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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

IPTV multimedia services and applications for IPTV –
IPTV service discovery up to consumption

## Mechanisms for service discovery and selection for IPTV services

Recommendation ITU-T H.770

## ITU-T H-SERIES RECOMMENDATIONS

## AUDIOVISUAL AND MULTIMEDIA SYSTEMS

# Recommendation ITU-T H.770

# Mechanisms for service discovery and selection for IPTV services

**Summary**

Recommendation ITU-T H.770 describes the mechanisms for service provider discovery, service discovery and selection for IPTV services. The mechanisms enable IPTV terminal devices to provide the end-users with effective ways for consuming IPTV services. The expected types of IPTV services using service discovery information include linear TV and video-on-demand, etc.

This Recommendation identifies service discovery metadata elements and attributes providing information concerning service providers and contents/services, and its delivery protocols covering both unicast and multicast transport mechanisms.

Amendment 1 (11/2009) adds descriptive texts concerning service provider discovery to Appendix I and corrects errors identified in Appendix II.

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## 1        Scope

Recommendation ITU-T H.770 describes the mechanisms for service provider discovery, service discovery and selection for IPTV services. The mechanisms enable IPTV terminal devices to provide the end-users with effective ways to discover and select IPTV services. The expected types of IPTV services using service discovery information include linear TV and video-on-demand, etc.

This Recommendation identifies service discovery metadata elements and attributes providing information concerning service providers and contents/services, and its delivery protocols covering both unicast and multicast transport mechanisms.

## 2        References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.222.0]        Recommendation ITU-T H.222.0 (2006) | ISO/IEC 13818-1:2007, *Information technology – Generic coding of moving pictures and associated audio information: Systems*.

[ITU-T H.610]        Recommendation ITU-T H.610 (2003), *Full service VDSL – System architecture and customer premises equipment*.

[ITU-T H.701]        Recommendation ITU-T H.701 (2009), *Content delivery error recovery for IPTV services*.

[ITU-T H.721]        Recommendation ITU-T H.721 (2009), *IPTV terminal devices: Basic model*.

[ITU-T H.750]        Recommendation ITU-T H.750 (2008), *High-level specification of metadata for IPTV services*.

[ITU-T X.891]        Recommendation ITU-T X.891 (2005) | ISO/IEC 24824-1:2007, *Information technology – Generic applications of ASN.1: Fast infoset*.

[ITU-T Y.1910]        Recommendation ITU-T Y.1910 (2008), *IPTV functional architecture*.

[ATIS-0800022]        ATIS standard ATIS-0800022 (2008), *IPTV Consumer Domain Decide Configuration Metadata*.

[ETSI EN 300 468]  ETSI EN 300 468 V1.10.1 (2009), *Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems*.

[ETSI TS 101 154]  ETSI TS 101 154 V1.9.1 (2009), *Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream*.

[ETSI TS 102 034]  ETSI TS 102 034 V1.4.1 (2009), *Digital Video Broadcasting (DVB); Transport of MPEG 2 TS Based DVB Services over IP Based Networks*.

[ETSI TS 102 472]  ETSI TS 102 472 V1.3.1 (2009), *Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Content Delivery Protocols*.

[IETF RFC 768]     IETF RFC 768 (1980), *User Datagram Protocol (UDP)*.

[IETF RFC 959]     IETF RFC 959 (1985), *File Transfer Protocol (FTP)*.

[IETF RFC 2236]    IETF RFC 2236 (1997), *Internet Group Management Protocol, Version 2*.

[IETF RFC 2250]    IETF RFC 2250 (1998), *RTP Payload Format for MPEG1/MPEG2 Video*.

[IETF RFC 2616]    IETF RFC 2616 (1999), *Hypertext Transfer Protocol – HTTP/1.1*.

[IETF RFC 2818]    IETF RFC 2818 (2000), *HTTP over TLS*.

[IETF RFC 3376]    IETF RFC 3376 (2002), *Internet Group Management Protocol, Version 3*.

[IETF RFC 3550]    IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications*.

[IETF RFC 3810]    IETF RFC 3810 (2004), *Multicast Listener Discovery Version 2 (MLDv2) for IPv6*.

[ISO/IEC 23001-1]  ISO/IEC 23001-1 (2006), *Information technology – MPEG systems technologies – Part 1: Binary MPEG format for XML*.

[W3C XML]          World Wide Web Consortium (W3C) Recommendation XML1.1 (2008), *Extensible mark-up language (XML) 1.0, Fifth Edition*.

# 3      Definitions

## 3.1      Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

**3.1.1    broadcast** [b-ITU-T M.60]: One-way transmission from one point to two or more other points.

**3.1.2    content** [b-ITU-T T.174]: Encoded generic value, media or non-media data.

**3.1.3    electronic content guide (ECG)** [ITU-T H.721]: A service navigation application used especially for streamed and downloaded content. ECG deals with metadata unlike service information used in terrestrial broadcasting.

**3.1.4    electronic program guide (EPG)** [b-ITU-T Y.1901]: A structured set of data, intended to provide information on available content that may be accessed by end-users.

**3.1.5    end-user** [ITU-T Y.1910]: The actual user of the products or services.

NOTE – The end-user consumes the product or service. An end-user can optionally be a subscriber.

**3.1.6    EPG provider** [b-ITU-T J.90]: The entity that collects, collates and assembles the elements of information that constitute the EPG database.

**3.1.7    home network (HN)** [b-ITU-T H.622]: Home network is the collection of elements that process, manage, transport and store information, thus enabling the connection and integration of multiple computing, control, monitoring, communication and entertainment devices in the home.

**3.1.8    Internet protocol television (IPTV)** [b-ITU-T Y.1901]: Multimedia services such as television, video, audio, text, graphics, data delivered over IP-based networks managed to support the required level of QoS/QoE, security, interactivity and reliability.

**3.1.9    IPTV terminal device** [b-ITU-T Y.1901]: A terminal device which has ITF functionality, e.g., a STB.

**3.1.10   IPTV terminal function (ITF)** [b-ITU-T Y.1901]: The end-user function(s) associated with a) receiving and responding to network control channel messages regarding session set-up,

maintenance, and teardown, and b) receiving the content of an IP transport from the network and rendering.

**3.1.11 linear TV** [b-ITU-T Y.1901]: A television service in which a continuous stream flows in real time from the service provider to the terminal device and where the user cannot control the temporal order in which contents are viewed.

**3.1.12 metadata** [b-ITU-T Y.1901]: Structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment, and management of the described entities.

NOTE – EPG metadata has many applications and may vary in depth from merely identifying the content package title or information to populate an EPG to providing a complete index of different scenes in a movie or providing business rules detailing how the content package may be displayed, copied, or sold.

**3.1.13 middleware** [b-ITU-T Y.1901]: A layer of software between applications and resources, which consists of a set of service enablers that allow multiple functionalities running on one or more devices in an IPTV system to interact across a network.

**3.1.14 multimedia** [b-ITU-T J.148]: The combination of multiple forms of media such as audio, video, text, graphics, fax, and telephony in the communication of information.

**3.1.15 network provider** [ITU-T Y.1910]: The organization that maintains and operates the network components required for IPTV functionality.

NOTE 1 – A network provider can optionally also act as service provider.

NOTE 2 – Although considered as two separate entities, the service provider and the network provider can optionally be one organizational entity.

**3.1.16 package** [b-ITU-T Y.1901]: A collection of content components that in some combination (either all or a subset) together provide an end-user experience and are intended to be used together.

NOTE – A package can be instantiated with or without audiovisual content depending on scenarios, in which audiovisual content and package can be tightly associated or can be loosely coupled enough to be handled (generation, delivery, consumption) independently.

**3.1.17 portal** [ITU-T H.721]: A portal presents information from diverse sources in a unified manner and provides a way to attach the communication services.

**3.1.18 program specific information (PSI)** [ITU-T H.222.0]: PSI consists of normative data which is necessary for the demultiplexing of Transport Streams and the successful regeneration of programs and is described in clause 2.4.4 of [ITU-T H.222.0]. An example of privately defined PSI data is the non-mandatory network information table.

**3.1.19 service and content protection (SCP)** [b-ITU-T Y.1901]: A combination of service protection and content protection.

**3.1.20 service** [b-ITU-T Y.101]: A structured set of capabilities intended to support applications.

**3.1.21 service information (SI)** [ETSI EN 300 468]: Digital data describing the delivery system, content and scheduling/timing of broadcast data streams, etc.

NOTE – It includes MPEG-2 PSI together with independently defined extensions.

**3.1.22 service navigation** [b-ITU-T H.720]: The presentation of information that allows the end-user to discover, select and consume services.

**3.1.23 service provider** [b-ITU-T M.1400]: A general reference to an operator that provides telecommunication services to customers and other users either on a tariff or contract basis. A service provider may or may not operate a network. A service provider may or may not be a customer of another service provider.

**3.1.24 set-top box (STB)** [b-ITU-T J.183]: A device that contains demodulator, de-multiplexer, decoder, other functionalities and interfaces related to signal reception and presentation of the distributed programme at the subscriber's site.

**3.1.25 stream** [b-ITU-T J.200]: A unidirectional continuous flow of content.

**3.1.26 subscriber** [b-ITU-T M.3050.1]: The subscriber is responsible for concluding contracts for the services subscribed to and for paying for these services.

**3.1.27 telecommunication service** [b-ITU-T F.700]: Set of telecommunication capabilities that work in a complementary and cooperative way in order to let users perform applications.

**3.1.28 terminal device (TD)** [b-ITU-T Y.1901]: An end-user device which typically presents and/or processes the content, such as a personal computer, a computer peripheral, a mobile device, a TV set, a monitor, a VoIP Terminal or an audiovisual media player.

**3.1.29 user device** [b-ATIS-0800002]: Also known as home network end-device (HNED), home network device (HND), consumer equipment (CE), terminal and physical device. A piece of hardware equipment running its software and attached to a home network and being identified by a GUID, e.g., a MAC address. A single device can be used by one or more users.

**3.1.30 video on demand (VoD)** [b-ITU-T Y.1901]: A service in which the end-user can, on demand, select and view a video content and where the end-user can control the temporal order in which the video content is viewed (e.g., the ability to start the viewing, pause, fast forward, rewind, etc.).

NOTE – The viewing may occur some time after the selection of the video content.

## 3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

**3.2.1 application**: A functional implementation realized as software running in one or spread over several interplaying hardware entities.

**3.2.2 SCP provider**: A service provider that offers service and content protection (SCP) functionalities to the other service providers.

**3.2.3 service platform**: A set of functions that facilitate telecommunication services provided by service providers.

NOTE – In the context of IPTV services, examples of service platform functions are service authentication, content aggregation and content delivery.

## 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

| | |
|---|---|
| AV | Audio Video |
| ASN.1 | Abstract Syntax Notation One |
| BCG | Broadband Content Guide |
| BiM | Binary MPEG format for XML |
| CAS | Conditional Access System |
| DRM | Digital Rights Management |
| DVBSTP | DVB SD&S Transport Protocol |
| ECG | Electronic Content Guide |
| EPG | Electronic Program Guide |

| | |
|---|---|
| FQDN | Fully Qualified Domain Name |
| HN | Home Network |
| HNED | Home Network End-Device |
| HTML | Hyper Text Mark-up Language |
| HTTP | Hyper Text Transport Protocol |
| ID | IDentifier |
| IGMP | Internet Group Management Protocol |
| IP | Internet Protocol |
| IPG | Interactive Program Guide |
| MAC | Media Access Control |
| MLD | Multicast Listener Discovery |
| MPEG | Moving Picture Experts Group |
| PER | Packed Encoding Rules |
| PSI | Program Specific Information |
| PSIP | Program and System Information Protocol |
| SADS | Service and Application Discovery and Selection |
| SCP | Service and Content Protection |
| SI | Service Information |
| SOAP | Simple Object Access Protocol |
| SP | Service Provider |
| TS | Transport Stream |
| UDP | User Datagram Protocol |
| URI | Uniform Resource Identifier |
| URL | Uniform Resource Locator |
| VoD | Video on Demand |
| XML | eXtensible Mark-up Language |

## 5      Introduction

Service discovery includes a number of steps toward content acquisition, as illustrated in Figure 5-1. The acquisition of the entry point data to start the service discovery process, which is assumed to be architecture-specific, is not part of this Recommendation.
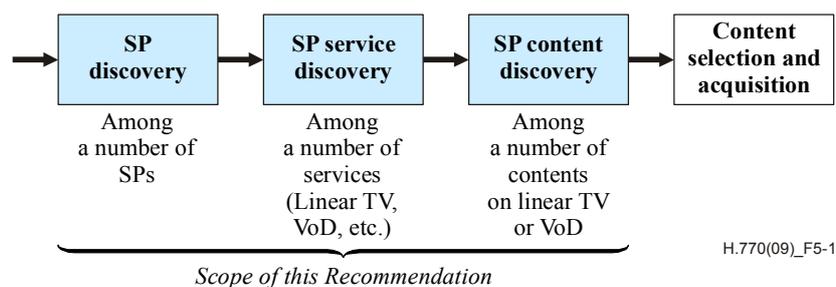
NOTE – SP discovery: Discovery of the service providers available on the network.
  – SP service discovery: Discovery of the services offered by a specific or all service providers.
  – SP content discovery: Discovery of the individual services or contents from a specific service provider.
  – Content selection and acquisition: At the end of the navigation through the offered services and contents, the end-user selects a service or content and acquires it. This step is not part of this Recommendation.
  – End-users and/or devices may be authenticated before service provider attachment or service attachment as part of the security provisions [b_ATIS-0800017].

**Figure 5-1 – From service provider discovery to content acquisition**

Each IPTV architecture has its own way to make the starting entry point(s) available to the IPTV terminal device.

A starting entry point might be:

–       An IPTV service provider description provider entry point (when there are several IPTV service providers on the network and no specific service provider entry point is provided in the IPTV terminal device configuration data).

        NOTE 1 – IPTV service provider description provider is an organization providing service provider information.

–       An IPTV service provider entry point (when there is only one IPTV service provider on the network or when a specific service provider entry point is provided in the IPTV terminal device configuration data). The IPTV service provider may be running a web-based solution, a metadata-based solution or both of them.

–       One of the following:

    •    a multicast address for delivering the entry point information described above;

    •    location of service and application discovery and selection (SADS) functions (i.e., FQDN or unicast IP address). The SADS functional block provides for the discovery and selection of IPTV services and applications [ITU-T Y.1910].

The descriptions of the different steps for service discovery are described below. These are independent of any specific IPTV architecture.
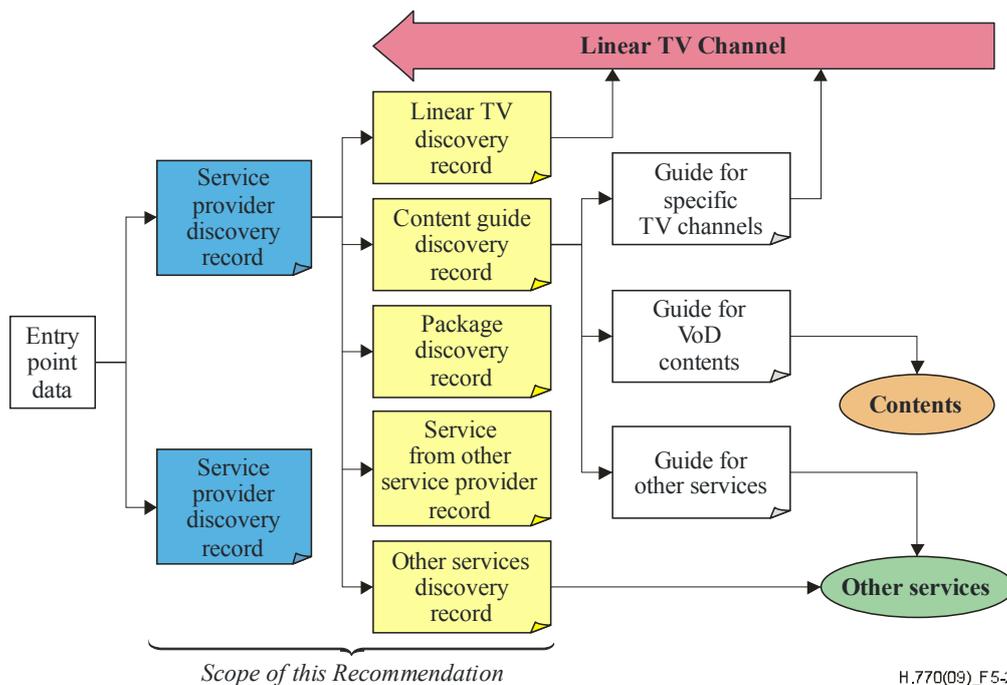
**Figure 5-2 – From entry point data to service/content acquisition**

NOTE 2 – Details of each record are explained in clauses 7 and 10.

There are several solutions for the IPTV terminal device to obtain the "entry point data", but this is part of network signalling and therefore is not included here.

Figure 5-2 indicates the boundary between what is outside and inside the scope of this Recommendation.

In addition, exchange of service discovery information between the SADS functional block and IPTV terminal devices can be performed in push mode or pull mode [ITU-T Y.1910], or a mix of both, as follows:

– Push mode: the SADS functional block actively sends the service and application discovery information to the IPTV terminal devices.

– Pull mode: the IPTV terminal devices repeatedly request the service and application discovery information from the SADS functional block.

## 6 Service provider discovery process

The first step is to discover the IPTV service providers.

In the case where there is only one IPTV service provider or if the user is directly registered with one particular service provider, this first step is simpler.

In the case where there are several service providers and there is no preconfigured service provider, it is necessary to provide the end-user device with one or more starting entry point(s) from where to obtain the description of the service providers available on the network, and there are different solutions, depending on the IPTV architecture, to obtain these entry points.
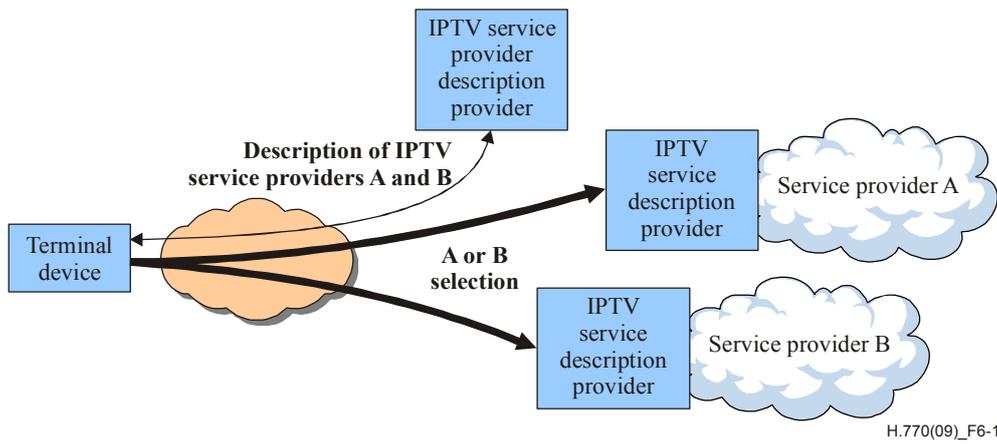
**Figure 6-1 – Service provider discovery with a central IPTV
service provider description provider**

NOTE – IPTV service description provider is an organization providing information about IPTV services (e.g., EPG provider).

In the previous configuration, there is one entry point which allows acquiring information about available service providers; this is the "IPTV service provider description provider" entry point.

An alternative solution without a central "IPTV service provider description provider" is also possible as described in Figure 6-2.
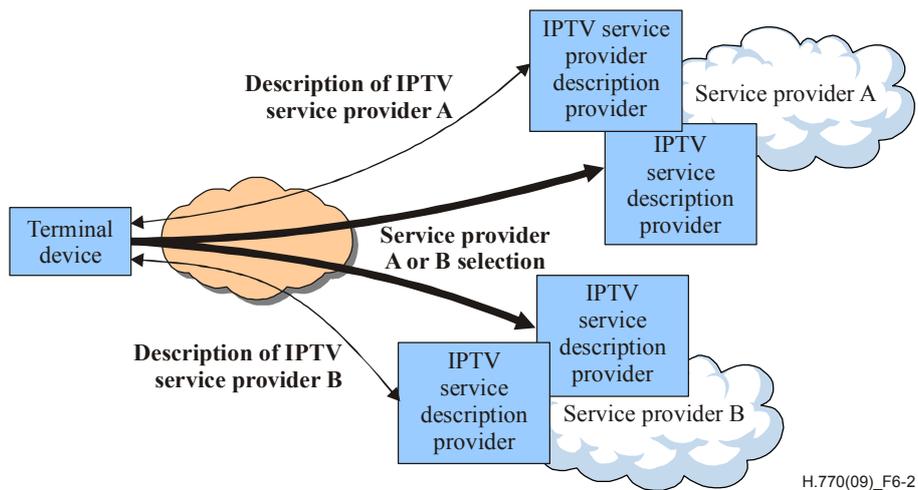


**Figure 6-2 – Service provider discovery without a central
service provider description provider**

## 7      Service provider information

### 7.1      Service provider information record

This clause specifies the first level of information about service providers.

The information related to a service provider is called a "service provider information" record.

The service provider information record contains the first level description of a service provider.

Several service provider information records can be grouped together if there are several service providers to be described.

Table 7.1-1 lists the elements/attributes identified for the service provider information record.

Mandatory elements and attributes are shown as "M", optional ones are shown as "O", conditional requirements are shown as "C".

**Table 7.1-1 – Service provider information record**

| Element/ Attribute | Description | M/O/C | Example(s) of values |
|---|---|---|---|
| Record type | Type of this set of data (See Table 7.1-4). | M | Service provider information |
| Record version | Version of this record. It is incremented with any change to the service provider information record. | M | 1 |
| Individual service provider information (one per service provider) | Complex element containing basic information about service providers (see Table 7.1-2). Several individual service provider information entries are possible, each of them for a specific service provider. | M | – |

The elements/attributes described in Table 7.1-2 have been identified to be part of the "individual service provider information".

**Table 7.1-2 – Individual service provider information elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) of values |
|---|---|---|---|
| Service provider identifier | The unique identifier given to the service provider (e.g., an Internet DNS domain name, an URI, etc.). | M | itu-t.int <scheme>://<authority>/ |
| Individual service provider information version | Version of this set of individual service provider information elements. It is incremented with any change to the set of individual service provider information elements. | M | 1 |
| Service provider logo URI | Pointer to a service provider logo for potential display. | O | <scheme>://<authority>/<path> |
| Service provider name | Usual name of the service provider for display. Several names are possible, each of them in a specific language. | O | GTN |
| Service provider description | Textual description of the service provider for potential display. Several textual descriptions are possible, each of them in a specific language. | O | Geneva Telecommunication News |
| Web portal URL | URL for the portal to discover the service details using a Web-based solution. This portal may provide the direct path to several detailed IPTV services. | O | <scheme>://<authority> [:<port>]/<path> |

**Table 7.1-2 – Individual service provider information elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) of values |
|---|---|---|---|
| Service offer summary (one per offering) | Complex element containing basic information about services offered by the service provider (see Table 7.1-3). Several service offer summary entries are possible, each of them for a specific service. | M | – |

The elements/attributes described in Table 7.1-3 have been identified to be part of the "service offer summary".

**Table 7.1-3 – Service offer summary elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Push address | Multicast location of the "detailed service offer" record described in clause 10. For details of address description, see Table 10.1-3 (e.g., Port number, IP address, Source). | C (Note 1) | – |
| Pull URL | Unicast location of the "detailed service offer" records described in clause 10. | C (Note 1) | &lt;scheme&gt;://&lt;authority&gt; [:&lt;port&gt;]/&lt;path&gt; |
| Web portal URL | URL for the portal to discover the service details using a Web-based solution. This portal may provide the direct path to several detailed IPTV services. | C (Note 1) | &lt;scheme&gt;://&lt;authority&gt; [:&lt;port&gt;]/&lt;path&gt; |
| Offer type | Type of service discovery offered by a service provider. | O | Linear TV discovery |
| Segment identifier and version (Note 2) | Identification of a segment containing the "detailed service offer" (or a part of it) with the indication of the latest version. Several segment identifiers and versions are possible if the detailed service offer is spread over several segments for transmission. | O | &lt;id&gt;.&lt;version&gt; |

NOTE 1 – At least one of them is required to be presented.

NOTE 2 – Segments are small divided units of 'detailed service offer' information records. The service discovery information records may be of a substantial size, but only parts of them are needed by an IPTV terminal device at any one time. Also, changes to the records may be localized to part of the records. Segments are defined in the context of a single record type of service discovery information in Table 7.1-4 [ETSI TS 102 034].

Classification of metadata records are specified by using "record type". Table 7.1-4 lists the record types a service provider may offer.

**Table 7.1-4 – Details of record type**

| Record Types | | Reference |
|---|---|---|
| Service provider information | | In this clause |
| Linear TV discovery | | See clause 10.1 |
| Package discovery | | See clause 10.2 |
| Content guide discovery | | See clause 10.3 |
| Service from other service provider discovery | | See clause 10.4 |
| Other services discovery | E-book | See clause 10.5 |
| | SMS messaging | |
| | Email | |
| NOTE – "Other services discovery" entries are not limited to those listed in this table. | | |

Figure 7-1 contains a graphical representation of an implementation example of the service provider information records.



Record type, version
Service provider ID, logo, description, etc.
Service offer summary: Linear TV
Service offer summary: Package
, etc.
, etc.
Service offer summary: Content guide
Service offer summary: Package
dc
Service offer summary: Other Services

H.770(09)_F7-1
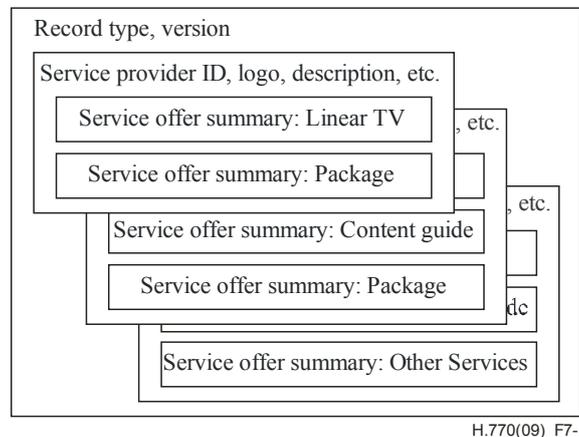
**Figure 7-1 – Graphical representation of the service
provider information record**

Relevant standards are:

– Clause 5.2.5 of [ETSI TS 102 034] specifies the service provider discovery information.

– Clause 8 of [ATIS 0800022] also specifies the service provider discovery information.

### 7.2 Service role information

A single organization may play various roles. Supplementary elements may be appended to service provider information or to other elements for identifying these roles and for finding service groupings.

Service role information is necessary for cases such as the following:

– When a network provider and a service provider are separate organizational entities as shown in Figure 6-1 of [ITU-T Y.1910];

– When SCP functions [ITU-T Y.1910] are provided by an entity other than the service provider or the network provider.

While Appendix I shows possible examples using such service role information, the details of service role information are for further study.

## 7.3 Encoding of service provider information

The format and encoding of the service provider information record in this clause are:

–    Service provider information is encoded in XML [W3C XML].

–    Service provider information can optionally be compressed by using Fast Infoset [ITU-T X.891], ZLIB including GZIP format [ETSI TS 102 472] or BiM [ISO/IEC 23001-1].

## 8 Service provider information delivery protocol(s)

The recommended transport mechanisms for the delivery of the descriptions of IPTV service providers over IP are as follows:

–    HTTP version 1.1 [IETF RFC 2616] for "Service Provider Information" delivery over unicast (pull mode);

–    HTTP over TLS [IETF RFC 2818] for "Service Provider Information" delivery over unicast with secure manner (pull mode);

–    IGMP version 2 [IETF RFC 2236] for "Service Provider Information" delivery over IPv4 multicast (push mode);

–    IGMP version 3 [IETF RFC 3376] for "Service Provider Information" delivery over IPv4 multicast (push mode);

–    MLD version 2 [IETF RFC 3810] for "Service Provider Information" delivery over IPv6 multicast (push mode);

–    FLUTE [ETSI TS 102 472] for "Service Provider Information" delivery over IPv4/IPv6 multicast ("push mode");

–    DVBSTP [ETSI TS 102 034]: a light protocol specified by DVB, used for delivery over multicast (push mode).
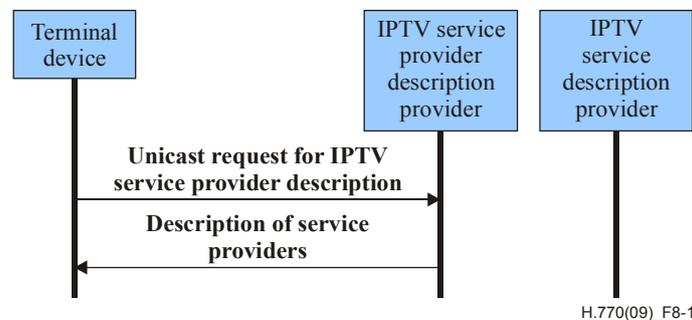


**Figure 8-1 – Unicast request to get the description of
the available IPTV service providers**

In the case of Figure 8-1, the service provider description provider may answer with a set of metadata containing the description of the available service providers.
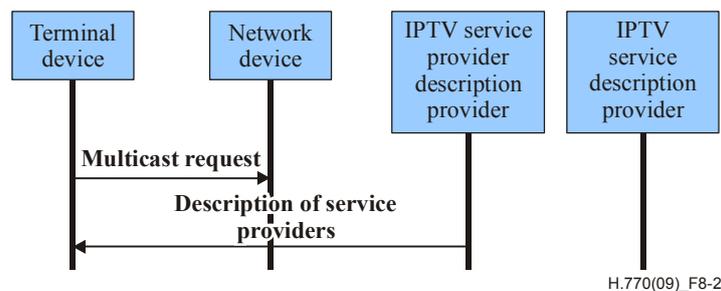
**Figure 8-2 – Multicast request to receive the description of
the available IPTV service providers**

In the case of Figure 8-2, the service provider description provider periodically sends the set of metadata containing the description of the available service providers.

# 9 Service discovery process

In the service provider information, the IPTV terminal device discovers all service providers available on the network.

If a specific service provider is already configured in the IPTV terminal device, the IPTV terminal device can proceed with a request to the service provider for the description of all services offered by this service provider.

If no specific service provider is already configured in the IPTV terminal device and if several service providers are available, the IPTV terminal device may display information about the available service providers extracted from the service provider information to allow the user to select one of them.

When the IPTV terminal device knows the service provider to which the end-user wants to connect, it can proceed with a request to the service provider for the description of all services offered by this service provider.

The access point for this request can be found in the service provider information.

# 10 Detailed service offer information

This clause specifies the elements and attributes which could be or must be included in the description of the services offered by a service provider.

A number of service types which could be offered by service providers have been identified and for each of them, metadata has been defined.

Here is the list of the specified service offers:

– linear TV discovery record,
– package (service collection) discovery record,
– content guide discovery record,
– service from other service providers discovery record,
– other services discovery record.

## 10.1 Linear TV discovery

The linear TV discovery record provides the necessary information to find available linear TV services.

With this record, linear TV delivered over MPEG-2 transport stream (TS) can have "service information (SI)" embedded. The SI obtains important information for the process of the service discovery, especially in traditional broadcasting services (e.g., used in up/down channel changing, channel selection by channel numbers, or display of EPG). Information about individual services is acquired afterwards from the transport stream itself one by one through classical use of SI. When SI is embedded in TS, IPTV terminal devices need to connect to all services and parse all SI to build a service list [b-ETSI TS 102 542]. For details of the usage of TS with SI, see Appendix IV.

Table 10.1-1 lists the elements/attributes identified for the linear TV discovery record and Table 10.1-2 lists elements/attributes identified for the "linear TV service(s)" of Table 10.1-1.

**Table 10.1-1 – Linear TV discovery record**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Record type | Type of this set of data. | M | Linear TV discovery record type |
| Service provider identifier | The unique identifier given to the service provider (e.g., an Internet DNS domain name, an URI, etc.). | M | itu-t.int<scheme>:// <authority>/ |
| Record version | Version of this record. It is incremented with any change to this record. | M | 1 |
| Metadata server URL | URL for the metadata server of the current service (Note). | O | <scheme>://<server_name> [:<port>]/<path>/ |
| Portal URL | URL for the portal of the current service. | O | <scheme>://<server_name> [:<port>]/<path>/ |
| Purchase information URL | URL for the server that provides the purchasing information for this service. For security reasons, the scheme could be "https". | O | <scheme>://<server_name> [:<port>]/<path> |
| Linear TV service(s) | For detailed information on individual linear TV services, see Table 10.1-2. | M | – |
| NOTE – A request on the "Metadata server URL" shall return a record compliant with a schema that will be specified in a later revision of this Recommendation. | | | |

**Table 10.1-2 – Linear TV services elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Service identifier | A unique name for the service within the service provider's domain. | M | Channel 1 |
| Original network Id | Network Id of the originating delivery system. NOTE – Each linear TV service can be identified by the combination of original network Id, transport stream Id and service Id [ETSI TS 102 034]. | O | 0 |
| Transport stream Id | Identification of the transport stream. | O | 200 |

**Table 10.1-2 – Linear TV services elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Service Id | Service identification within the TS. The service Id is the same as the program number in the corresponding program map table. | O | 231 |
| Max bit rate | Maximum bit rates (in kbits/s) of the overall stream carrying the service. | O | 4000 |
| Service location(s) | A number of linear TV service locations. At least one is required to be present. For a detailed description, see Table 10.1-3. | M | – |
| Audio coding | Details of the audio coding algorithms and purpose that the service may use. | O | Audio MPEG-1 Layer II |
| Video coding | Details of the video coding that may be used by the service. | O | Video H.264 (AVC) |
| Service availability | It allows each service to have a list of 'cells' (regions) with which the service is associated. By default, all the single services are available everywhere. There shall be at most one service availability element for each country code (See Table 10.1-5). | O | – |
| Streaming type | RTP or direct UDP streaming. By default, RTP streaming is assumed. | O | RTP |
| Multiplex mode | MPEG-2 TS or Time-stamped MPEG-2 TS. By default, MPEG-2 TS streaming is assumed. NOTE – For detail information of time-stamped MPEG-2 TS, see Appendix I of [ITU-T H.721]. | O | MPEG-2 TS |

A service location is either a multicast or a unicast location.

Table 10.1-3 lists the "service location" elements/attributes identified for service location(s) of Table 10.1-2.

**Table 10.1-3 – Service location elements/attributes**

| Element/<br>Attribute | Description<br>(Note 1) | M/O/C | Example(s) |
|---|---|---|---|
| IP multicast address | IP multicast address at which the service may be accessed. | C<br>(Note 2) | 224.1.2.3 |
| IP multicast port | IP multicast port at which the service may be accessed. | C<br>(Note 2) | 5678 |
| IP multicast source | IP multicast address of the source of the service. | C<br>(Note 3) | 224.10.102.13 |
| Unicast URL | Unicast location to access the linear TV server. | C<br>(Note 2) | <scheme>://<server_name><br>[:<port>] |
| NOTE 1 – When multiple service locations are included in this record, end-users can access one of them (e.g., one location is a main delivery site, and the others are proxy sites).<br>NOTE 2 – Either multicast address and port or unicast URL is required, at least.<br>NOTE 3 – Source address is mandatory when IPv6 multicast is deployed. | | | |

Table 10.1-4 lists the FEC elements/attributes which can be used together with multicast service location(s) in Table 10.1-2. For details of FEC, see [ITU-T H.701].

**Table 10.1-4 – FEC elements/attributes**

| Element/<br>Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| FEC base layer multicast address | IP multicast address for FEC base layer. If the IP multicast address is omitted, then the FEC flow is assumed to be on the same multicast address as the original data. For details of addressing, see Table 10.1-3. | M | – |
| FEC enhancement layer multicast address | IP multicast address for FEC enhancement layer. If the IP multicast address is omitted, then the FEC flow is assumed to be on the same multicast address as the original data. For details of addressing, see Table 10.1-3. | O | – |
| Maximum packet number in blocks | Maximum number of stream source packets that will occur between the first packet of a source block (which is included) and the last packet for that source block (source or repair). | O | 8 |
| Maximum FEC block duration | Maximum transmission duration of any FEC block (source and repair packets). | O | 100 |
| FEC specific information | FEC object transmission information for the FEC enhancement layer. This information contains the maximum source block length and the encoding symbol size. If FEC enhancement layer element is included, then this element is required to be included. | C<br>(Note) | – |
| NOTE – This information is required when FEC enhancement layer is used. | | | |

Table 10.1-5 lists the elements/attributes identified for the "service availability" of Table 10.1-2.

**Table 10.1-5 – Service availability elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Country code | Country for which the availability is being defined. | O | Switzerland |
| Availability | Flag to indicate whether the service is available in the country specified by "Country Code". The default is true. When true, the service is available in the specified country with the exception of those regions identified by cells. When false, the service is not available in the specified country with the exception of those regions identified by cells. | O | False |
| Region codes | List of string identifiers representing geographical regions in the country identified by "Country Code". The cells listed represent the exception to the value supplied by the flag, i.e., the negation of the "Availability" flag applies to any listed cells. | O | Geneva |

Whereas a linear TV record can provide necessary information for linear TV discovery without SI in MPEG-2 TS, IPTV terminal devices can create a service list only with the received linear TV record. In this case, in order to provide information equivalent to SI, the following 'additional linear TV discovery elements/attributes' should be used.

**Table 10.1-6 – Additional linear TV discovery elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Type of service | It shall be coded as per the relevant SI standards. Examples are linear TV service, digital radio sound service, mosaic service, data broadcast service, etc. | M | Linear TV |
| Priority SI source | Source of service information to give priority (XML record or SI) in case SI tables are present within TS. The default value is XML. NOTE – Both SI and XML record can be optionally used at the same time without priority. | O | XML, SI, SI+XML |
| Service name | Service name for display in one or more languages. | O | Town scenery |
| Service description | Service description for potential display in one or more languages. | O | Video gallery of worldwide life style |

**Table 10.1-6 – Additional linear TV discovery elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Content guide discovery record identifier(s) | Identifier(s) of the content guide discovery record(s) that carries the information on this service. If this element is present, it shall be used in preference to the service description location. | O | Cgd.avd.0001 |
| Preferred content guide discovery record location(s) | Preferred content guide discovery record(s) location if any. | O | <scheme>:// <server_name>[:<port>]/ <path> |
| Service genre(s) | One or more genre of the service (not individual programmes). For example movie/drama channel or news/current affairs channel. | O | Sports, football/soccer |
| Announcement stream | Type of spoken announcements that are supported by the service (for example, emergency flash, road traffic flash, etc.). Furthermore, it informs about the transport method of the announcement and gives the necessary linkage information so that the announcement stream can be monitored. | O | – |
| Secondary service Id | Service replacement service Id which may be selected automatically by the IPTV terminal devices when the service being decoded fails. | O | itu-t.proxy.int |
| Mosaic information | Mosaic description element. It identifies the elementary cells of a mosaic service, groups different elementary cells to form logical cells, and establishes a link between the content of all or part of the logical cell and the corresponding service or package information. | O | – |

## 10.2    Package discovery record

The package discovery record provides a means for a collection of services to be marketed as, or grouped into, a single entity.

Table 10.2-1 lists the elements or attributes for this package discovery record.

**Table 10.2-1 – Package discovery record**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Record type | Type of this set of data. | M | Package discovery record type |
| Service provider identifier | The unique identifier given to the service provider (e.g., an Internet DNS domain name, an URI, etc.). | M | itu-t.int <scheme>:// <authority>/ |
| Record version | Version of this record. It is incremented with any change to this record. | M | 1 |
| Package identifier | Unique package identifier. This identifier is allocated by the service provider. | M | Pkg1011 |
| Displayable | A boolean value which indicates in combination with the package availability element, whether this package shall be presented to the user. The default value is true. | O | True |
| Package name | Package name for display in one or more languages. | O | AVD topics |
| Package description | Package description for display in one or more languages. | O | Hot technologies about audio, video and data |
| Preferred content guide discovery record identifier | If present and a value is set, this is an identifier of the preferred content guide discovery record that carries the information on this package. | O | Cgd.avd.0001 |
| Preferred content guide discovery record location | If present and a value is set, this value indicates preferred content guide discovery record location. | O | <schema>://<server_name> [:<port>]/<path> |
| Package reference(s) | Identifiers of package(s) included in the current package. A package may include other package(s). | O | Pkg.2009.1012 |
| Individual service(s) | List of services forming the package. For detail of service relevant elements, see Table 10.2-2. | M | – |
| Package availability | Package availability (support for regionalization). It allows each package to have a list of cells (regions) with which the package is associated. By default, the package is available everywhere. There shall be at most one Package availability element for each country code. Refer to service availability elements in Table 10.1-5. | O | – |

Table 10.2-2 lists the elements/attributes identified for each "individual service" of Table 10.2-1.

A service may belong to more than one package. A service does not have to be part of any package.

**Table 10.2-2 – Individual service elements/attributes**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Individual service provider identifier | Unique identifier for the service provider. If this is omitted, service provider identifier of Table 10.3-1 is used. | O | itu-t.avd.int |
| Service identifier | A unique name for the service within the service provider's domain | M | 0001.0002.0003 |
| Additional service description location | The URI of additional service description provided in the context of a package; this is not required to acquire a service. | O | <schema>://<server_name> [:<port>]/<path> |
| Logical channel number | The logical channel number of the service.<br>NOTE – The logical channel number provides a convenient way to select a service by assignment of a preferred number being different from a physical channel number. | O | 12 |

## 10.3    Content guide discovery record

Content guide in this clause refers to service navigation functionality for the end-users (e.g., ECG, BCG, IPG and EPG). The content guide discovery record provides a means to discover the locations of guides listing the content that is available, either live (e.g., through a linear TV offering) or via content on demand.

General aspects of metadata concerning the content guide are illustrated in [ITU-T H.750]. Details of the usage of elements and of attributes as the content guide are for further study.

NOTE – [b-ETSI TS 102 822-3-1] provides important information about content guide schemes. According to [b-ETSI TS 102 822-3-1], standardization organizations' work on content guide standardizations include [b-ETSI TS 102 323] [b-ATIS-0800020].

Several content guide discovery records can be grouped together if several guides are available.

Table 10.3-1 lists the elements/attributes identified for the content guide discovery record.

**Table 10.3-1 – Content guide discovery record**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Record type | Type of this set of data. | M | Content guide discovery record type |
| Service provider identifier | The unique identifier given to the service provider (e.g., an Internet DNS domain name, an URI, etc.). | M | itu-t.int <scheme>://<authority>/ |
| Record version | Version of this record. It is incremented with any change to this record. | O | 1 |
| Content guide discovery record identifier | The identifier of the content guide discovery record. It is allocated by the service provider. | M | Cgd.avd.0001 |

**Table 10.3-1 – Content guide discovery record**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Content guide name | The name of this content guide for potential display. Several names are possible, each of them associated with a specific language. | O | Sports channel index |
| Content guide provider name | The name of the provider of this content guide for potential display. Several names are possible, each of them associated with a specific language. | O | World Sports News Corp |
| Content guide description | This is the description of this content guide for potential display. Several descriptions are possible, each of them associated with a specific language. | O | Fun sports: Football, tennis, ski, etc. |
| Content guide locator (Note) | Locator to access the broadband content guide. Several possibilities can be described (e.g., push mode, HTTP pull mode, SOAP [b-W3C SOAP] pull mode, etc.). | M | \<scheme\>://\<server_name\> [:\<port\>]/\<path\> |
| Content guide logo URI | Pointer to the logo of this content guide for potential display. | O | \<scheme\>://\<server_name\> [:\<port\>]/\<path\> |
| Content guide type | The content guide type. It indicates if the content guide relates to live programs, content on demand, both, or some other form of content. | O | Linear TV |
| Target service provider identifier | This is the identifier of the service provider whose content is described by this content guide. | O | Geneva Entertainment Channel |
| NOTE – A request on the "content guide locator" shall return a record compliant with a schema that will be specified in a later revision of this Recommendation. | | | |

## 10.4 Service from other service providers record

A service provider can reference individual services or a complete offering provided by another service provider. Supplying its textual service identifier references a service. Supplying the service provider's identifier without a service list references an entire service provider's offering.

Elements and attributes for the "service from other service providers" record are as follows:

**Table 10.4-1 – Service from other service providers record**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Record type | Type of this set of data. | M | Service from other service provider record type |
| Service provider identifier | The unique identifier given to the service provider (e.g., an Internet DNS domain name, an URI, etc.). | M | itu-t.int <scheme>://<authority>/ |
| Record version | Version of this record. It is incremented with any change to this record. | C (Note) | 1 |
| Referenced service provider identifier | The unique identifier given to the referenced service provider (e.g., an Internet DNS domain name, an URI, etc.). | O | itu-t.int <scheme>://<authority>/ |
| Service identifier(s) | A unique identifier for the service within the referenced service provider's domain for each service from the referenced provider. Not required if the entire set of offerings from the service provider is referenced. | O | 0003.0004.0005 |
| NOTE – Record version is mandatory when the record is provided on request (i.e., "pull mode") and is optional when the record is multicast (i.e., "push mode"). |||||

## 10.5    Other services discovery record

In addition to IPTV services (e.g., linear TV, content on demand), a variety of other services (e.g., SMS, email, e-newspaper) may be offered.

The discovery record for other services includes at least the following core general information elements or attributes, see Table 10.5-1.

Additional specific elements might be needed for each individual service type.

**Table 10.5-1 – Other services discovery record**

| Element/ Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Record type | Type of this set of data: SMS, email, chat, e-newspaper, etc. | M | Chat discovery record type |
| Service provider identifier | The unique identifier given to the service provider (e.g., an Internet DNS domain name, an URI, etc.). | M | itu-t.int <scheme>://<authority>/ |
| Record version | Version of this record. It is incremented with any change to this record. | O | 1 |
| Service name | Name of specific service specified by offer type; brand name provided by the service provider. | O | Geneva AVD chat |
| Service identifier | It identifies an instance of the service allowing the service provider to provide multiple versions of the application or service. | M | srv.2.4.5 |

**Table 10.5-1 – Other services discovery record**

| Element/<br>Attribute | Description | M/O/C | Example(s) |
|---|---|---|---|
| Service description | Textual description of the service for potential display. Several textual descriptions are possible, each of them in a specific language. | O | Chat with worldwide authorities |
| Service locator | Location (e.g., URI or IP addresses) to get access to the service (e.g., URI or IP addresses). | M | itu-t.int<br><scheme>://<authority>/ |

## 10.6 Encoding of detailed service offer information

Format and encoding of detailed service offers information in this clause are as follows:

– Detailed service offer information is encoded in XML [W3C XML].

– Detailed service offer information can optionally use Fast Infoset [ITU-T X.891], ZLIB including GZIP format [ETSI TS 102 472] or BiM [ISO/IEC 23001-1].

## 11 Detailed service offer information delivery protocol

The recommended transport mechanisms for the delivery of the descriptions of IPTV services offered by an IPTV service provider are:

– HTTP 1.1 [IETF RFC 2616] for "Detailed Service Offer" delivery over unicast (pull mode);

– HTTP over TLS (to be confirmed for the use of HTTPS);

– IGMP version 2 [IETF RFC 2236] for "Detailed Service Offer" delivery over IPv4 multicast (push mode);

– IGMP version 3 [IETF RFC 3376] for "Detailed Service Offer" delivery over IPv4 multicast (push mode);

– MLD version 2 [IETF RFC 3810] for "Detailed Service Offer" delivery over IPv6 multicast (push mode);

– DVBSTP [ETSI TS 102 034]: a light protocol specified by DVB, used for delivery over multicast (push mode);

– FLUTE [ETSI TS 102 472] for "Detailed Service Offer" delivery over IPv4/IPv6 multicast (push mode).
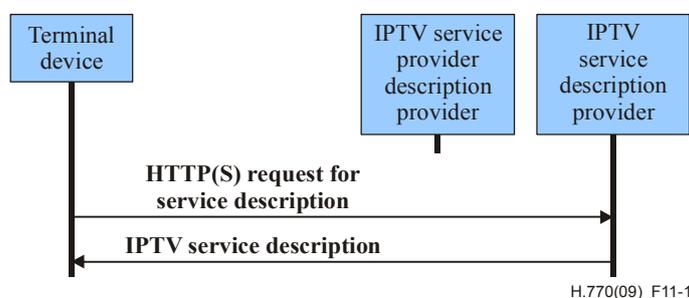


**Figure 11-1 – HTTP or HTTP over TLS request for description of the IPTV services offered by a service provider**

When using HTTP or HTTP over TLS, the service description provider may answer with a set of metadata containing the description of the available services.



H.770(09)_F11-2
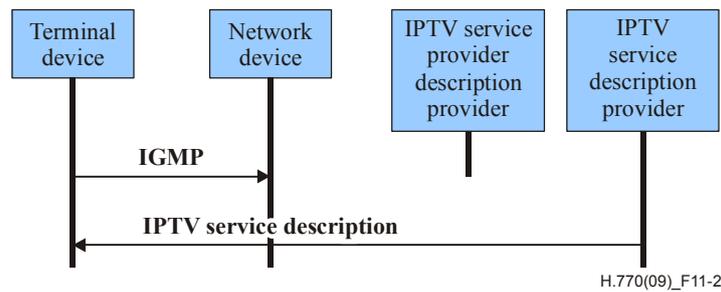
**Figure 11-2 – IGMP or MLD join request to receive the description of the IPTV services offered by a service provider**

For multicast, the service provider description provider periodically sends the set of metadata containing the description of the available services.

## 12      Service selection process

By default the IPTV terminal device may tune directly to the last linear TV channel watched in the past or to a preconfigured TV channel.

However, through the "detailed service offer" information and any referred guide, the IPTV terminal device may display the IPTV services offered by the selected service provider to allow the end-user to select one of them. Figure 12-1 is an example of service selection through a service guide description.



H.770(09)_F12-1
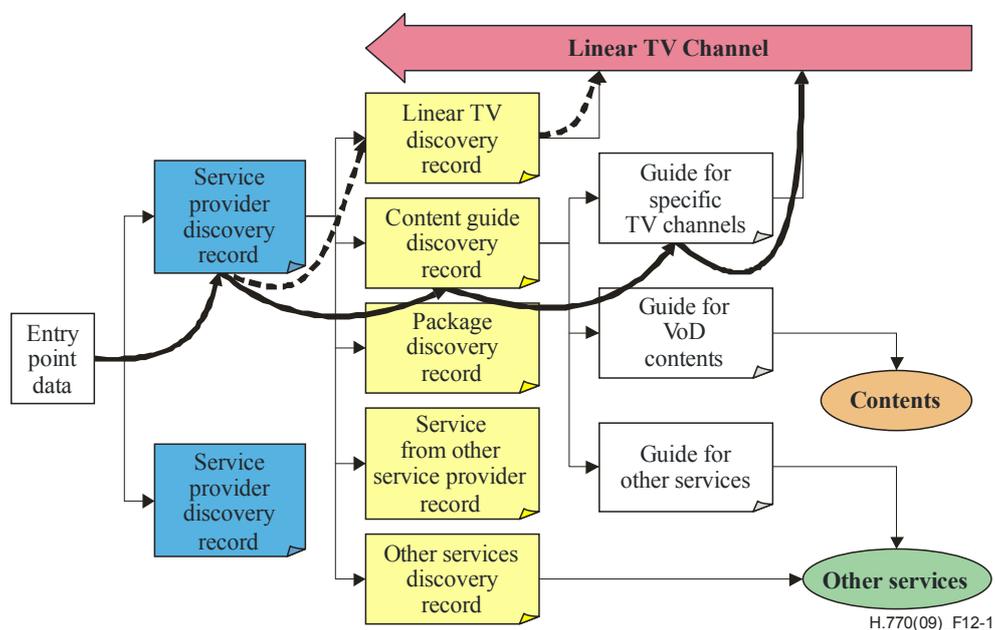
**Figure 12-1 – Example of live channel selection through a service guide**

In the example above, the IPTV terminal device proceeds as follows (along the bold line):

1.      Acquisition of the "Service Provider Information" related to two service providers ("service provider discovery record" boxes).

2.      Acquisition of the detailed service offer information of a certain service provider (content guide discovery, package discovery, service from other service provider discovery).

3.      Access to TV content guide service (see clause 10.3).

4.      Navigation through the guide.

5.      Selection of a TV channel.

6.      Tuning to the selected TV channel.

Another solution for the IPTV terminal device was to make use of the "linear TV discovery" description and to select from it a linear TV channel (along the dotted bold line).

For content selection and acquisition, with the exception of linear TV services, the IPTV terminal device proceeds as follows (as illustrated on Figure 12-2):

1.      Acquisition of the "Service Provider Information" related to two service providers ("service provider discovery record" boxes).

2.      Acquisition of the detailed service offer information of certain service provider (content guide discovery, package discovery, service from other service provider discovery, other services discovery).

3.      Access to VoD guide service.

4.      Navigation through the guide.

5.      Selection of a content.

6.      Request of the content.
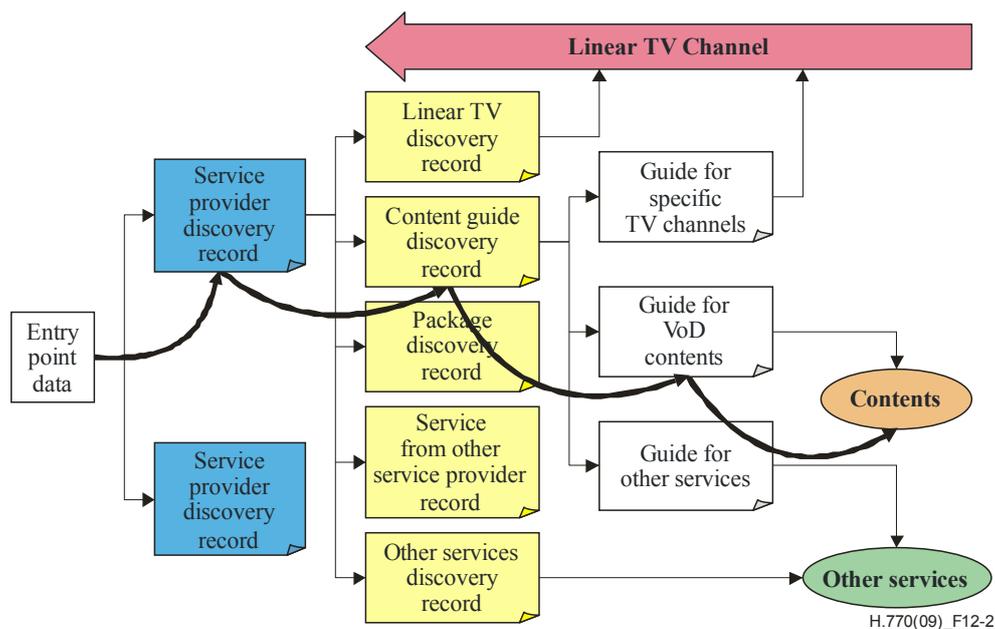


**Figure 12-2 – Example of content selection through a VoD Guide**

# Annex A

## Service discovery profile

(This annex forms an integral part of this Recommendation)

The profiles in Tables A.1 and A.2 concern linear TV services. Profiles related to other IPTV services are for further study.

NOTE – These profiles do not prohibit being used in conjunction with SI tables at the same time.

**Table A.1 – Profile A for linear TV**

<table>
<tr><th colspan="2">Items</th><th>Specification</th></tr>
<tr><td rowspan="2">Service provider discovery</td><td>Elements/Attributes</td><td>Service provider discovery information (see clause 7)</td></tr>
<tr><td>Delivery protocols</td><td>– HTTP 1.1 or HTTP over TLS as pull mode<br>– DVBSTP as push mode</td></tr>
<tr><td rowspan="2">Service discovery</td><td>Elements/attributes</td><td>– Linear TV discovery (see clause 10.1)<br>– Package discovery record (see clause 10.2)<br>– Content guide discovery record (see clause 10.3)</td></tr>
<tr><td>Delivery protocols</td><td>– HTTP or HTTP over TLS as pull mode<br>– DVBSTP as push mode</td></tr>
<tr><td colspan="3">NOTE – Pull mode and push mode are not mandatory simultaneously.</td></tr>
</table>

**Table A.2 – Profile B for linear TV**

<table>
<tr><th colspan="2">Items</th><th>Specification</th></tr>
<tr><td rowspan="2">Service provider discovery</td><td>Elements/attributes</td><td>Service provider discovery information (see clause 7)</td></tr>
<tr><td>Delivery protocols</td><td>– HTTP 1.1 or HTTP over TLS as pull mode<br>– FLUTE as push mode</td></tr>
<tr><td rowspan="2">Service discovery</td><td>Elements/attributes</td><td>– Linear TV discovery (see clause 10.1)<br>– Package discovery record (see clause 10.3)<br>– Content guide discovery record (see clause 10.4)</td></tr>
<tr><td>Delivery protocols</td><td>– HTTP or HTTP over TLS as pull mode<br>– FLUTE as push mode</td></tr>
<tr><td colspan="3">NOTE – Pull mode and push mode are not mandatory simultaneously.</td></tr>
</table>

# Appendix I

## Multiple service platforms

(This appendix does not form an integral part of this Recommendation)

This appendix presents two use-cases to illustrate the usage of service role information from clause 7.2.

### I.1 Introduction to service role information

A single organization may play various roles. Supplementary elements described in Table I.1-1 may be appended to service provider information or to other elements for identifying these roles and for finding service groupings.

Possible roles of IPTV service related entities are:

– Network provider: providing access network infrastructure for IPTV services.

– Service platform: facilitating IPTV services by providing equipment and services.

– SCP provider: providing service providers with SCP functionalities such as authentication, DRM and CAS functions.

– Service provider: providing linear TV, VoD, re-transmission, web services, etc., through "service platform".

**Table I.1-1 – Service role information elements/attributes**

| Element name | Description | M/O | Example(s) |
|---|---|---|---|
| Network provider identifier | Information regarding the network provider. | O | Network provider name, unique ID |
| Service platform identifier | Information regarding the organizational entity providing equipment and IPTV services. | O | Platform provider name, unique ID |
| SCP provider identifier | Information regarding SCP systems. | O | SCP provider name, unique ID |
| NOTE 1 – The above elements assist in identifying service providers. The information can be easily handled by existing mechanisms such as those of [b-ETSI TS 183 063] and [b-ATIS-0800017]. Although there is no metadata format, when the service discovery information is transmitted using DVBSTP, the service provider identifier can be inserted into the multicast UDP packet header. NOTE 2 – Network_id may be used as the service platform identifier if SI is transmitted (see Appendix III). | | | |

### I.2 Multiple service platforms

In this use-case multiple service, platforms provide IPTV services produced by one service provider. The following conditions are assumed:

– The service provider is a type of "Complementary service provider" which is visible to the end-user (see [b-ITU-T M.3050.4]).

– The end-user can subscribe to any service platform.

– The service provider creates the service discovery information.
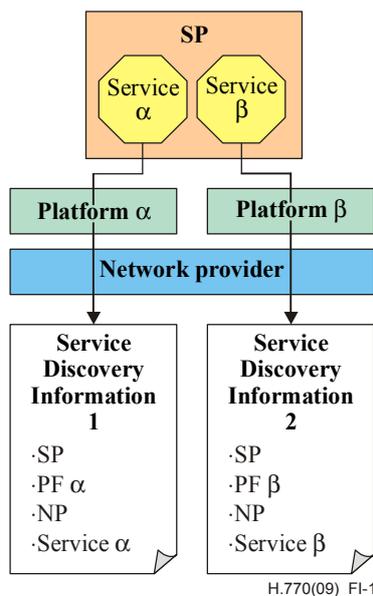
**Figure I.1 – The case of providing different services
from one service provider**

NOTE – The exact format of service role information elements/attributes is for further study. These may be added to the "Service discovery information" (as indicated on this figure), to the "Service provider discovery information" or distributed among them.

In this use-case, additional service provider information, such as network provider's, service platform described in Table I.1-1, assists in the identification of available services. Arrow lines indicate the flows of services relevant to respective service discovery information. If an end-user subscribes only to "Service Platform α", service discovery information 1 is selected by the service platform identifier.

## I.3     Service mobility

In this use-case, service mobility is possible through interworking between two different network providers. It is assumed that one service provider provides services through different service platforms. "Network Provider a" is normally accessed as the permanent home-network, and "Network Provider b" is temporarily used as a visited network.

When an end-user accesses the visited network, the IPTV terminal device checks the item concerning network provider identifier information and changes its configuration to the new network accordingly. Moreover, when an end-user accesses a visited network, the IPTV terminal device can properly select the relevant service discovery information with the service platform identifier.

In Figure I.2, "Network Provider b" is a visited network. The IPTV terminal has to select "Service Discovery Information 2" or "Service Discovery Information 3". Since the end-user subscribes to "Platform α", the IPTV terminal device would select "Service Discovery Information 2".
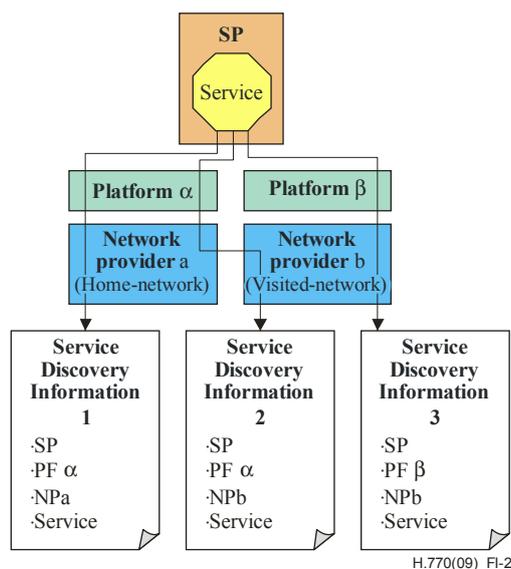
**Figure I.2 – The case of service mobility**

## I.4 An example of service discovery processes

This clause illustrates the processes of service discovery for a case with multiple service entities. Figure I.3 shows a simple case to explain the processes. There are two network providers and two service providers; moreover, service provider S connects to two network providers. In this figure, content provider is the entity that owns or is licensed to sell content or content assets [ITU-T Y.1910], but this entity does not concern the service discovery processes.
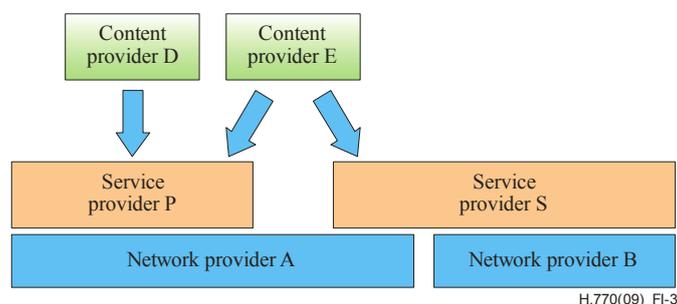


**Figure I.3 – Basic IPTV service provider model**

The details of the respective service discovery processes shown in Figure I.4 are as follows:

1) The IPTV terminal device, at network connection set-up on one of the network providers (A or B), gets one or more entry points from the network provider. There may be one entry point for each service provider or an entry point for a common service provider description repository.

2) From the left-side entry point(s), the terminal device gets the description of the IPTV service providers available on that network provider with a summary of the services offered by these service providers and entry points for detailed service offers.

3) From the third entry point for detailed service offer, the terminal device gets a detailed description of each service and can select one of them (e.g., Channel A).
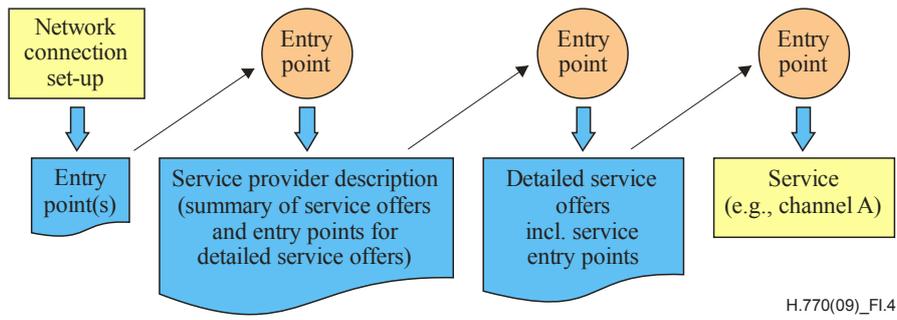
**Figure I.4 – ITU-T H.770 service discovery process**

# Appendix II

# Requirements in other standards organizations

*(This appendix does not form an integral part of this Recommendation)*

In this part, requirement levels are compared according to standards of major standards organizations.

Mandatory elements and attributes are shown as "M", optional ones are shown as "O", conditional requirements are shown as "C" and "–" indicates that there are no corresponding elements/attributes.

Element and attribute names are the same as in the main text. Exact names of elements and attributes are different between standards; however, the corresponding elements and attributes are compared based on their semantics.

## II.1    Service provider discovery information

**Table II.1-1 – Service provider information record**

| Element/Attribute | DVB | ATIS-IIF | ITU-T |
|---|---|---|---|
| Record type | M | M | M |
| Record version | M | O | M |
| Individual service provider information | M | M | M |

**Table II.1-2 – Individual service provider information elements/attributes**

| Element/Attribute | DVB | ATIS-IIF | ITU-T |
|---|---|---|---|
| Service provider identifier | M (Note) | O | M |
| Individual service provider information version | M | O | M |
| Service provider logo URI | O | O | O |
| Service provider name | M | O | O |
| Service provider description | O | O | O |
| Web portal URL | – | O | O |
| Service offer summary(s) | M | – | M |
| NOTE – Uses DNS host name. | | | |

**Table II.1-3 – Service offer summary elements/attributes**

| Element/Attribute | DVB-IP | ATIS-IIF | ITU-T |
|---|---|---|---|
| Push address | M | M (Note 1) | C (Note 2) |
| Pull URL | O | M (Note 1) | C (Note 2) |
| Offer type | O | – | O |
| Segment identifier and version | O | – | O |
| NOTE 1 – One of locator information is required.<br>NOTE 2 – One of them is required to be presented. | | | |

## II.2 Detailed service offer information

**Table II.2-1 – Linear TV discovery record**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Record type | M | M | M |
| Service provider identifier | M (Note 1) | M | M |
| Record version | C (Note 2) | M | M |
| Metadata server URL | O | O | O |
| Portal URL | O | O | O |
| Purchase information URL | – | – (Note 3) | O |
| Linear TV service(s) | M | M | M |
| NOTE 1 – Uses DNS host name.<br>NOTE 2 – Record version is mandatory when the record is provided on request (i.e., pull mode) and is optional when the record is multicast (i.e., push mode).<br>NOTE 3 – Purchase information (e.g., rights owners, publishers) is treated as EPG metadata in ATIS. Requirement level in ATIS is optional [b-ATIS-0800020]. | | | |

**Table II.2-2 – Linear TV services elements/attributes**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Service identifier | M (Note 1) | M | M |
| Original network Id | M | O | O |
| Transport stream Id | M | O | O |
| Service Id | M | O | O |
| Max bit rate | O | – (Note 2) | O |
| Service location(s) | M | M | M |
| Audio coding | O | O | O |
| Video coding | O | O | O |

**Table II.2-2 – Linear TV services elements/attributes**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Service availability | O | – | O |
| Streaming type | O | – | O |
| Multiplex mode | – | –<br>(Note 3) | O |
| NOTE 1 – Uses DNS host name.<br>NOTE 2 – ATIS requires rate type such as constant bit rate (CBR), variable bit rate (VBR).<br>NOTE 3 – ATIS handles IP or RF as content source. | | | |

**Table II.2-3 – Service location elements/attributes**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| IP multicast address | M | M | M |
| IP multicast port | M | M | M |
| IP multicast source | O<br>(Note) | O<br>(Note) | O<br>(Note) |
| Unicast URL | O | – | – |
| NOTE – Source address is mandatory when IPv6 multicast is deployed. | | | |

**Table II.2-4 – FEC elements/attributes**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| FEC base layer multicast address | M<br>(Note 1) | M | M |
| FEC enhancement layer multicast address | O<br>(Note 1) | O | O |
| Maximum packet number in blocks | O | M | O |
| Maximum FEC block duration | O | M | O |
| FEC specific information | C<br>(Note 2) | C<br>(Note 2) | C<br>(Note 2) |
| NOTE 1 – IP multicast port is mandatory for FEC. IP multicast and IP multicast source are optional.<br>NOTE 2 – This information is required when FEC enhancement layer is used. | | | |

**Table II.2-5 – Service availability elements/attributes**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Country code | M | – | O |
| Availability | O | – | O |
| Region codes | O | – | O |

**Table II.2-6 – Additional linear TV discovery elements/attributes**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Type of service | M | M | M |
| Priority SI source | O | – | O |
| Service name | M | O (Note) | O |
| Service description | O | O (Note) | O |
| Content guide discovery record identifier(s) | O | – | O |
| Preferred content guide discovery record location(s) | O | O (Note) | O |
| Service genre(s) | O | O (Note) | O |
| Announcement stream | O | – | O |
| Secondary service Id | O | – | O |
| Mosaic information | O | – | O |
| NOTE – Provided by EPG metadata [b-ATIS-0800020]. | | | |

**Table II.3-1 – Package discovery record**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Record type | M | M (Note 1) | M |
| Service provider identifier | M (Note 2) | M (Note 1) | M |
| Record version | C (Note 3) | M (Note 1) | M |
| Package identifier | M | M (Note 1) | M |
| Displayable | O | – | O |
| Package name | M | – | O |
| Package description | O | M (Note 1) | O |
| Preferred content guide discovery record identifier | O | – | O |
| Preferred content guide discovery record location | O | – | O |
| Package reference(s) | O | – | O |
| Individual service(s) (Note 4) | M | M (Note 1) | M |
| Package availability | O | – | O |
| NOTE 1 – ATIS handles information regarding linear TV services as "Virtual Channel" related metadata. NOTE 2 – Uses DNS domain name. NOTE 3 – Record version is mandatory when the record is provided on request (i.e., "pull mode") and is optional when the record is multicast (i.e., "push mode"). NOTE 4 – At least one individual service element is required. | | | |

**Table II.3-2 – Individual service elements/attributes**

| Element name | DVB | ATIS | ITU-T |
|---|---|---|---|
| Individual service provider identifier | O | O<br>(Note 1) | O |
| Service identifier | M | M | M |
| Additional service description | O | O<br>(Note 2) | O |
| Logical channel number | O | M | O |
| NOTE 1 – ATIS can handle "virtual channel" related metadata as the equivalent identifiers [ATIS-0800022].<br>NOTE 2 – Provided by EPG metadata [b-ATIS-0800020]. | | | |

**Table II.4-1 – Content guide discovery record**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Record type | M | M | M |
| Service provider identifier | M<br>(Note 1) | O | M |
| Record version | C<br>(Note 2) | O | O |
| Content guide discovery record identifier | M | – | M |
| Content guide name | M | – | O |
| Content guide provider name | O | M | O |
| Content guide description | O | O | O |
| Content guide locator | M | M | M |
| Content guide logo URI | O | O | O |
| Content guide type | O | – | O |
| Target service provider identifier | O | O | O |
| NOTE 1 – Uses DNS domain name.<br>NOTE 2 – Record version is mandatory when the record is provided on request (i.e., "pull mode") and is optional when the record is multicast (i.e., "push mode"). | | | |

**Table II.5-1 – Service from other service provider's record**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Record type | M | – | M |
| Service provider identifier | M<br>(Note 1) | – | M |
| Record version | C<br>(Note 2) | – | C<br>(Note 2) |
| Referenced service provider identifier | – | – | O |
| Service identifier(s) | – | – | O |
| NOTE 1 – Uses DNS domain name.<br>NOTE 2 – Record version is mandatory when the record is provided on request (i.e., "pull mode") and is optional when the record is multicast (i.e., "push mode"). | | | |

**Table II.6-1 – Other service discovery record**

| Element/Attribute | DVB | ATIS | ITU-T |
|---|---|---|---|
| Record type | M | – | M |
| Service provider identifier | M (Note 1) | – | M |
| Record version | O (Note 2) | – | O |
| Service name | M | – | O |
| Service identifier | O | – | M |
| Service description | O | – | O |
| Service locator | M | – | M |
| NOTE 1 – Uses DNS domain name. <br> NOTE 2 – Record version is mandatory when the record is provided on request (i.e., "pull mode") and is optional when the record is multicast (i.e., "push mode"). | | | |

# Appendix III

## The usage of TS with service discovery information

(This appendix does not form an integral part of this Recommendation)

### III.1  Study on the SI tables

Service information (SI) consists of information tables defined by each standard. In order to compare the tables, it is convenient to illustrate the terms and identifiers defined by DVB-SI ([ETSI EN 300 468]) and ARIB-SI ([b-ARIB B10]):

–      network: collection of MPEG-2 transport stream (TS) multiplexes transmitted on a single delivery system.

–      original_network_id: unique identifier of a delivery system (e.g., specific cable network, satellite network and terrestrial network).

–      network_id: unique identifier of a current delivery system.

–      service: sequence of programmes under the control of a broadcaster, which can be broadcast as part of a schedule.

–      service_id: unique identifier of a service within a TS (i.e., channel).

–      transport_stream_id: unique identifier of a TS within an original network.

–      event_id: unique identifier of a programme within a service.

ATSC-PSIP ([b-ATSC A/65]) uses the idea of the following virtual channel:

–      virtual channel: A virtual channel is a designation, usually a number, which is recognized by the end-user as a single entity that will provide access to a set of one or more digital elementary streams. It is called "virtual" because its identification (name and number) may be defined independently from its physical location.

–      source_id: unique identifier for a virtual channel, almost the same as service_id.

Figure III.1 shows the image of entities carried over a delivery system using each identifier mentioned above.
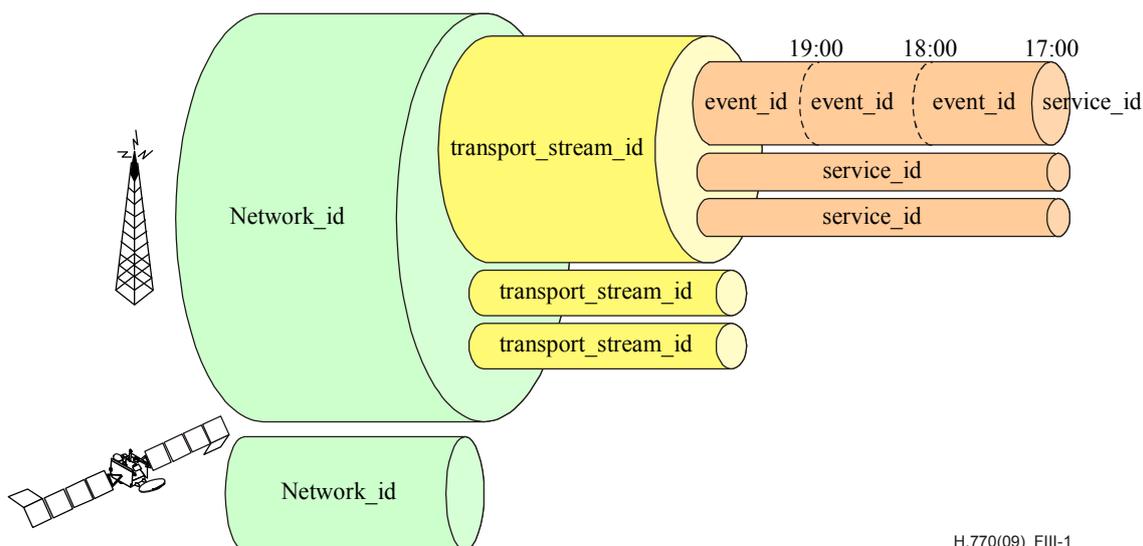


**Figure III.1 – Network identifiers**

DVB-SI/ARIB-SI usually specifies services uniquely by using a triplet of original_network_id, transport_stream_id and service _id.

Table III.1-1 shows the usage of the main tables of service information according to the different standards. Details of the tables (e.g., key elements/attributes, relationship among tables) and the usage of the tables are defined by each respective standards organization, except for PAT and PMT which are defined by [ITU-T H.222.0]. For example, ARIB originates BIT as a container of broadcaster information.

Table III.1-2 roughly shows the roles and characteristics of SI tables. For the details of SI tables (mainly original descriptors), see the relevant standard.

**Table III.1-1 – Comparison of SI tables used in digital terrestrial (Note 1)**

| | DVB-SI | ARIB-SI | ATSC-PSIP |
|---|---|---|---|
| H.222.0 \| ISO/IEC 13818-1 | PAT | | |
| | PMT | | |
| Individual definition | NIT, SDT, BAT (Note 2) | | MGT, VCT |
| | EIT (Note 2) | | EIT, ETT |
| | – | BIT | – |

NOTE 1 – This table omits some SI tables regarding system time, rights control and parental rating.
NOTE 2 – Exact descriptors contained in SI tables are different between DVB and ARIB.

**Table III.1-2 – SI tables defined by standards development organizations**

| Abbr. | Table name | Information conveyed | Typical table identifiers (Notes 1, 2) | Looped identifier/ Descriptor (Notes 1, 2) |
|---|---|---|---|---|
| PAT | Program association table | Locations (the Packet identifier (PID)) of corresponding PMT, NIT | TS_id | Program number and program map table PID |
| PMT | Program map table | Locations of streams, program clock reference | program_number, PCR_ID | PID values for components of one or more programs |
| NIT | Network information table | TS and its transmitting path | network_id | original_network_id, TS_id |
| SDT | Service description table | Programmed channel as services within a TS | original_network_id, TS_id, | service_id, channel name |
| EIT | Event information table | TV programs within a programmed channel | original_network_id, TS_id, service_id | event_id, program name/description, broadcasting date and time |
| BAT | Bouquet association table | A set of programmed channels | bouquet_id | original_network_id, TS_id, bouquet name, service list |
| BIT | Broadcaster information table | SI transmission parameter of each broadcaster unit. | original_network_id | Broadcaster identifier/name, circulation periods of tables |

**Table III.1-2 – SI tables defined by standards development organizations**

| Abbr. | Table name | Information conveyed | Typical table identifiers (Notes 1, 2) | Looped identifier/ Descriptor (Notes 1, 2) |
|-------|-----------|---------------------|----------------------------------------|---------------------------------------------|
| MGT | Master guide table | Top level of PSIP tables. Identifies what PSIP tables are in transport stream | Table_id | PID values for tables, table type |
| VCT | Virtual channel table | Content within a TS, its number as virtual channel | TS_id | Assigned_TS_id, Source_id, channel number |
| ETT | Extended text table | Detailed description of virtual channels and programs | ETT_table_id_extention | Text messages |
| NOTE 1 – Names of identifiers and descriptors are modified in this Recommendation. NOTE 2 – Looped identifier/descriptor are defined repeatedly in a table. | | | | |

## III.2 Classification of TS with SI

Well-known "TS-Full SI" and "TS-Optional SI" defined by DVB are as follows:

– TS-Full SI [ETSI TS 102 034]: A transport stream with embedded service information (SI) as defined by broadcasting standards organizations (e.g., ARIB, ATSC and DVB).

– TS-Optional SI [ETSI TS 102 034]: A transport stream with MPEG PSI (PAT and PMT tables) as defined by ISO/IEC; all other MPEG-2 and other tables are optional.

These definitions are slightly modified for this Recommendation. Based on the definitions, TS-Optional SI includes TS-Full SI (i.e., TS-Full SI is a specific case of TS-Optional SI).

Linear TV services delivered over MPEG-2 transport stream (TS) can have "service information (SI)" embedded. The SI obtains important information for the process of service discovery, especially in traditional broadcasting services (e.g., used in up/down channel changing, channel selection by channel numbers, or display of EPG). Information on individual services is afterwards acquired from the transport stream itself, one by one, through classical use of SI. When SI is embedded in TS, IPTV terminal devices need to connect all services and parse all SI to build a service list (see [b-ETSI TS 102 542]).

"TS-Full SI" is compliant with the DVB-SI, ARIB-SI and ATSC-PSIP specifications (with all the SI/PSIP tables), but with a reduced/customized size, carried over IP, just as in retransmission of broadcast channel captured from satellite or terrestrial broadcast.

"TS-optional SI" is intended for the situation where a service provider wants to present its services, but cannot afford or does not want to use bandwidth for usual service description information ([ETSI TS 102 034]).

Concrete information contained in TS-Full SI (i.e., SI tables and their descriptors) is different for each standards development organization. For example, TS-Full SI defined by DVB which does not include NIT may be treated as TS-Optional SI in ARIB.

## III.3 Variation of the usage of service discovery information

TS-Optional SI allows selecting and using SI tables within a transport stream as mentioned above. The following table shows the case of combination of service discovery information records. The detail of service information may be different for each country because of the details of their specifications. Case 1 may comprise DVB's TS-Full SI ([b-ETSI TS 102 542]).

**Table III.3-1 – Variation of the TS with service discovery information**

| Information | SI | Case 1 | Case 2 | Case 3 |
|---|---|---|---|---|
| Service provider | NIT | Service provider discovery records | NIT plus service provider discovery records | Service provider discovery records |
| Service description | SDT (Note 1) | SDT (Note 1) | SDT (Note 1) | Linear TV discovery records |
| Service location | NIT | Linear TV discovery records | NIT | Linear TV discovery records |
| Program schedule | EIT (Note 2) | EIT (Note 2) | EIT (Note 2) | Content guide discovery record (Note 4) |
| Package | BAT (Note 3) | BAT (Note 3) | Package discovery records | Package discovery records |
| Logical (virtual) channel | (VCT) | (VCT) | Package discovery records | Package discovery records |
| NOTE 1 – In case of ATSC, SDT corresponds to MGT plus EIT. | | | | |
| NOTE 2 – In case of ATSC, EIT corresponds to MGT plus EIT. | | | | |
| NOTE 3 – In case of ATSC, BAT corresponds to VCTs. | | | | |
| NOTE 4 – Content guide discovery record supports discovery of a content guide which includes schedule information. The details of the content guide itself is for further study. | | | | |

# Appendix IV

## Alternative methods for entry point handling

(This appendix does not form an integral part of this Recommendation)

Alternative methods for delivery and handling of entry data are as follows [b-ATIS-0800017] [b-ETSI TS 183 063]:

– Preconfigured methods

  • IPTV terminal devices may be preconfigured or manually configured with service discovery information.

– DHCP-based methods

  • DHCP [b-IETF RFC 2131] container option can deliver entry point data information when the IPTV terminal device acquires network information, such as its own IP address, from a DHCP server.

    NOTE 1 – There is substantial variation in the usage of container option and details of these have not been agreed by IETF.

  • Download methods (also known as pull mode).

  • IPTV terminal devices may download information using the unicast-based procedure such as TFTP ([b-IETF RFC 1350]), HTTP.

– TR-069 protocol-based method

  • Remote management system can provide addressing information of service providers with the TR-069 protocol ([b-DSL-F TR069]).

– DNS service records (SRV)-based method

  • The result of DNS SRV [b-IETF RFC 2782] lookup can provide available IPTV service servers within the specified domain name.

    NOTE 2 – This method is often used when a SIP server finds the locations of services as FQDN.

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