described in a separate document [GUIDELINE].