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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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

IPTV terminal device discovery

Recommendation ITU-T H.772



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Recommendation ITU-T H.772

IPTV terminal device discovery

Summary

Recommendation ITU-T H.772 describes mechanisms for Internet protocol television (IPTV) terminal device (TD) discovery that make IPTV terminal devices discoverable and selectable to one another within a public or local network environment. For example, terminal device discovery is useful for services that allow users to share content with other terminal devices. This Recommendation also describes the connection model and functional architecture for IPTV terminal device functional blocks to support the IPTV terminal device discovery mechanism. Moreover, the procedures of IPTV terminal device discovery are given in this Recommendation. In addition, the reference point, the related protocols, elements and attributes to be used in the communication messages are also specified in this Recommendation.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T H.772	2015-11-29	16	11.1002/1000/12650

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

FOREWORD

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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.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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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In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Recommendation ITU-T H.772

IPTV terminal device discovery

1 Scope

This Recommendation describes the mechanisms for Internet protocol television (IPTV) terminal device (TD) discovery. These mechanisms enable IPTV terminal devices to provide end-users with effective ways to discover and select terminal devices.

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.721] Recommendation ITU-T H.721 (2015), *IPTV terminal devices: Basic model*.

[ITU-T H.722] Recommendation ITU-T H.722 (2014), *IPTV terminal device: Full-fledged model*.

[ITU-T H.770] Recommendation ITU-T H.770 (2015), *Mechanisms for service discovery and selection for IPTV services*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 acquisition [b-ITU-T Y.1901]: The process of obtaining content by the end-user.

NOTE – For content with accessibility features, this means that the content will be available in a form that can be used by the end-user.

3.1.2 application [b-ITU-T Y.1901]: A structured set of capabilities, which provide value-added functionality supported by one or more services.

3.1.3 end user [b-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.

3.1.4 functional architecture [b-ITU-T Y.2012]: A set of functional entities and the reference points between them used to describe the structure of an NGN. These functional entities are separated by reference points, and thus, they define the distribution of functions.

NOTE 1 – The functional entities can be used to describe a set of reference configurations. These reference configurations identify which reference points are visible at the boundaries of equipment implementations and between administrative domains.

NOTE 2 – This definition is taken from [b-ITU-T Y.2012] and therefore relates to NGN. However, it is also valid for other networks, e.g., networks supporting IPTV terminal device.

3.1.5 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.

3.1.6 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.

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

3.1.8 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.

3.19 service discovery (SD) [ITU-T H.770]: 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.

3.1.10 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 can optionally operate a network. A service provider can optionally be a customer of another service provider.

NOTE – Typically, the service provider acquires or licenses content from content providers and packages this into a service that is consumed by the end-user.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 multiple device service: The mechanisms for a multi-device service, which includes the entire system architecture, core functional requirement of multi-device enabled systems, technologies that support the multi-device service, service prospects, system API and interface.

3.2.2 terminal device discovery: A procedure that allows IPTV terminal devices to discover other IPTV terminal devices and their capabilities, as required for the provisioning of convergent, multi-device IPTV services.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AES	Advanced Encryption Standard
DNS	Domain Name System
HN	Home Network
HTTP	Hypertext Transfer Protocol
HTTPS	Secure Hypertext Transfer Protocol
IPTV	Internet Protocol Television
MDS	Multi-Device Service
RP	Reference Point
SD	Service Discovery
SP	Service Provider
STB	Set-Top Box
TD	Terminal Device
TDD	Terminal Device Discovery

UI	User Interface
URL	Uniform Resource Locator
XML	extensible Mark-up Language

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "is prohibited from" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "is not recommended" indicate a requirement which is not recommended but which is not specifically prohibited. Thus, conformance with this specification can still be claimed even if this requirement is present.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

6 Introduction

With the proliferation of digital content and the expanding variety of connected and IP-enabled Internet protocol television (IPTV) terminal devices (TDs) such as the basic model [ITU-T H.721], full-fledged model [ITU-T H.722] and mobile model [b-ITU-T H.IPTV-TDES.4], consumers can access and share IPTV services seamlessly inside or outside their home network (HN).

For the purpose of IPTV services sharing between IPTV TDs, after finishing the service provider (SP) service discovery (SD) procedure, as is defined in [ITU-T H.770], an IPTV TD will initiate the terminal device discovery (TDD) procedure to connect with other IPTV TDs for the convergent IPTV services. Several steps towards terminal device discovery and device capability acquisition are included, as illustrated in Figure 6-1.

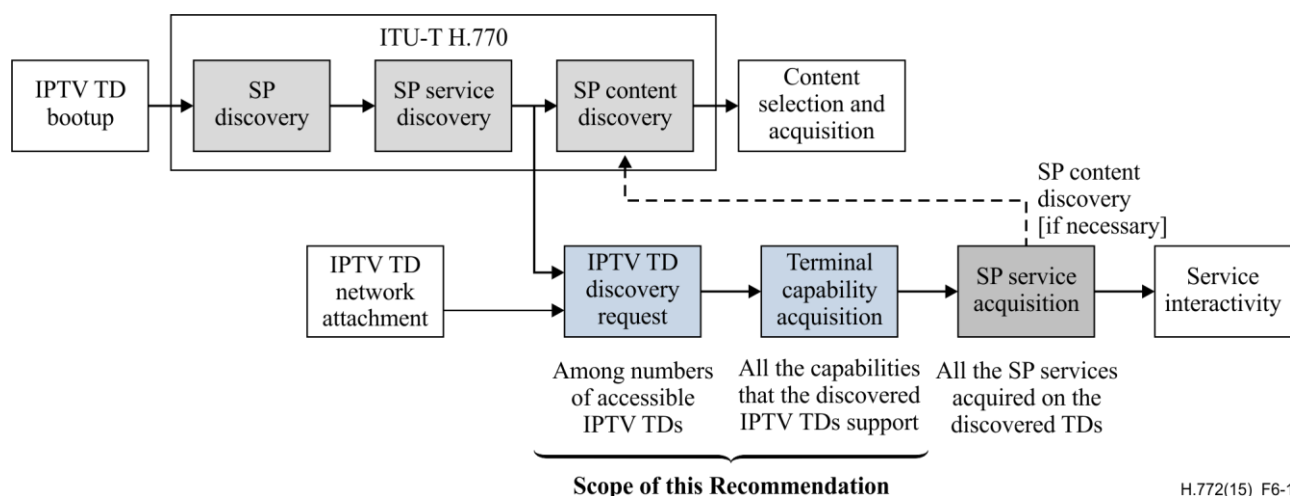


Figure 6-1 – Scope of this Recommendation and the TDD procedure in general

NOTE:

- IPTV TD discovery request: request for discovering all available IPTV TDs; information on the discovered TDs would be listed in this step.
- Terminal capability acquisition: acquisition on the capability of the discovered IPTV TDs, including hardware, software and services supported.
- Terminal device discovery can optionally start from SP discovery by using its defined SP discovery records. For more information on SP discovery, SP service discovery and SP content discovery please refer to [ITU-T H.770]. Appendix I provides an example of retrieving the entrance address for registration-based terminal device discovery (see clause 8.1) by means of service discovery record defined in [ITU-T H.770]. Appendix II provides an example of registration server backup issues. Additional use cases where terminal device discovery is useful can be found in [b-ITU-T HSTP.IPTV-SMTD].

6.1 Overview of terminal device discovery

The target of terminal device discovery is to list the available terminal devices so as to be aware of an interested terminal device. But considering the different device connection model, the terminal device discovery mechanism is different as well.

A discovery request message is recommended to be used to initiate the terminal device discovery procedure. According to different cases, the information involved in the response message may be different. The following clause provides a brief description.

6.1.1 Terminal device discovery in indirect connection mode

In the indirect connection mode, an intermediate entity connects both terminal devices. The intermediate entity can be one of various types. For example, it could be a home gateway, or a remote service platform or just a hub. In a discovery stage, the discovery request message will be transferred through the intermediate device. According to the different working modes, the intermediate device could work as a simple message transfer, or it could manage each possible message route for all terminals.

Figure 6-2 summarizes the steps for terminal device discovery in indirect connection mode.

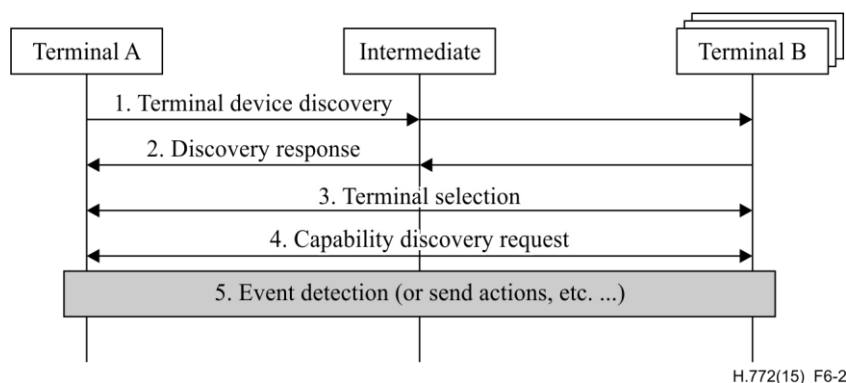


Figure 6-2 – Terminal device discovery for indirect connection mode

1. Terminal A (source) sends out a discovery request message to an intermediate device by broadcast/multicast/unicast mechanism. The intermediate device forwards that message to any possible Terminal B (targets).
2. Terminal B receives the discovery request message and sends back a response message with its identifier through the intermediate device. Otherwise, the discovery request message will be dropped by Terminal B.

3. According to the response message, Terminal A is able to select one or more Terminal B(s) and to initiate a communication request. Then, a communication channel will be established.
4. A capability discovery request message is exchanged between/among all interconnected terminals.
5. After terminal device discovery is completed, the specific application, such as a multi-device application, could be implemented by monitoring events, actions, etc.

6.1.2 Terminal device discovery in direct connection mode

In the direct connection mode, the messages are only transferred between two terminals. The procedure for terminal device discovery is simple. Client-server mode is commonly used; usually this is conducted by non-IP connection means such as infrared or Bluetooth.

Figure 6-3 describes the overview steps of terminal device discovery in direct connection mode.

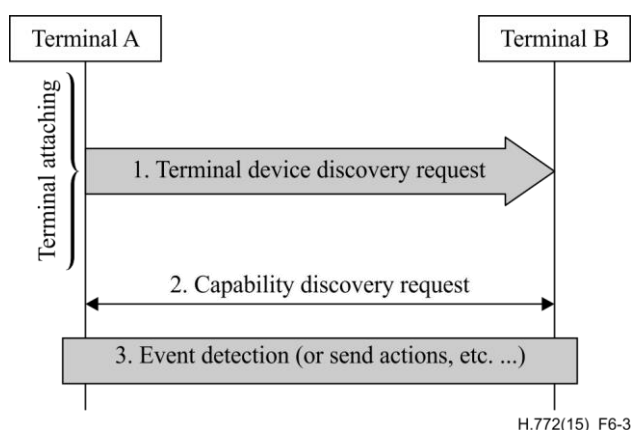


Figure 6-3 – Terminal device discovery for direct connection mode

1. The terminal device discovery request procedure is completed with terminal attaching. Both terminals can be aware of their identifier information (e.g., device name, device ID) within the terminal attaching procedure.
2. A capability discovery request message is exchanged between the two terminal devices.
3. After terminal device discovery is completed, the specific application, such as a multi-device application, could be implemented by monitoring events, actions, etc.

7 Functional architecture of terminal device discovery

Two mechanisms are introduced here: registration-based solution and broadcast-based solution. In IPTV terminal functions, these two mechanisms may have the different requirements for the terminal device discovery functions. In this Recommendation, the discovery agent refers to an IPTV terminal device with an embedded discovery client application. For example, an agent could be regarded as one of the function components of multiple device service (MDS) enabler functions [b-ITU-T H.IPTV-MDS]. The discovery server refers to an IPTV terminal device or an IPTV server platform with an embedded a discovery server application. Both the discovery agent and server should provide the necessary functions to support the terminal device discovery procedure.

Figure 7-1 presents the functional architecture of the discovery agent and server within the common application functions.

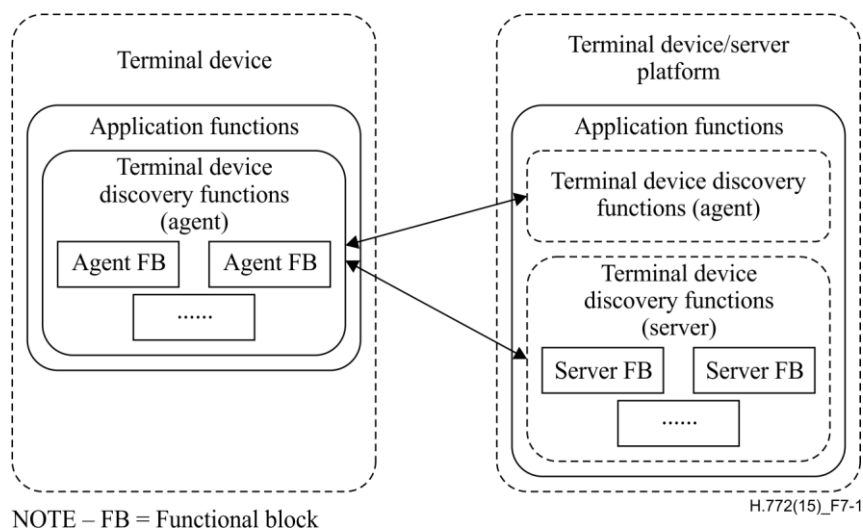


Figure 7-1 – Functional architecture of discovery agent and server

In the public network environment, the client-server model is recommended to be used with the registration-based solution. The discovery server works as an information centre. All terminals should connect to the server for acquiring other terminal information.

In a local network environment, especially in a peer-to-peer network, the discovery may happen directly between terminal devices with a broadcast-based solution. The terminal's information could be shared among all the terminal devices or among special grouped terminals within a local network.

It is noted that, in some powerful terminal devices, e.g., [ITU-T H.722], it might be possible to install both agent and server applications for supporting two functional roles.

Therefore, the functional requirements for the discovery agent and server can be summarized in the following contexts.

7.1 Agent functional block

The agent functional block shall be able to:

- support multicast/unicast based transport protocols;
- register/announce its identification information to other agents/server;
- able to detect the registration/announcement information from other agents;
- translate/encapsulate the registration/announcement information to another format as a proxy for the connected terminal devices;
- collect terminal information from its own terminal device;
- access or allow access to the discovered terminal device for its capability information or service information.

7.2 Server functional block

The server functional block shall be able to:

- detect and receive the registration/announcement information from the connected agents;
- (temporarily) store or maintain terminal device information, including capability information or service information;
- authenticate or transmit an authentication request for terminal devices;