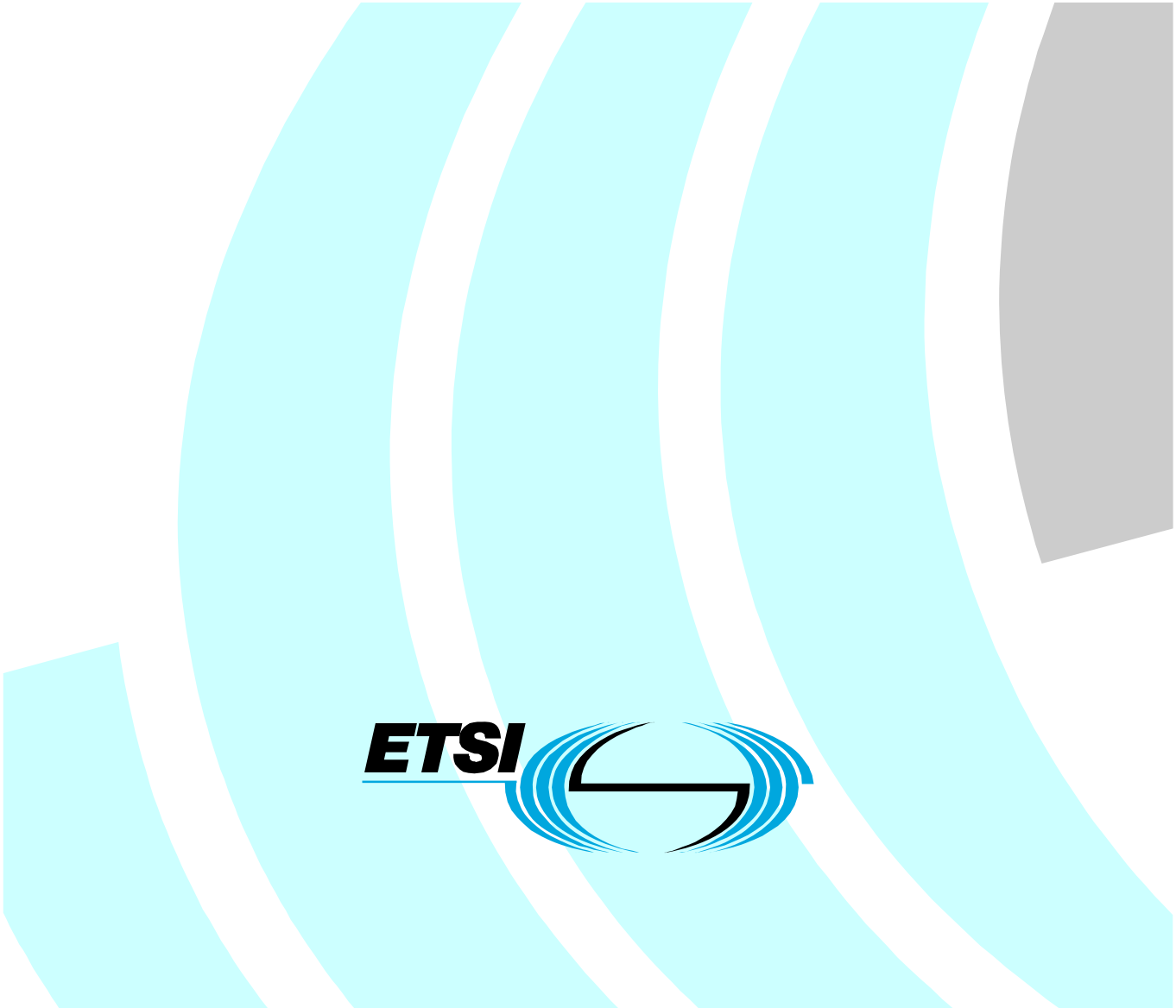
ETSI TS 185 009 V2.2.1 (2009-05)

Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Architecture and reference points of a customer network device for IMS based IPTV services



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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Introduction

The present document describes the main type of IMS based IPTV Customer Devices that take part in Customer Premises Network in terms of general architecture and in terms of reference points with the NGN and CNG.

1 Scope

The present document defines the stage 2 Customer Network Devices for IPTV services (IPTV-CND) specifications. It is therefore addressing the overall architecture of the customer network device (CND) enabling the IPTV service consumption. The architectural definition is covering both transport and service layer related functionalities. The reference points between the CND and the Customer Network Gateway (CNG) are also part of the specifications.

The 2 solutions elaborated specified in TS 182 027 [2] and TS 182 028 [4] are IMS based IPTV and IPTV Dedicated Subsystem solutions but only the IMS based IPTV solution is considered in the present document.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 181 016: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Service Layer Requirements to integrate NGN services and IPTV".

[2] ETSI TS 182 027: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IPTV Architecture; IPTV functions supported by the IMS subsystem".

[3] ETSI TS 183 063: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based IPTV stage 3 specification".

[4] ETSI TS 182 028: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IPTV Architecture; Dedicated subsystem for IPTV functions".

[5] ETSI TS 183 064: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Dedicated IPTV subsystem stage 3 specification".

[6] ETSI TS 185 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Customer Network Gateway Architecture and Reference Points".

[7] ETSI TS 185 006: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Customer Devices architecture and interfaces and Reference Points".

[8] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture".

[9] ETSI TS 181 005: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); Service and Capability Requirements".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] ETSI TR 185 004: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); High level customer network architectures".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Customer Network Device (CND): physical device enabling service(s) usage

NOTE: CNDs can be dedicated to the internet, conversational and audio-video services, but they could be also Consumer Electronics equipment and other devices which may have nothing to do with these premium services (e.g. services performing a content sharing within a CPN, typically between a PC and a music system, through the CNG).

Customer Network Gateway (CNG): gateway between the Customer Premises Network (CPN) and the Access Network able to perform networking functions from physical connection to bridging and routing capabilities, but also possibly implementing functions related to the service support

Customer Premises Network (CPN): in-house network composed by customer network gateway, customer network devices, network segments (physical wired or wireless connections between customer network elements), network adapters (performing a L1/L2 conversion between different network segments) and nodes (network adapters with L3 routing capabilities)

IPTV services Customer Network Device (IPTV-CND): physical device enabling consumption of IPTV service(s)

NOTE: IPTV-CNDs are dedicated to the TV like audio-visual services such as live TV or On demand.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACF	Access Configuration Function
AtF	Attachment Function
B2BUA	Back-to-Back User Agent
BC	BroadCast
BF	Browser Function
BTA	Broadcast TV Application
C-BGF	Core Border Gateway Function
CDA	CoD Application
CF	Configuration Function
CMF	Configuration and Maintenance Function

CMM	Configuration Management and Monitoring
CND	Customer Network Device
CNG	Customer Network Gateway
CNGCF	Customer Network Gateway Configuration Function
COD	Content On Demand
CPA	Client PVR Application
CPN	Customer Premises Network
cPVR	client PVR
DHCP	Dynamic Host Configuration Protocol
DLNA	Digital Living Network Alliance
EPG	Electronic Programme Guide
ESG	Electronic Service Guide
IGMP	Internet Group Management Protocol
IMS	IP Multimedia Subsystem
IPTV	Internal Protocol TeleVision
IPTVF	IPTV Function
LAF	Local Authentication Function
MD	Media Delivery
MDA	MetaData Application
MDF	Media Delivery Function
MDP	MetaData Processing
MPC	Media Player Control
MPPF	Media Packet Processing Function
NACF	Network Access Configuration Function
NAPT	Network Address and Port Translation
NAT	Network Address Translation
NGN	Next Generation Network
NPA	N-PVR Application
NPVR	Network Personal Video recorder
NTF	NAPT Traversal Function
PCF	Policy Control Function
P-CSCF	Proxy Call Session Control Function
PPF	Plug and Play Function
PVR	Personal Video Recorder
QoE	Quality of Experience
QoS	Quality of Service
RTP	Real Time Protocol
RTSP	Real Time Streaming Protocol
SCF	Session Control Function
SDF	Service Discovery Function
SIP	Session Initiation Protocol
SPA	Service Profile Application
SPM	Service Profile Management
SSF	Service Selection Function
STB	Set Top Box
UA	User Agent
UE	User Equipment
UPnP	Universal Plug and Play
VOD	Video On Demand

4 High level functional architecture for IPTV-CNDs

The high level functional architecture of IPTV-CND is composed of 3 layers as represented in figure 4.1.

4.1 Architecture layers

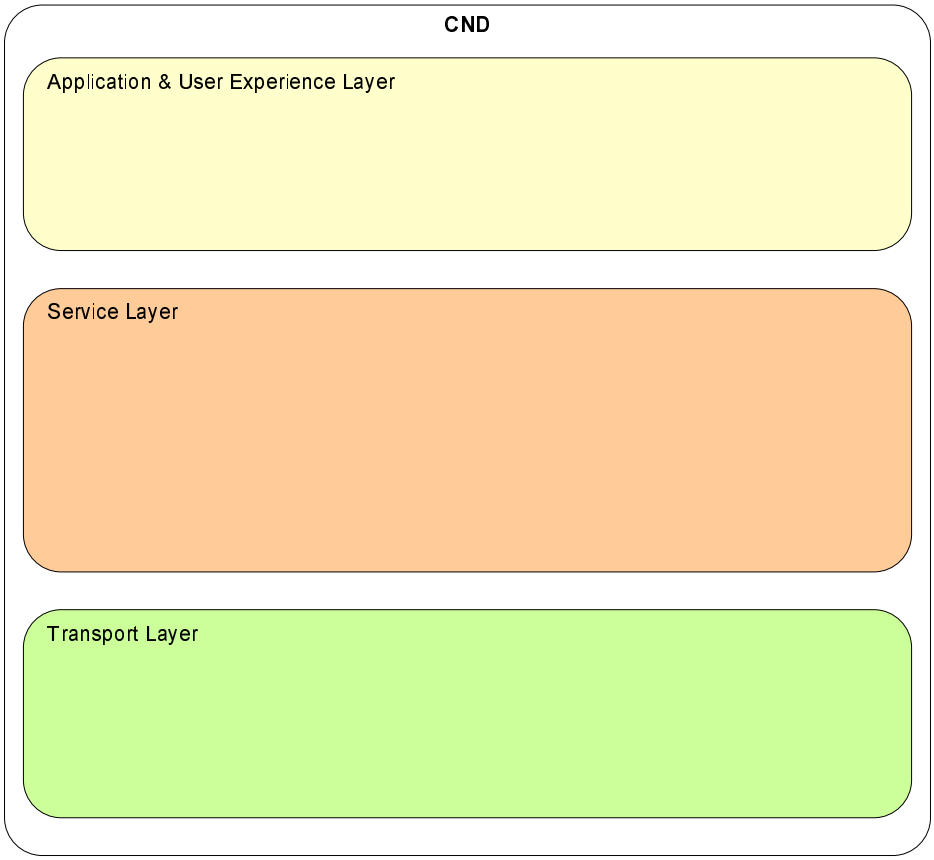

Figure 4.1: Architecture layers

4.1.1 Transport layer

This layer comprises functional entities that provide relevant IPTV transport level functions such as network attachment and media processing and streaming functions.

4.1.2 Service layer

This layer comprises functional entities that provide relevant IPTV functionality to applications above and also include entities that are used for management and control of platform itself. Depending on the type of services, the service layer entity must communicate either with other devices in the customer network or the external network using the transport layer. Service layer entities do not have a direct user interface and may be controlled via appropriate applications layer entities.

Examples include:

- Media Management function.
- Service Discovery function.
- Platform security function.
- CA/DRM function.

- Configuration and Management function, etc.

4.1.3 Application and User Experience layer

This layer comprises IPTV applications that have user interface (user driven input and /or output) and use the services provided by the underlying Service Layer to drive end user experience.

Examples of applications include:

- VOD.
- Broadcast TV.
- IPTV Service Guide interface, etc.

The user may be a customer or a service operator.

For the service operator, these functions may include service specific functions such as measurement applications (e.g. user satisfaction).

4.2 IPTV operating modes

IPTV CNDs can be simple terminals connected to the NGN or be part of a CPN in connection with the CNG. Different configuration are discussed in TR 185 004 [i.1]. Consequently, the IPTV CND can work in different modes in relation with the CNG.

- **Bridged mode:** In this mode, the IPTV CND is working in compliance with TS 183 063 [3] and is connected to the NGN network or connects to the NGN via a CNG operating in bridged mode. In bridged mode of operation, the CNG provides only L1-L2 functionality. The CND connects over G_m to the NGN.
- **Routed mode:** In this mode, the IPTV CND connects to the NGN via a CNG operating in routed mode and is capable to interact with other devices in the CPN with other protocols above L3. In routed mode of operation, the CNG includes routing and service layer functionality as well (L3 and above). The routed mode shall be related to an authentication session. A session operating in one of the following routed modes can only operate in one of them at the same time:
  - NGN mode: IPTV CND connects directly to the NGN through the CNG over G_m. The CNG-PCF and CNG-NFF as defined in ETSI TS 185 003 [6] may perform functionality such as NAPT and CNG internal QoS.
  - CPN mode: IPTV CND connects to the NGN through CNG over $G_{m'}$. The CNG-SIP Proxy B2BUA, CNG-ACF, CNG-PCF as defined in TS 185 003 [6] may perform functionality such as NAT/FW traversal, CNG internal QoS or IETF SIP to IMS SIP conversion.
- **Intra CPN mode:** At service layer, the 2 devices interact with or without the support of the CNG.

NOTE: Specifications for the intra CPN mode are not part of the present document but in this case, for example, IPTV CND could follow DLNA (Digital Living Network Alliance) interoperability guidelines.

5 IPTV Customer Network Device Architecture

The present document categorizes IPTV-CNDs into two types depending on TISPAN IPTV solutions that have been developed by WG2. They are:

- Devices compatible with the IPTV dedicated subsystem solution.
- Devices compatible with the IMS based IPTV solution.

Devices compatible with IPTV dedicated subsystem solution:

This category of IPTV CNDs includes IPTV capable device which can be utilized in conjunction with IPTV services delivered in compliance with TS 182 028 [4] and TS 183 064 [5].

Devices compatible with the IMS based IPTV solution:

This category of IPTV CNDs includes IPTV capable device which can be utilized in conjunction with IPTV services delivered in compliance with TS 182 027 [2] for "IPTV functions supported by the IMS subsystem" for the architecture aspects and TS 183 063 [3] for protocols aspects.

Only IMS based IPTV compatible devices are considered for detailed description in the present document.

5.1 IMS based IPTV compatible devices

IMS based IPTV compatible means compliance with TS 182 027 [2].

5.1.1 Detailed Architecture

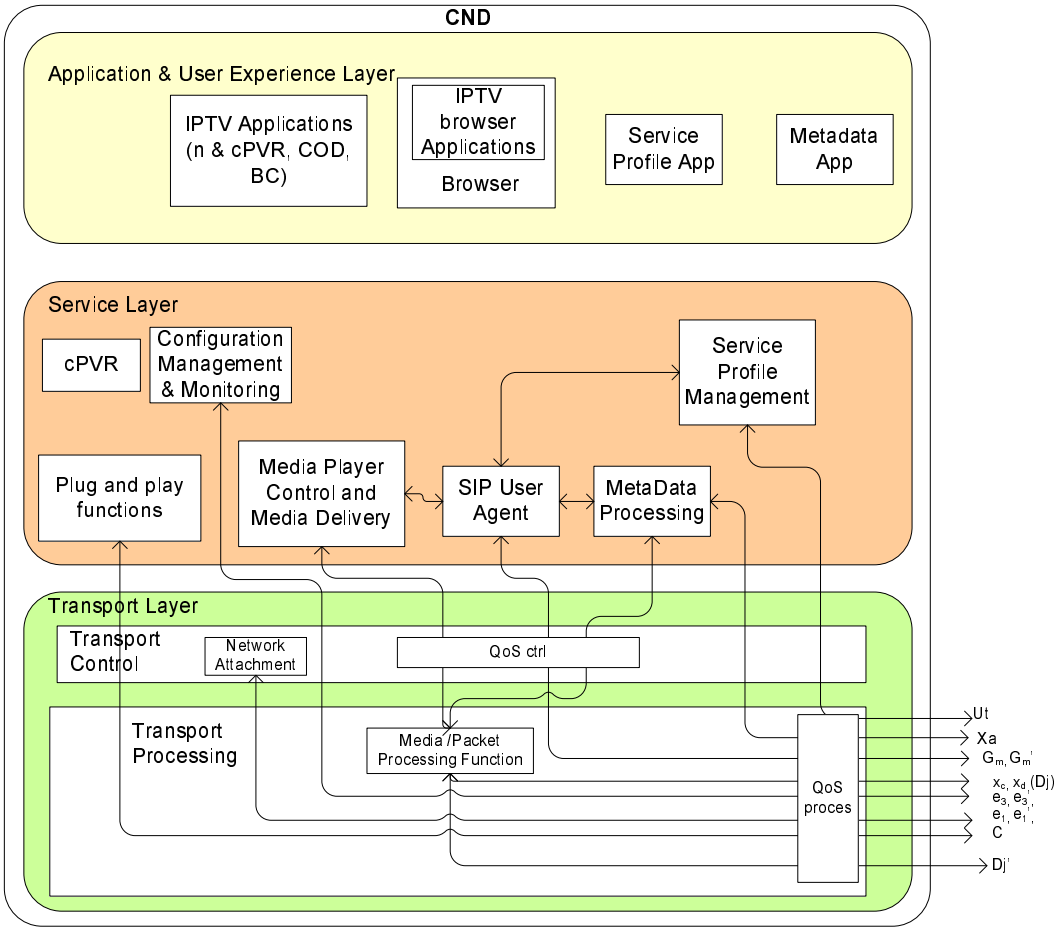

Figure 5.1: Detailed IPTV CND architecture

NOTE: Entities in a given layer are interfacing/interacting with one or more functional entities in layers below it in order to accomplish the given function. Figure 5.1 does not depict all these internal interfaces/interactions which are implementation specific.

5.1.1.1 Transport Layer Functions

5.1.1.1.1 Network attachment functions

IPTV CND attachment functions are compliant with the specifications for CNDs TS 185 006 [7]. They include:

- IPTV-CND-CMF: Customer Network Device - Configuration and Maintenance Function.
- IPTV-CND-AtF: Customer Network Attachment Function.
- IPTV-CND-LAF: Customer Network Device - Local Authentication Function.

5.1.1.1.2 Transfer functions

IPTV CND transfer functions are compliant with the specifications for CNDs TS 185 006 [7].

- IPTV-CND-NTF: NAPT Traversal Function.

5.1.1.1.3 Transport functions

5.1.1.1.3.1 IPTV-CND-MPPF: IPTV Customer Network Device-Media Packet Processing Function

The MPPF is the termination point for media flows encrypted or not encrypted, over the D_j interface connecting the UE to the NGN C-BGF as defined in ES 282 001 [8].

NOTE 1: The handling of encrypted media flows is out of scope of this release.

NOTE 2: This function is providing support for NAT traversal such as the media port punching mechanisms and also for the usage of IGMPv3.

5.1.1.1.3.2 IPTV-CND-QOS: IPTV Customer Network Device-QoS Function

The IPTV CND should support the following set of QoS functions for egress traffic:

1) Traffic classification based on rules defined by the NGN service provider, access network provider or connectivity provider (business role definitions are defined in TS 181 005 [9]).

2) Packet marking based on the different service classes.

5.1.1.2 Service layer functions

NOTE: The security aspects are not specified in this release. The term security is to be taken here in a general sense covering several aspects including content protection, conditional access, privacy and parental control.

5.1.1.2.1 IPTV-CND-SIP UA: IPTV Customer Network Device SIP UA

This block implements the G_m, $G_{m'}$ interfaces on IPTV CND compatible with the IMS based IPTV solution. This SIP UA shall perform the service authentication and manage signalling flows securely following in that what is already described in clause 6 on Authentication in TS 185 006 [7].

5.1.1.2.2 IPTV-CND-SPM: IPTV Service Profile Management function

This block implements the U_t interface; the U_t enables the access to an Application Sever to support the user in configuration services update.

5.1.1.2.3 IPTV-CND-MDP: IPTV Customer Network Device MetaData Processing

This functional entity utilizes X_a, G_m and/or X_d to receive service related metadata (e.g. IPTV services plans, EPG, VOD catalogue, customer applications).

5.1.1.2.4 IPTV-CND-MPC: IPTV Customer Network Device Media Player Control

This functional entity utilizes X_c for control of media delivery (e.g. RTSP set up, Play, stop, etc.).

5.1.1.2.5 IPTV-CND-MD: IPTV Customer Network Media Delivery

This functional entity implements the X_d interface for the media streaming (e.g. RTP streams).

5.1.1.2.6 IPTV-CND-CMM: Configuration Management and Monitoring

This function provides support for the IPTV-CND-CMF for service layer configuration, middleware management, performance monitoring (providing feedback on QoS/QoE including packet losses, packet delay and delay jitter, frame loss, pixilation) and diagnostics through the e_3 reference point and e3' reference point.

5.1.1.2.7 IPTV-CND-PPF: IPTV Customer Network Device - Plug and Play Function

The CND-PPF in the CNG may exchange some device information (discovery, description) with other devices and allow their control. Particularly, the entity should allow a communication between many types of Customer Device within the CPN, based for instance on UPnP.

Additional functions may be present in the CNG and the IPTV CND to support multi service providers capabilities as well as local communications between the different devices of the CPN, including the CNG.

The functions supporting these capabilities are already defined in:

- TS 185 003 [6] as the CNG-PPF (CNG - Plug and Play function).
- TS 185 006 [7] as the CND-PPF (Customer Network Device - Plug and Play function).
- IPTV-CND-PPF: IPTV CND Plug and Play function.

And the related reference point defined in:

- TS 185 006 [7] Reference point C.

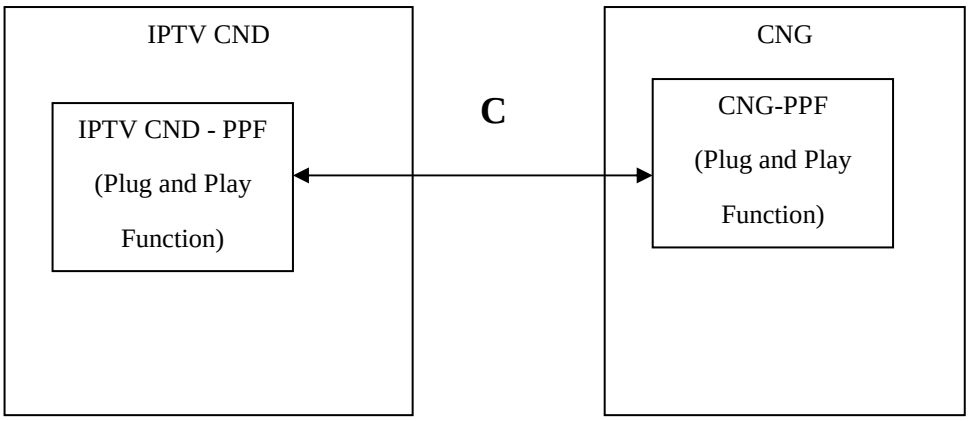

Figure 5.2: Reference point C between CNG and IPTV CND

Specific definitions of these functions for IPTV services are described hereafter.

Role of IPTV CND Plug and Play function: collect and deliver information related to:

- Content availability and description: There can be different format utilized in the CPN to represent these data. The Plug and Play function may include capabilities for converting data format.
- Local user identity and related rules for content access: there may be local identity utilized only in the CPN. The Plug and Play function may include capabilities for managing local identities with IMS domain customer identities.

- User interactivity related data to get control over resources and content selection and playing. Presentation data supporting user interactivity can be in different format. The Plug and Play function may include capabilities for adaptation of these data format.

- Aggregation of content description data: content can be provided from outside by different service providers or can be stored locally.

5.1.1.2.8 IPTV-CND-cPVR: IPTV client PVR Function

This functional entity has a normal PVR's capabilities, i.e. it records linear TV program and plays the recorded TV program; in addition, it provides also time-shift capability.

The interface between IPTV application cPVR and the cPVR function is internal; therefore it can be proprietary.

5.1.1.3 Applications and user experience layer functions

The functions in this layer may be supported directly on the CND by native applications or they may be executed in a browser-based environment. Both types of applications may coexist on the CND implementing a hybrid concept.

5.1.1.3.1 IPTV Applications

The IPTV Applications provide support for a variety of IPTV Services and functions. They include:

5.1.1.3.1.1 IPTV-CND-CDA: The CoD Application

This application function allows a user to select and control playback of a CoD stream.

5.1.1.3.1.2 IPTV-CND-BTA: Broadcast TV Application

This application function allows a user to select a broadcast channel to view live/broadcast IPTV content.

5.1.1.3.1.3 IPTV-CND-NPA: N-PVR Application

This application function allows users to schedule N-PVR capture requests.

5.1.1.3.1.4 IPTV-CND-CPA: Client PVR Application

This application function allows end-users to schedule client PVR for recording TV program and playing the recorded TV program and time-shift TV.

5.1.1.3.2 IPTV-CND-SPA: Service Profile Application

This application function allows users to manage IPTV service profile information.

5.1.1.3.3 IPTV-CND-MDA: MetaData Application

This functional entity enables the user to exchange service selection data/metadata (using the IPTV-CND-MDP) that enriches IPTV service experience and may be exchanged with the SSF (EPG guide, CoD catalogue, etc.), MDF or the SCF.

Implementations of the IPTV-CND-MDA shall contain:

- EPG services as required in TS 181 016 [1].

Implementations of the IPTV-CND-MDA may contain:

- ESG services as required in TS 181 016 [1].

- Instant messaging services as required in TS 181 016 [1].

- Context aware messaging services (e.g. content recommendations) as required in TS 181 016 [1].

5.1.1.3.4 IPTV-CND-BF: Browser Function

The Browser Function (BF) loads web based IPTV Application (for example, COD, Broadcast TV and NPVR) from the Service Selection Function (SSF) via the Xa reference point defined in TS 182 027 [2].

It should be able to run IPTV applications (web based) for presentation of user interface and including scripting support for interaction at the underlying service layer functions (e.g. Media Player Control and Media Delivery, Metadata Processing, etc.).

For example an application that runs in the BF can query (internally to the IPTV-CND at the Metadata Processing Function) the Metadata-based Content Guide in order to extract any data it may contain.

6 Reference points

6.1 Reference points for IMS based IPTV compatible devices

6.1.1 Transport layer Reference points

6.1.1.1 Transport Reference points

D_j: This reference point is used to carry all data between the UE and the access point in the NGN. As such, in the case of IPTV CND, the D_j reference point is used to send and receive media data and media control flows to/from the NGN as specified in TS 182 027 [2]. The Dj reference point complies with the ES 282 001 [8] specifications.

$D_{j'}$: The $D_{j'}$ reference point is responsible for the exchange of media flows between the IPTV CND and the CNG. It is applicable only in case the CNG is supporting IPTV in routed mode, as specified in the present document. Through $D_{j'}$, the IPTV CND communicates with the CNG-IPTVF and its related functionalities (IGMP proxy and snooping).

This reference point is mandatory for IPTV CNDs performing CoD service (using RTSP) and BC service (using IGMP).

6.1.1.2 Network attachment Reference points

e_1: This reference point between the IPTV-CND and NACF is used by the IPTV CND for attaching itself to the IMS IPTV service provider network. The usage of the e_1 reference point conforms to TS 185 006 [7].

$e_{1'}$: This reference point between the IPTV CND and CNG (in "routed mode") provides network attachment functions and conforms to TS 185 006 [7].

e_3: This reference point between IPTV-CND and CNGCF is used to remotely configure and manage the IPTV CND. The usage of the e_3 reference point conforms to TS 185 006 [7].

$e_{3'}$: This reference point between the IPTV CND and CNG (in "routed mode") provides device configuration functions and conforms to TS 185 006 [7].

6.1.2 Service layer Reference points

C: This reference point is between the Plug and Play function in the IPTV CND and the CNG-PPF in accordance with definition given in TS 185 006 [7] and TS 185 003 [6]. This reference point is optional and is used only in the ***Routed NGN mode*** and the ***Routed CPN mode***. In these modes, the reference point C allows the establishing of a relationship between the CPN resources and the NGN; this relationship is based on exchange of information between CNDs and possibly the CNG in the CPN.

G_m: This reference point between the IPTV CND and the NGN (P-CSCF) and conforms to TS 185 006 [7].

$G_{m'}$: This reference point between the IPTV CND and CNG conforms to TS 185 006 [7].

X_c: This logical end-to-end reference point between the IPTV-CND and IPTV Media Control Function is used for carrying media control messages. The usage of the X_c reference points conforms to TS 182 027 [2].

X_d: This logical end-to-end reference point between the IPTV-CND and IPTV Media Delivery Function is used for carrying the actual media. The usage of the X_d reference points conforms to TS 182 027 [2].

X_a: This reference point between IPTV-CND and SSF is used by the IPTV-CND to make appropriate service selections.

U_t: This reference point between the IPTV-CND and IPTV Service Control is used for IPTV user profile configuration and conforms to TS 182 027 [2].

NOTE: The **X_a**, reference point between IPTV-CND and SDF used by the IPTV-CND to make appropriate service attachment is a non mandatory reference point defined in an informative annex of TS 182 027 [2] and is for further study.

7 The IPTV - CND Data Model

The IPTV CND shall support the device data model for remote management as proposed by DSL Forum, the TR135 model for STB published December 2007.

Additionally, any relevant TR135 object extensions specified in TS 183 063 [3] required to support IPTV Service Provider/SDF Discovery as per "TR-069 Based SDF Discovery procedures" should be supported.

8 Deployment's scenarios

In the CPN the IPTV service can be provided in at least two deployment's scenario. Below are two such options provided:

- **Option 1:** All IPTV functionalities are implemented in the IPTV-CND.
- **Option 2:** Some IPTV functionalities are implemented in the IPTV-CND and the others in the CNG.

8.1 Option 1

In the deployment's scenario "Option 1" all functionalities described in the present document are implemented in the IPTV-CND.

8.2 Option 2

In the deployment's scenario "option 2", according to TS 185 003 [6], a subset of functionalities described in the present document are implemented in the IPTV-CND.

Table 8.1 lists the functionalities that are implemented on the CNG and on the IPTV-CND.

Table 8.1: Deployment's scenario "option 2"

Layer	Function	CNG	IPTV-CND
Transport	Network Attachment: *CMF* - Configuration and Maintenance *AtF* - Attachment *LAF* - Local Authentication	X	X
	Transfer : *NTF*- NAPT Traversal	X	
	MPPF - Media Packet Processing Function		X
	QoS - QoS Function	X	X
	IPTV Function (IGMP proxy, snooping, etc.)	X	

Layer	Function	CNG	IPTV-CND
Service	SIP UA	X	
	SPM - Service Profile Management		X
	MDP - Metadata Processing	X	X
	MPC - Media Player Control		X
	MD - Media Delivery		X
	CMM - Configuration Management and Monitoring	X	X
	CF (PPF) - Plug&Play Function	X	X
	Sec - Security Function		X
Application	*IPTV Application:* *IPTV-CND-CDA* - CoD Appl. *IPTV-CND-BTA* - Broadcast TV Appl. *IPTV-CND-NPA* - N-PVR Appl. *IPTV-CND-CPA* - client PVR Appl.		X
	SPA - Service Profile Appl.		X
	MDA - Metadata Appl.		X
	IPTV-CND-BF Browser Function		X
NOTE: X: means where (CNG or IPTV-CND) the functionality should be implemented, if it is present.			

The option 2 allows the IPTV-CND to use some functions present in CNG, e.g. SIP-UA, according to TS 185 003 [6].

9 Information Flows

NOTE: Information flows clause is non normative text reported in form of examples to better understand the relationships between the IPTV CND and the NGN, the CNG and other CNDs.

The list of flows given hereafter is not exhaustive.

9.1 Information flows between IPTV-CND and NGN

9.1.1 Example message flows on X_a

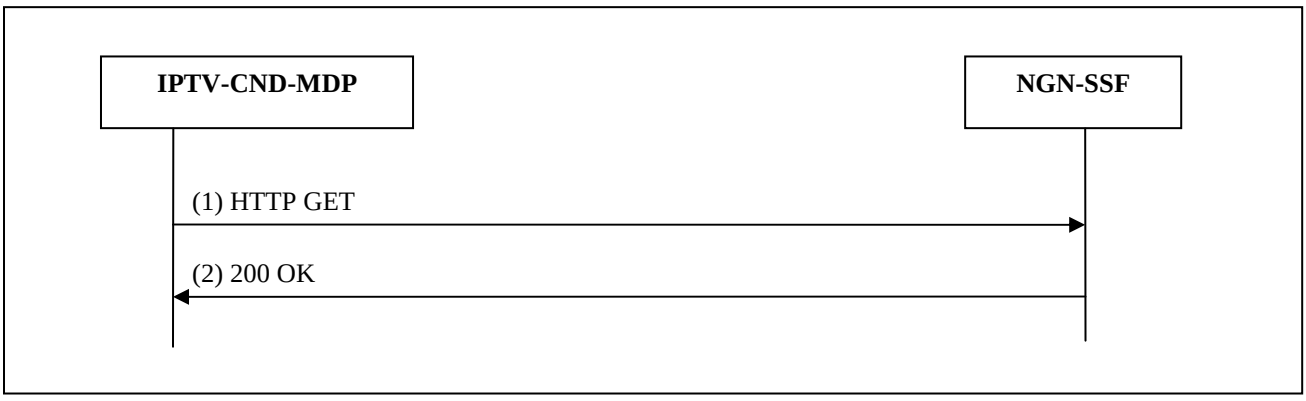

Figure 9.1: Message flows for service selection

The message flow in figure 9.1 is an example of service selection function.

With the HTTP GET, the CND asks the NGN for the program information, such as CoD catalogue, BC channels. And NGN returns the program information to the CND.

This procedure example for service selection using HTTP is compliant with TS 183 063 [3].

This procedure example is applicable for the IPTV-CND in the bridged mode.

9.1.2 Example message flows on U_t

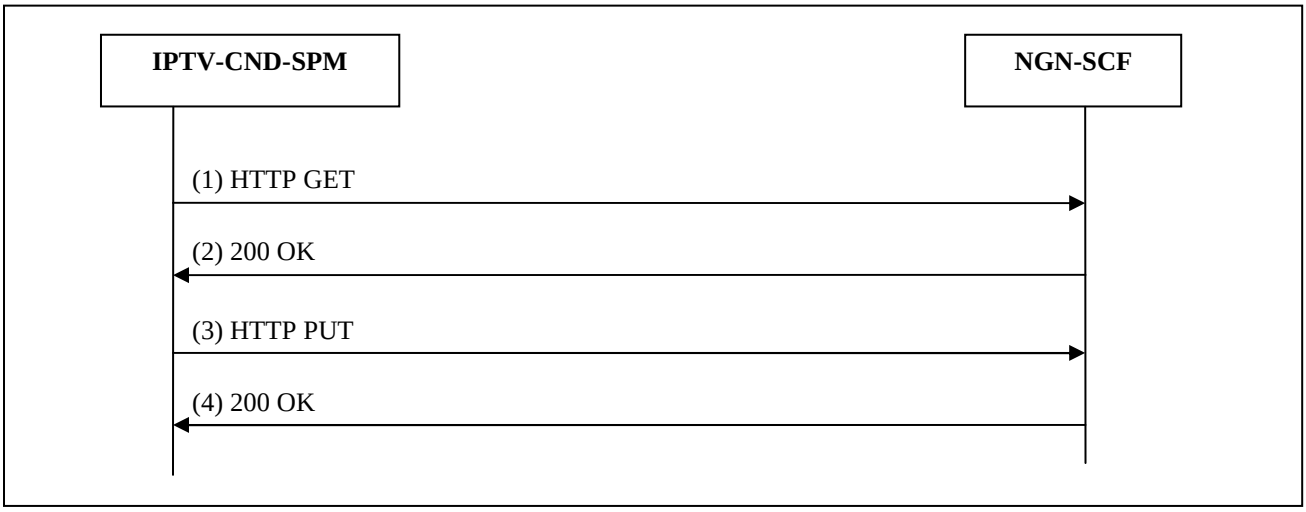

Figure 9.2: Message flows for service related information configuration

The message flow in figure 9.2 is an example of service related information configuration function.

With HTTP GET and PUT methods, the CND retrieves and modifies its service related information.

The procedure example for service related information configuration using HTTP is compliant with TS 183 063 [3].

This procedure example is applicable for the IPTV-CND in the bridged mode.

9.1.3 Example message flows on G_m

9.1.3.1 Registration

The NGN registration flows are compliant with TS 183 063 [3].

9.1.3.2 Session Initiation and Termination

The Session Initiation and Termination flows are compliant with TS 183 063 [3].

9.1.3.3 IPTV Service Action Data Delivery

The IPTV service action data delivery flows are compliant with TS 183 063 [3].

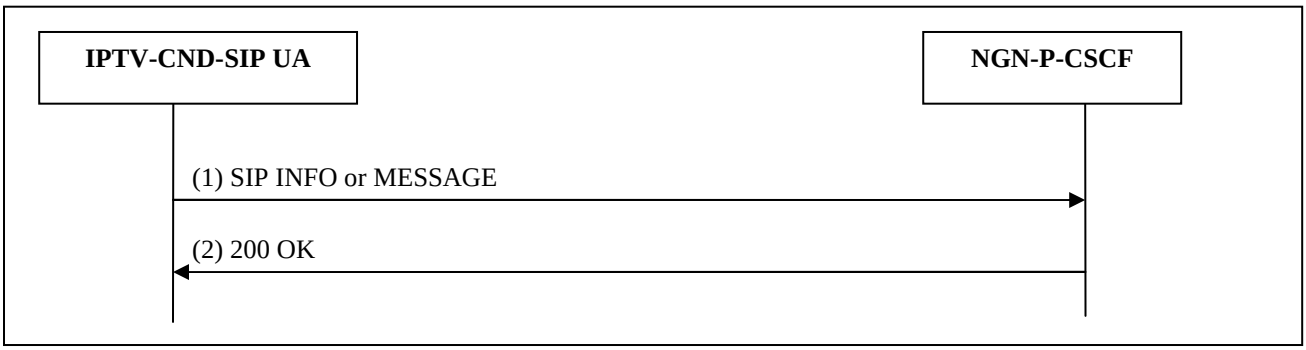

Figure 9.3: Message flows for IPTV service action data delivery

IPTV service action data, such as BC bookmarks, Available CoD and NPVR items, are delivered to CNG-SIP via SIP INFO or MESSAGE method.

This procedure example for service action data delivery is compliant with TS 183 063 [3].

This procedure example is applicable for the IPTV-CND in the bridged mode.

9.1.4 Example message flows on X_c and X_d

IPTV application utilizes X_c for media control, such as RTSP setup, play, teardown, and utilizes X_d for media streaming, such as RTP stream.

9.1.4.1 Message flows for CoD service

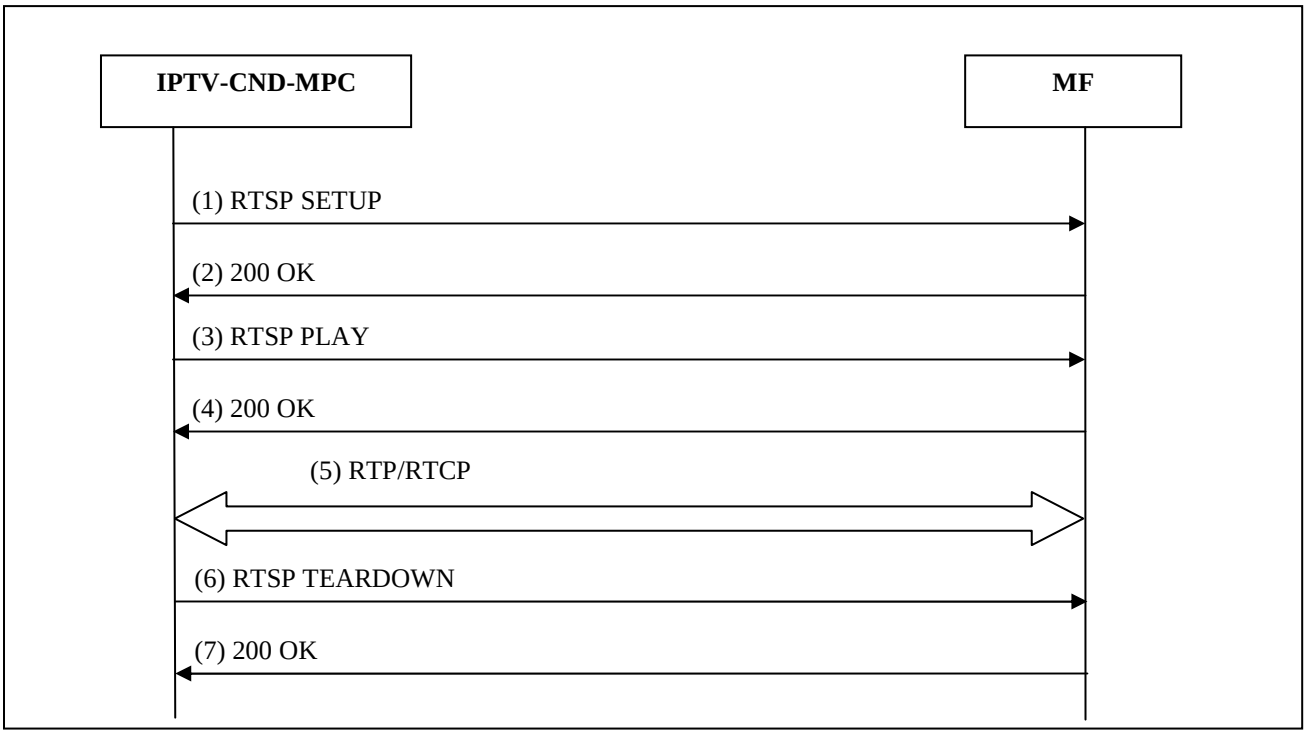

Figure 9.4: Information flows for media content control and delivery

This procedure example for media control using RTSP is compliant with TS 183 063 [3].

This procedure example is applicable for the IPTV-CND in the bridged mode.

9.1.4.2 Message flows for BC service

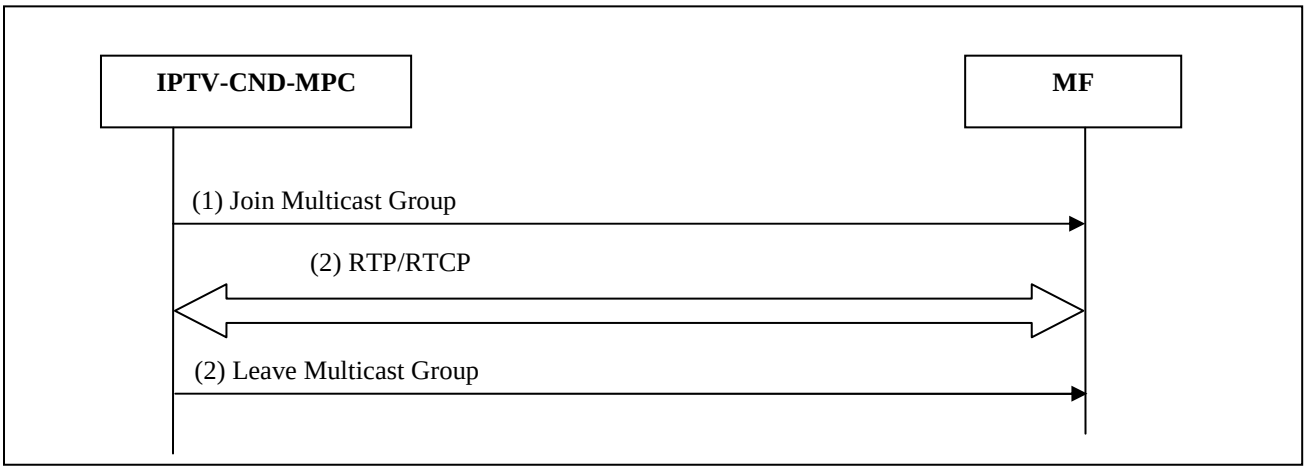

Figure 9.5: Information flows for media content control and delivery

This procedure example for media streaming using IGMP is compliant with TS 183 063 [3].

This procedure example is applicable for the IPTV-CND in the bridged mode.

9.1.5 Example message flows on e_3

Figure 9.6: Message flows for configuration and management

IPTV applications utilize e_3 for auto-configuration, software management and diagnostics.

This procedure example is applicable for the IPTV-CND in the bridged mode.

9.1.6 Example message flows on e_1

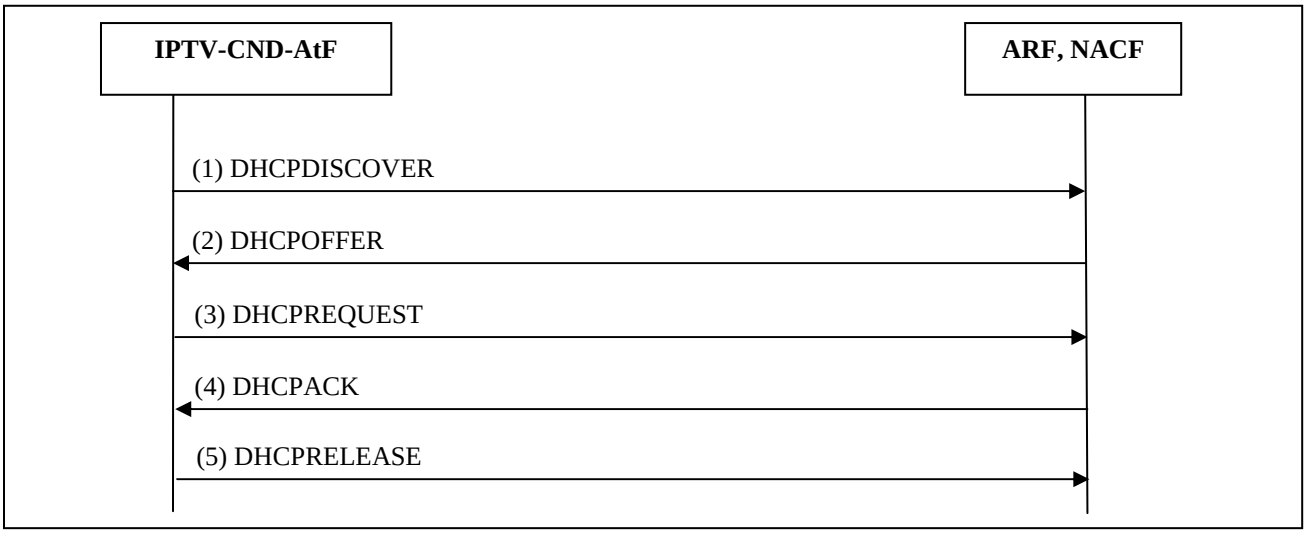

Figure 9.7: Message flows for network attachment

1) The CND broadcasts a DHCPDISCOVER message with its client identifier and some request parameters, such as Domain name and P-CSCF address, etc.

2) Multiple DHCP servers return DHCPOFFERs with parameters to the CND.

3) The CND choose one DHCPOFFER, and broadcasts DHCPREQUEST message with configuration parameters.

4) The DHCP server selected in the DHCPREQUEST message commits the binding and responds with a DHCPACK message containing the configuration parameters for the CND.

5) The CND receives the DHCPACK message with configuration parameters. At this point, it is configured. The CND may choose to relinquish its lease on a network address by sending a DHCPRELEASE message to the server.

The client identifier is unique within its subnet. It may contain a hardware address. For a UPnP device, a unique device name can be chosen as its client identifier.

This procedure example is applicable for the IPTV-CND in the bridged mode.

9.2 Information flows between IPTV-CND and CNG

9.2.1 Example message flows on C

In UPnP environment, the control point can retrieve the information of device of interest. The information includes the device description and service description describing the capabilities exposed by the device. After getting this information, control point sends suitable control message to perform control action.

This following message flow gives an example of device information exchange and device control based on UPnP enabled devices.

9.2.1.1 Message flows for device and service information exchange

The information includes the device description and service description describing the capabilities exposed by the device. Two cases are shown in Figures 9.8(a) and 9.8(b) respectively.

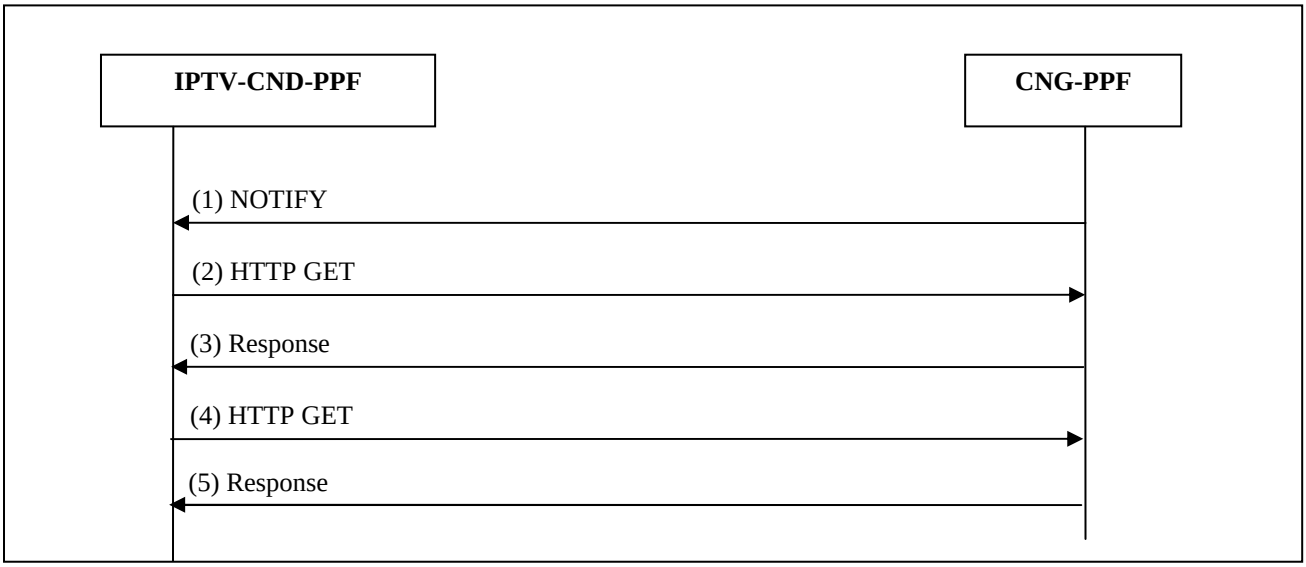

Figure 9.8(a): Message flows for device information exchange based on UPnP

In figure 9.8(a):

1) When the CNG is added to the network, it multicasts a number of discovery message advertising itself. The interested control point IPTV-CND can listen to the standard multicast address for notifications that new capabilities are available.

2) IPTV-CND retrieves the device description of the CNG by issuing an HTTP GET request to the URL in the NOTIFY request from the CNG.

3) The CNG returns its device description in the body of the HTTP response.

4) The IPTV-CND retrieves the service description of the CNG by issuing an HTTP GET request to the URL in the device description of the CNG.

5) The CNG returns description of the service description in the body of the HTTP response.

This procedure example is applicable for the IPTV-CND in the routed mode.

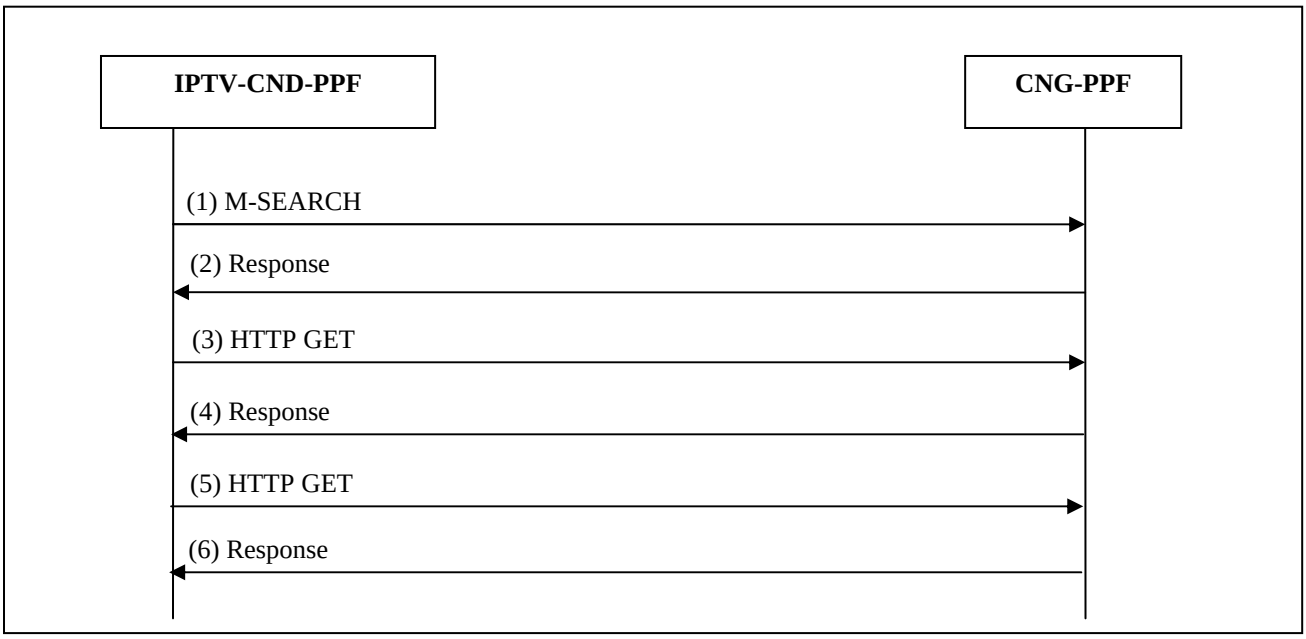

Figure 9.8(b): Message flows for device information exchange based on UPnP

In figure 9.8(b):

1) When the IPTV-CND is added to the network, it multicasts a discovery message searching for interesting devices.

2) The CNG listens to the standard multicast address for these messages and finds itself matching the search criteria in the discovery message. The CNG responds with its unique service name and location.

3), 4), 5), 6) are similar to 2), 3), 4), 5) in figure 8.8(a) respectively.

This procedure example is applicable for the IPTV-CND in the routed mode.

9.2.1.2 Message flows for device control

Figure 9.9: Message flows for device control based on UPnP

The capabilities exposed by CNG are various, such as QoS provisioning, local user identity, etc. clause 6.1.3 gives the details. All these capabilities can be defined in its service description and be performed by sending control message using SOAP.

1) IPTV-CND-PPF invokes a POST request to the CNG-PPF and waits for the response. The SOAP message containing the value of input parameters is embedded in the HTTP request.

2) The CNG-PPF performs the requested control action and returns the response with SOAP message embedded to the IPTV-CND-PPF.

This procedure example is applicable for the IPTV-CND in the routed mode.

9.2.2 Example message flows on $G_{m'}$

9.2.2.1 Registration

The NGN registration flow is compliant with the specifications for CNDs TS 185 006 [7] in clause 8.3.1.

9.2.2.2 IPTV Service Action Data Delivery

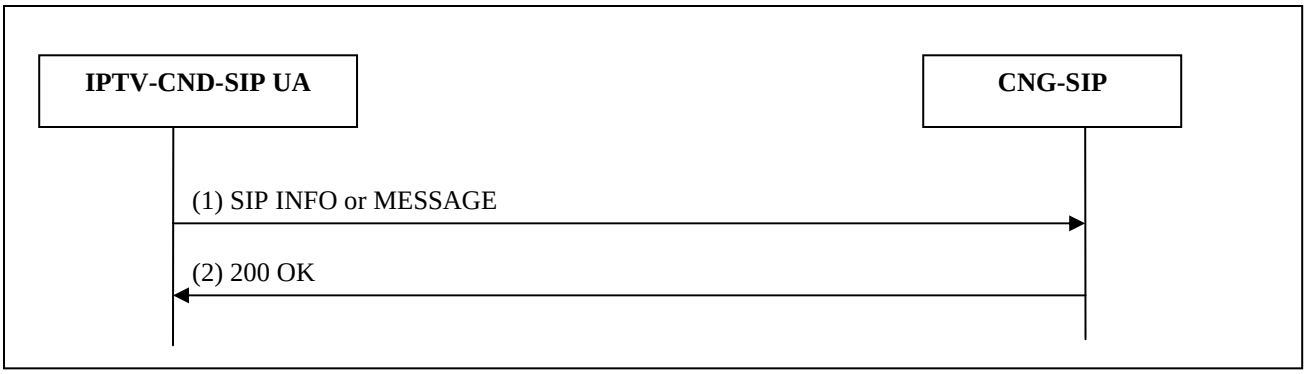

Figure 9.10: Message flows for IPTV service action data delivery

IPTV service action data, such as BC bookmarks, Available CoD and NPVR items, are delivered to CNG-SIP via SIP INFO or MESSAGE method.

The procedure example for service action data delivery is compliant with TS 183 063 [3].

This procedure example is applicable for the IPTV-CND in the routed CPN mode.

9.2.3 Example message flows on $e_{1'}$

The message flows on $e_{1'}$ are compliant with the specifications for CNDs TS 185 006 [7] in clause 8.1.

9.2.4 Example message flows on $e_{3'}$

The message flows on $e_{3'}$ are compliant with the specifications for CNDs TS 185 006 [7] in clause 8.2.

9.2.5 Example message flows on a_u

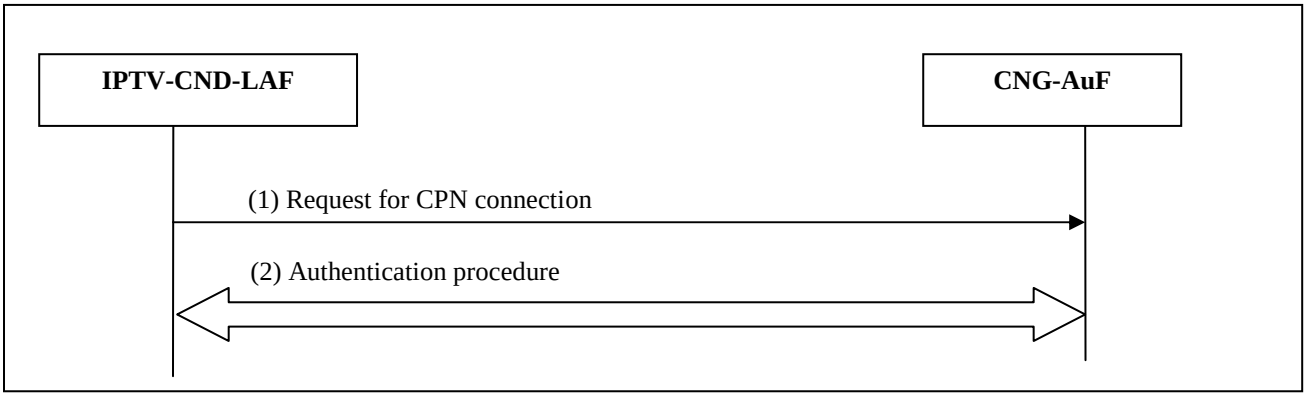

Figure 9.11: Information flows for IPTV CND connecting to CPN

This procedure example is applicable for the IPTV-CND in the routed mode.

Annex A (informative): Bibliography

ETSI TS 185 005: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Services requirements and capabilities for customer networks connected to TISPAN NGN".

Annex B (informative): Change history

Date	WG Doc.	CR	Rev	CAT	Title / Comment	Current Version	New Version
02-07-08	18WTD147	001		F	Clarification of Routed Modes definition	2.0.0	2.0.1
07-11-08					CRs approved at TISPAN#19	2.0.1	2.1.1
28-11-08	19bTD071r1	002		F	TS 185 009 Change Request	2.1.1	2.1.2
23-01-09	19tTD225r3	003		F	Editorial corrections	2.1.2	2.1.3
					Update of work item and addition of change history annex	2.1.3	2.1.4
					publication	2.1.4	2.2.1

History

Document history		
V2.1.1	July 2008	Publication
V2.2.1	May 2009	Publication