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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

IPTV multimedia services and applications for IPTV –
IPTV terminal devices

IPTV terminal device: Interworking-enabled model of multiple devices

Recommendation ITU-T H.724



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Recommendation ITU-T H.724

IPTV terminal device: Interworking-enabled model of multiple devices

Summary

Recommendation ITU-T H.724 describes the functional components and features that enable the interworking amongst the Internet Protocol television (IPTV) terminal devices defined in Recommendations ITU-T H.721, ITU-T H.722 and ITU-T H.723. ITU-T H.724 complements the specifications of the basic, full-fledged and mobile terminal device models of those Recommendations by specifying the capabilities and functions needed in an IPTV terminal device to enable services or content consumption over multiple IPTV terminal devices. These capabilities and functions include the interworking models, functional roles, application framework, application programming interfaces (APIs), and physical and logical interfaces. In addition, the appendices describe use cases for the interworking models and various multi-device synchronization schemes.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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AVADOCUMENTS

Recommendation ITU-T H.724

IPTV terminal device: Interworking-enabled model of multiple devices

1 Scope

This Recommendation describes the features of the terminal device interworking model which enables the service and content to be consumed between/among the multiple Internet Protocol television (IPTV) terminal devices. Those features include interworking enabled terminal functionalities, functional roles, application framework, application programming interfaces (APIs) and physical/logical interfaces among the multiple IPTV terminal devices, which are also specified in this Recommendation.

The expected types of terminal devices are basic terminal devices defined in [ITU-T H.721], as well as full-fledged terminal devices and mobile terminal devices, which are defined in [ITU-T H.722] and [ITU-T H.723], respectively.

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.720] | Recommendation ITU-T H.720 (2008), <i>Overview of IPTV terminal devices and end systems</i> . |
| [ITU-T H.721] | Recommendation ITU-T H.721 (2015), <i>IPTV terminal devices: Basic model</i> . |
| [ITU-T H.722] | Recommendation ITU-T H.722 (2014), <i>IPTV terminal device: Full-fledged model</i> . |
| [ITU-T H.723] | Recommendation ITU-T H.723 (2016), <i>IPTV terminal device: Mobile model</i> . |
| [ITU-T H.772] | Recommendation ITU-T H.772 (2015), <i>IPTV terminal device discovery</i> . |
| [ITU-T Y.1901] | Recommendation ITU-T Y.1901 (2009), <i>Requirements for the support of IPTV services</i> . |
| [ITU-T Y.1910] | Recommendation ITU-T Y.1910 (2008), <i>IPTV functional architecture</i> . |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 end user [ITU-T Y.1901]: 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.

3.1.2 Internet Protocol television (IPTV) [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.

3.1.3 interworking [b-ITU-T Y.1401]: The term "interworking" is used to express interactions between networks, between end systems, or between parts thereof, with the aim of providing a functional entity capable of supporting an end-to-end communication.

3.1.4 IPTV terminal device [ITU-T Y.1901]: A terminal device which has ITF functionality, e.g., an STB.

3.1.5 IPTV terminal function (ITF) [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.

3.1.6 linear TV [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.

3.1.7 middleware [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.

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

3.1.9 terminal device (TD) [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.

3.1.10 time shifting [ITU-T Y.1901]: A function which allows playback of content after its initial transmission.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 multi-device service: An IPTV service for which all related IPTV functions are distributed cooperatively among two or more devices.

NOTE – The term "Multi-screen" is used synonymously with "Multi-device" in this Recommendation.

3.2.2 multi-device interworking: Interworking among multiple terminal devices with the aim of performing a task by working together, where the terminal devices are possibly of different models.

3.2.3 multi-device application: An interworking-enabled application that could add a multi-device service feature into IPTV service.

3.2.4 multi-device enabler: A set of functional components that provides capabilities for device interworking.

3.2.5 interwork instance: A possible configuration of functional roles for a pair or group of IPTV terminal devices for supporting a specific multi-device service scenario.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Programming Interface
DMC	Digital Media Controller
DMP	Digital Media Player
DMR	Digital Media Renderer
DMS	Digital Media Server

DVR	Digital Video Recorder
ECG	Electronic Content Guide
EPG	Electronic Programme Guide
GUI	Graphical User Interface
HN	Home Network
IP	Internet Protocol
IPTV	Internet Protocol Television
IPTV TD	Internet Protocol Television Terminal Device
ITF	IPTV Terminal Function
LAN	Local Area Network
mDNS	Multicast DNS
MDS	Multi-Device Service
OS	Operating System
P2P	Peer to Peer
PDA	Personal Digital Assistant
PVR	Personal Video Recorder
QoE	Quality of Experience
QoS	Quality of Service
RP	Reference Point
RTCP	RTP Control Protocol
RTP	Real-Time Protocol
SADS	Service and Application Discovery and Selection
SCAP	Service, Content and Application Protection
SCP	Service and Content Protection
STB	Set-Top Box
TD	Terminal Device
TDES	Terminal Device and End System
TD-PD	Terminal Device Peripheral Device
UI	User Interface
UPnP	Universal Plug and Play
VoD	Video-on-Demand
Wi-Fi	Wireless Fidelity

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 Recommendation 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 Recommendation 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 Recommendation 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 this Recommendation.

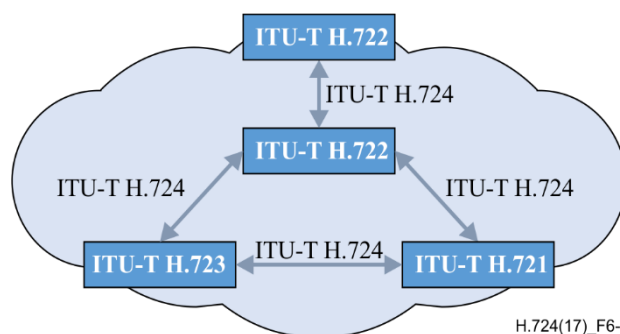
6 Introduction

An IPTV service provider provides the end-to-end solution for distributing content to users via their terminal devices (TDs). IPTV services can also be consumed from terminal devices other than the conventional set-top box (STB). In today's society, more and more people will carry with them more than one TD, such as a laptop or tablet and a mobile phone, at the same time. Each terminal device has its own advantages that help different customers to enjoy their lives in different ways. For example, STB+TV will provide the conventional viewing experience. Mobile phones and tablets will, however, increase the flexibility of watching TV anywhere by taking advantage of their mobility. Personal computers (PCs) provide more powerful computing capacity and a more precisely controlled capability through the use of a mouse and keyboard.

Therefore, there is a tendency for users to enjoy the multimedia service in a more convenient and comfortable manner, adapted to the context of their current experience, by using terminal devices independently or collaboratively.

The overall IPTV functional architecture is defined in [ITU-T Y.1910] and the ITU-T H.720 series of Recommendations (i.e., [ITU-T H.720], [ITU-T H.721], [ITU-T H.722] and [ITU-T H.723]) define the terminal device functions respectively according to the different terminal models. These Recommendations provide the basic hardware and software specifications to support IPTV services consumed over multiple terminal devices. To support multi-device service features in some scenarios, such as streaming, pushing or remote control for any type of terminal device, communication between terminal devices is necessary and should be defined in a standard format.

The relationship between this Recommendation and other ITU-T IPTV terminal device Recommendations is shown in Figure 6-1.



NOTE – Albeit basic model TDs [ITU-T H.721] and mobile model TDs, [ITU-T H.723] could interwork with the same model TD if they implement certain additional non-required features, this is not recommended (see Table 7-1). For this reason, self-interworking is represented in Figure 6-1 only for full-fledged TD models [ITU-T H.722].

Figure 6-1 – Relationship between ITU-T H.724 and other ITU-T IPTV terminal device Recommendations

Based on the general terminal functional architecture defined in the ITU-T H.720 series of Recommendations (i.e., [ITU-T H.720], [ITU-T H.721], [ITU-T H.722] and [ITU-T H.723]), a high-level overview of interworking between terminal devices is shown in Figure 6-2.

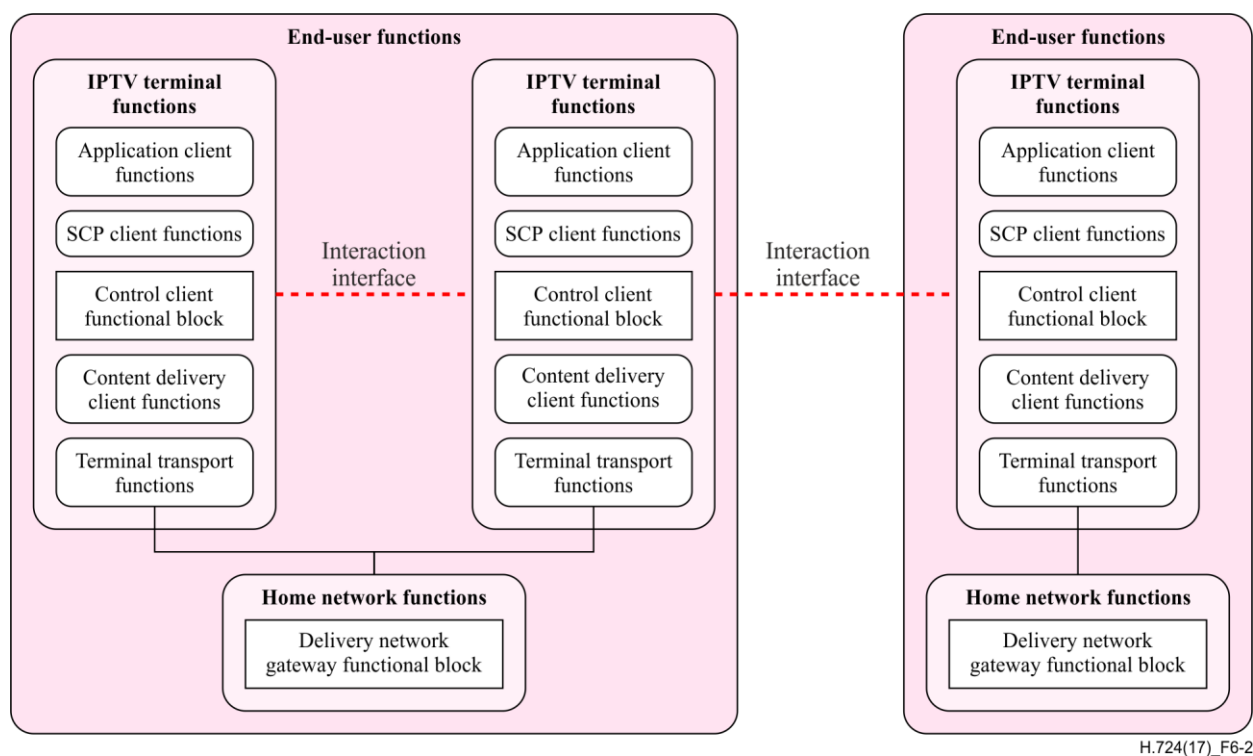


Figure 6-2 – High-level overview of interworking between terminal devices

There are three possible environments for support of interworking between terminal devices:

- All terminals are connected directly, especially for direct connection of two devices
- All terminals are connected together within a home network
- All terminals are connected together via different home networks or transport networks.

With the support of a connection environment, the main functions for implementing multi-device service interworking are listed as follows:

- Terminal device connection establishment

- Terminal device discovery and selection
- Authentication
- Capability discovery
- Content resource discovery and selection
- Service interaction.

It is recommended that the data connection be IP-based and relies on either fixed network connection or wireless or hybrid connection. For example, the digital living network alliance (DLNA) [b-IEC 62481] home networked device interoperability guidelines and the [b-ISO/IEC 29341] universal plug and play (UPnP) specifications are widely used to support the above scenarios, especially in device-to-device connection.

7 Services and key features of interworking among IPTV terminal devices

7.1 IPTV service over multiple terminal devices

The IPTV services listed in clause 6 are able to be consumed not only on each terminal device, but also cooperatively over multiple inter-connected terminal devices. Those terminals can be connected together with various access methods, e.g., wireless fidelity (Wi-Fi), Ethernet cable, Bluetooth, etc. Commonly, they can be connected directly with each other or via a central access point.

A full-fledged ITU-T H.722 IPTV terminal device, which supports multi-device service features, may be able to share the service with other terminal devices. For example, the terminal device may be seen as a media centre in a home network environment. Other ITU-T H.721, ITU-T H.722 and ITU-T H.723 terminal devices can be connected together and are able to be discovered and exchange information with each other. Therefore, any authorized TD is able to share/transfer the IPTV service with/into other TDs.

To support the above features, a full-fledged IPTV terminal device should provide the following capabilities.

- Connection and authentication mechanism for other terminal devices (e.g., a mobile phone or PC)
- Reciprocal discovery across the various device types
- Protocol for communication among the multiple aforementioned TDs
- Media information navigation over the connected TDs
- Media stream from/to another connected TD to play (with optional use of an adaption mechanism). Support of mirror mode, content sharing mode and coordination mode stream transferring
- Remote control over the connected TDs, including legacy remote controller and remote EPG mode, mirror controller
- Transfer of file-based media between the local storage of connected TDs
- Authorization for sending control instructions via full-fledged TD to control another TD (e.g., play, fast forward and rewind).

7.2 Features of multiple interworking terminal devices

7.2.1 Physical devices connection for interworking

The following modes are recommended to be used for supporting multiple interworking terminal devices: