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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

ITU-T H-SERIES RECOMMENDATIONS
AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Telepresence	H.420–H.429
Supplementary services for multimedia	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	H.620–H.629
Ubiquitous sensor network applications and Internet of Things	H.640–H.649
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779
Digital Signage	H.780–H.789
E-HEALTH MULTIMEDIA SERVICES AND APPLICATIONS	
Interoperability compliance testing of personal health systems (HRN, PAN, LAN, TAN and WAN)	H.820–H.859
Multimedia e-health data exchange services	H.860–H.869

For further details, please refer to the list of ITU-T Recommendations.



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 Internet protocol television (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 television (TV), video on demand (VoD), 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.

This 2015 edition of the Recommendation adds notes on how to treat "Web Portal URL" in clause 7.1. It also modifies the examples of "Portal URL" and "Metadata server URL", changing those into "<scheme>://<server_name>[:<port>]/<path>". In clause 10 it also adds a text to show the example on "Metadata server URL". Moreover, "Preferred Content Guide Discovery record Location" is changed into "Preferred Content Guide Discovery record" in clauses 10.1 and 10.2, and its example has been changed to a Boolean value. Relevant elements/attributes in Appendix II are also changed. This edition of the Recommendation also adds a new service type, "Widget service", to Table 7.1-4.

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Table of Contents

		Page
1	Scope.....	1
2	References.....	1
3	Definitions	2
	3.1 Terms defined elsewhere	2
	3.2 Terms defined in this Recommendation.....	4
4	Abbreviations and acronyms	4
5	Introduction.....	7
6	Service provider discovery process	8
7	Service provider information.....	9
	7.1 Service provider information record	9
	7.2 Service role information	13
	7.3 Encoding of service provider information.....	13
8	Service provider information delivery protocol(s)	13
9	Service discovery process.....	15
10	Detailed service offer information.....	15
	10.1 Linear TV discovery	15
	10.2 Package discovery record	20
	10.3 Content guide discovery record.....	22
	10.4 Service from other service providers record	23
	10.5 Other services discovery record	24
	10.6 Encoding of detailed service offer information.....	25
11	Detailed service offer information delivery protocol	25
12	Service selection process	26
	Annex A – Service discovery profile	29
	Appendix I – Multiple service platforms	30
	I.1 Introduction to service role information.....	30
	I.2 Multiple service platforms.....	30
	I.3 Service mobility.....	31
	I.4 An example of service discovery processes	32
	Appendix II – Requirements in other standards organizations	34
	II.1 Service provider discovery information	34
	II.2 Detailed service offer information.....	35
	Appendix III – The usage of TS with service discovery information.....	40
	III.1 Study on the SI tables	40
	III.2 Classification of TS with SI	42
	III.3 Variation of the usage of service discovery information.....	43
	Appendix IV – Alternative methods for entry point handling	44

	Page
Appendix V – Service discovery using TR-069	45
V.1 Service discovery profile for TR-069	45
V.2 Service provider discovery using TR-069	45
V.3 Detailed service offer discovery using TR-069	47
Bibliography.....	48

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Recommendation ITU-T H.770

Mechanisms for service discovery and selection for IPTV services

1 Scope

This Recommendation describes the mechanisms for service provider discovery, service discovery and selection for Internet protocol television (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 television (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 (2014) | ISO/IEC 13818-1:2015, *Information technology – Generic coding of moving pictures and associated audio information: Systems*.
- [ITU-T H.264] Recommendation ITU-T H.264 (2014) | ISO/IEC 14496-10: 2014, *Advanced video coding for generic audiovisual services*.
- [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 (2015), *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 H.765] Recommendation ITU-T H.765 (2015), *Packaged IPTV Application (Widget) Service*.
- [ITU-T X.891] Recommendation ITU-T X.891 (2005) | ISO/IEC 24824-1:2007, *Information technology – Generic applications of ASN.1: Fast infoset*.
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- [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 end-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 sometime 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 the 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

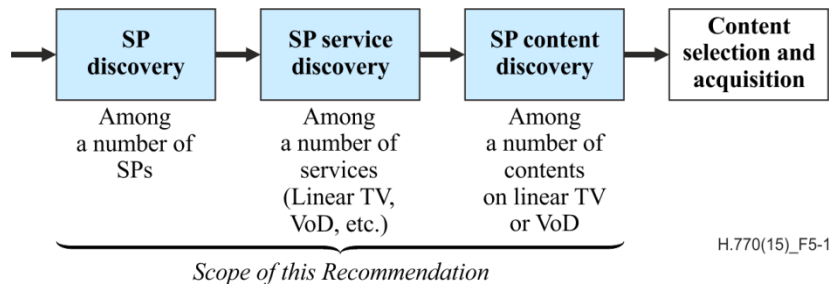
AVC Advanced Video Coding

AVD	Audio, Video and Data
ASN.1	Abstract Syntax Notation One
BAT	Bouquet Association Table
BBF	Broadband Forum
BCG	Broadband Content Guide
BiM	Binary MPEG format for XML
BIT	Broadcaster Information Table
CAS	Conditional Access System
CBR	Constant Bit Rate
CS	Configuration Server
DNS	Domain Name System
DRM	Digital Rights Management
DVBSTP	DVB SD&S Transport Protocol
ECG	Electronic Content Guide
EIT	Event Information Table
EPG	Electronic Program Guide
ETT	Extended Text Table
FEC	Forward Error Correction
FLUTE	File delivery over Unidirectional Transport
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
IPTV	Internet Protocol Television
ITF	IPTV Terminal Function
MAC	Media Access Control
MGT	Master Guide Table
MLD	Multicast Listener Discovery
MPEG	Moving Picture Experts Group
NIT	Network Information Table
PAT	Program Association Table
PER	Packed Encoding Rules

PID	Packet Identifier
PMT	Program Map Table
PSI	Program Specific Information
PSIP	Program and System Information Protocol
PVR	Personal Video Recorder
RF	Radio Frequency
RTCP	Real Time Control Protocol,
RTP	Real-time Transport Protocol
SADS	Service and Application Discovery and Selection
SCART	Société des Constructeurs d'Appareils Radiorécepteurs and Téléviseurs. A connector standard that supports various common analogue signal types.
SCP	Service and Content Protection
SDT	Service Description Table
SI	Service Information
SIP	Session Initiation Protocol
SMS	Short Message Service
SOAP	Simple Object Access Protocol
SP	Service Provider
STB	Set-Top Box
TD	Terminal Device
TFTP	Trivial File Transfer Protocol
TLS	Transport Layer Security
TS	Transport Stream
UDP	User Datagram Protocol
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
VBR	Variable Bit Rate
VCT	Virtual Channel Table
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-user 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., fully qualified domain name (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.

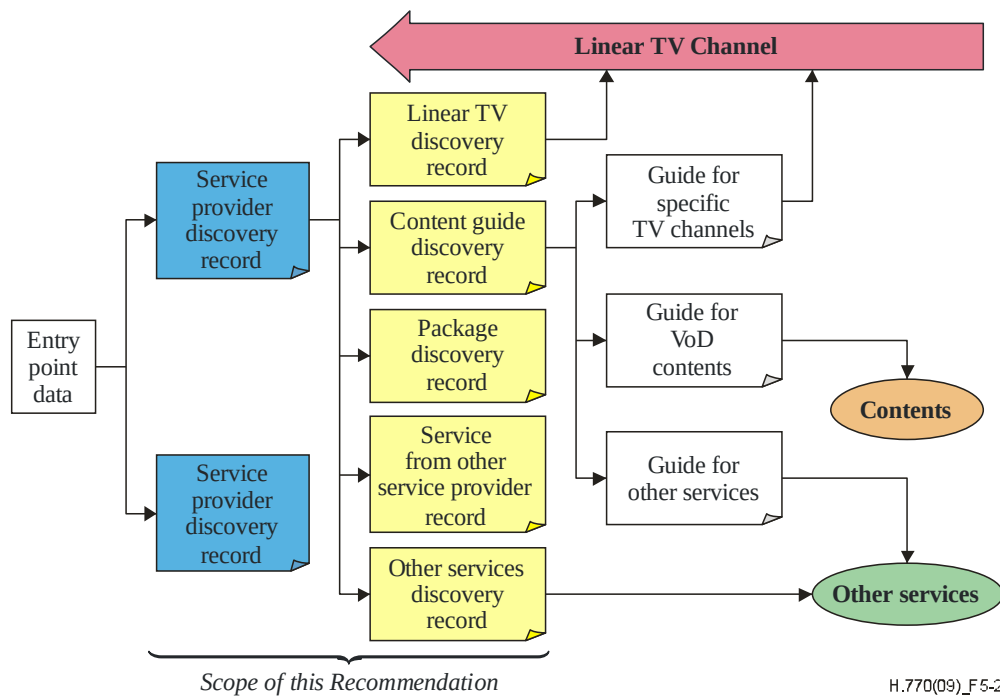


Figure 5-2 – From entry point data to service/content acquisition

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 the 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.

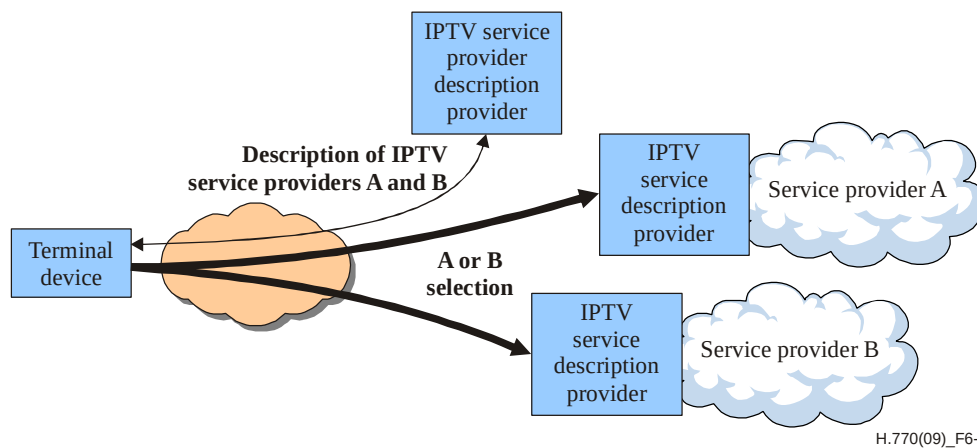


Figure 6-1 – Service provider discovery with a central IPTV service provider description provider

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

In Figure 6-1, 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.

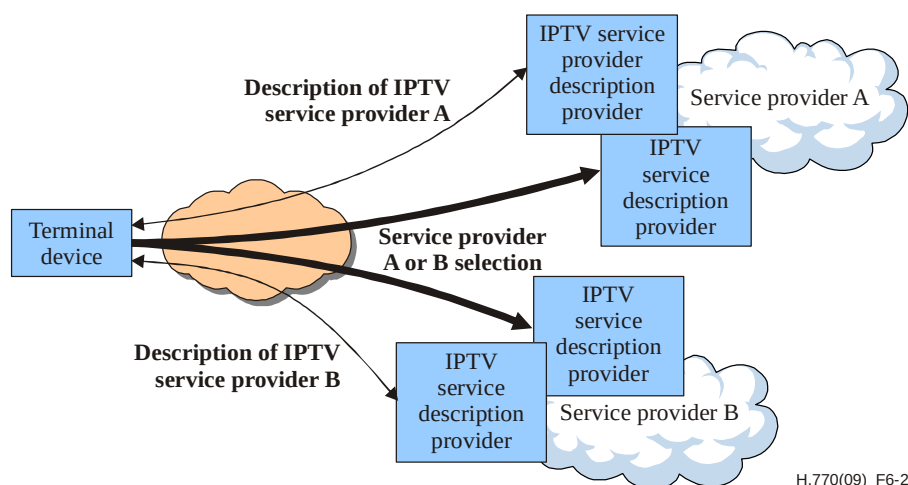


Figure 6-2 – Service provider discovery without a central service provider description provider

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)
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
Record provider identifier	The unique identifier given to the IPTV service provider description provider described in clause 6 (e.g., an Internet DNS domain name, an URI, etc.).	O	itu-t.int <scheme>:// <authority>/
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)
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

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

Element/ attribute	Description	M/O/C	Example(s)
Web portal URL (Note)	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>
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	–
NOTE – "Web portal URL" should be used either in this table or in Table 7.1-3.			

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 2)	–
Pull URL	Unicast location of the "detailed service offer" records described in clause 10.	C (Note 2)	<scheme>://<authority>[:<port>]/<path>
Web portal URL (Note 1)	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 2)	<scheme>://<authority>[:<port>]/<path>
CS location	Location of the IPTV configuration server, which is shown in clause 8, to be used to get the "Detailed Service Offer" records described in clause 10.	C (Note 2)	<scheme>://<authority>[:<port>]/<path>
Offer type	Type of service discovery offered by a service provider (see Table 7.1-4).	O	Linear TV discovery

Table 7.1-3 – Service offer summary elements/attributes

Element/ attribute	Description	M/O/C	Example(s)
Segment identifier and version (Note 3)	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	<id>.<version>
NOTE 1 – "Web portal URL" should be used either in this table or in Table 7.1-2. NOTE 2 – At least one of them is required to be presented. NOTE 3 – 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 providers discovery		See clause 10.4
Other services discovery (Note)	E-book	See clause 10.5
	SMS messaging	
	E-mail	
	Widget service [ITU-T H.765]	
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.