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Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Customer Devices architecture and Reference Points

Reference

RTS/TISPAN-05024-NGN-R2

Keywords

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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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 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.

The present document gives a Customer Devices classification based on services and access technology supported.

1 Scope

The present document defines the stage 2 Customer Network Devices (CND) specifications, including architectural building blocks to be included in the Customer Network Devices to support the interworking with control plane NGN architecture, both for the transport layers (NASS, RACS) and for the service layer. The present document will also define the reference points between the NGN architectural blocks involved and the corresponding CNDs functions here defined (for the cases in what the CNG will be transparent for the service and control planes point of view), as well as between the Customer Network Devices and the CNG when appropriate. The present document will perform, as first step, a categorization of the different user equipment with reference to the type of service supported and the different levels of implementation of the related functionalities.

Please note that in relation to the Customer Network Devices for IPTV usage the present document will cover only the classification step and will not provide any detail about the architecture and reference points. The IPTV CND are specified in TS 185 009 [i.1].

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 ES 282 002: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); PSTN/ISDN Emulation Sub-system (PES); Functional architecture".

[2] ETSI TS 183 043: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based PSTN/ISDN Emulation; Stage 3 specification".

[3] ETSI TS 182 012: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IMS-based PSTN/ISDN Emulation Subsystem; Functional architecture".

[4] ETSI ES 283 003 "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 (Release 7), modified]".

[5] 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".

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

NOTE: Available at http://www.homegateway.org.

[7] DSL-Forum TR-069 Amendment 1: "CPE WAN Management Protocol".

[8] DSL-Forum TR-104: "DSLHome Provisioning Parameters for VoIP CPE".

[9] DSL Forum TR-106: " Data Model Template for TR-069-Enabled Devices".

NOTE: Available at http://www.dslforum.org.

[10] IETF RFC 3261: "SIP: Session Initiation Protocol".

[11] ETSI ES 282 007 "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Functional architecture".

[12] ETSI ES 282 004: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture; Network Attachment Sub-System (NASS)".

[13] ETSI TS 183 019: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Network Attachment; User-Network Interface Protocol Definitions".

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

[15] ETSI TS 131 103: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Characteristics of the IP Multimedia Services Identity Module (ISIM) application (3GPP TS 31.103 version 7.3.0 Release 7)".

[16] IETF RFC 2131: "Dynamic Host Configuration Protocol".

[17] ETSI TS 124 229: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 version 8.2.0 Release 8)".

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 TS 185 009: "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".

[i.2] ETSI TS 187 001 (V2.1.5): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN SECurity (SEC); Requirements".

[i.3] ETSI TR 187 008: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NAT traversal feasibility study report".

[i.4] ETSI TR 185 007: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Analysis of protocols for customer networks connected to TISPAN NGN".

[i.5] ETSI TR 182 005: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Organization of user data".

3 Definitions and abbreviations

3.1 Definitions

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

CPN Device: device that is physically installed in the CPN allowing user access to network services; this can be a Customer Network Gateway with gateway functionalities towards the NGN, or a Customer Network Device being the end user terminal

Customer Network Device (CND): CPN device enabling the final user to have direct access to services through a specific user interface

NOTE 1: 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). CND classification is reported in clause 4.

NOTE 2: For CND classifications see clause 4.

Customer Network Gateway (CNG): CPN device acting as a gateway between the CPN and the NGN

NOTE: CNG is able to perform networking functions from physical connection to bridging and routing capabilities (L1-L3), but also possibly implementing functions related to the service support (up to L7).

Customer Premises Network (CPN): in-house network composed by customer network gateway, customer network devices, network segments, network adapters and nodes

NOTE: Network segments are physical wired or wireless connections between customer premises network elements); network adapters are elements performing a L1/L2 conversion between different network segments; nodes are network adapters with L3 routing capabilities.

"Multiple" Play Services (can be: double, triple, quadruple, etc.): delivery by a single service provider of different types of concurrent services to one or multiple users within the same CPN

NOTE: Services can be categorized in the following way: data (e.g. Web browsing, best effort traffic, etc.), person(s) to person(s) communication, entertainment.

3.2 Abbreviations

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

AKA	Authentication and Key Agreement
B2BUA	Back to Back User Agent
C-BGF	Core Border Gateway Function
CND	Customer Network Device
CND-A	CND-client Application
CND-AtF	CND-Attachment Function
CND-CMF	CND-Configuration and Management Function
CND-CSMF	CND-Communication Services Media Function
CND-LAF	CND-Local Authentication Function
CND-NASS	Customer Network Devices- Network Attachment SubSystem
CND-NTF	CND-NAPT Traversal Function
CND-PPF	CND-Plug and Play Function
CND-SC	CND-Self Configuration
CND-SF	Customer Network Devices - Service related Functional entities
CND-SIP UA	CND-SIP User Agent

CNG	Customer Network Gateway
CNG-ACF	CNG-Admission Control Function
CNG-AtF	CNG Attachment Function
CNG-AuF	CNG Authentication Function
CNGCF	Customer Network Gateway Configuration Function
CNG-CMF	CNG Configuration and Management Function
CNG-LF	CNG Location Function
CNG-NFF	CNG NAPT and Firewall Function
CNG-PCF	CNG Policy Control Function
CNG-PPF	CNG Plug and Play Function
CNG-UIF	CNG User reference point Function
CPN	Customer Premises Network
DB	DataBase
DHCP	Dynamic Host Configuration Protocol
FXS	Foreign eXchange Subscriber
IM CN	IP Multimedia Core Network
IMPU	IMS Public User identifier
IMS	IP Multimedia Subsystem
IP-PBX	Internet Protocol - Private Branch eXchange
IPTV	Internet Protocol TeleVision
ISDN	Integrated Services Digital Network
ISIM	IP Multimedia Services Identity Module
LAN	Local Area Network
MG	Media Gateway
NAPT	Network Address and Port Translation
NAS	Network Attached Storage
NASS	Network Attachment SubSystem
NAT	Network Address Translation
NBA	NASS Bundled Authentication
NGN	Next Generation Network
NTF	NAPT Traversal Function
NW	NetWork
P-CSCF	Proxy Call Session Control Function
PDA	Personal Digital Assistant
PES	PSTN/ISDN Emulation Sub-system
PLC	Power Line Communication
POTS	Plain Old Telephone Service
PSTN	Public Switched Telephone Network
RA	Remote Access
RACS	Resource and Admission Control Sub-system
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SSID	Service Set Identifier
STB	Set Top Box
UA	User Agent
UE	User Equipment
UICC	Universal Integrated Circuit Card
UPNP	Universal Plag aNd Play
UPSF	User Profile Server Function
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
USIM	Universal Subscriber Identity Module
WAN	Wide Area Network

4 Customer Network Device (CND) classification

The Customer Network Devices connected to the Customer Premises Network can be of different types. The services supported from each CND depend of the CND's type. In this clause a macro-classification is given. More in general, in a customer premises network End Devices used by end user, Network Devices to support the CPN infrastructure and Gateway Devices to connect the Customer Premises Network to the NGN are present.

End Devices:

The end devices can be divided into two main categories: non-IMS capable and IMS capable.

1) Non-IMS capable devices:

- **non-IP device:** It can be a POTS (Plain Old Telephone Service) phone that support traditional voice services and STS (Supplementary Telephone Services) services. It can be connected to the NGN through the CNG (e.g. in case of PSTN simulation services) or without the CNG (e.g. PSTN emulation services); it supports the Z interface.
  It can be a common ISDN phone supporting the S/T interfaces or also a DECT phone.

- **IP device:** It is a generic IP based device without any SIP stack. For example: PC, Personal Digital Assistant (PDA), network printer, Network Attached Storage (NAS), IP-PBX.
  In some cases IP devices, such as a PC or PDA, can evolve in an easy way to IMS capable devices.

- **SIP Device:** It is an IP device with a SIP stack not compliant with ES 283 003 [4] e.g. ietf based RFC 3261 [**10**]. For example Videophone, PDA, STB.

- **Consumer Electronics:** There are a number of consumer electronics equipment that can be connected to the CPN and they can be IP based or not. Some examples are the Set Top Box (STB), gaming console, Network Attached Storage (NAS). These devices in some cases do not need a connection with WAN side and are used for Intra-Customer Environment services.

- **Mobile Device:** It can be a 2G/3G mobile device that takes part into CPN through a wireless local access (mobility enable) offered by CNG.

2) IMS capable device:

An IMS capable device is able to register with the IM CN via exchange of SIP messages with the P-CSCF, and then create/accept/end multimedia IP sessions, in compliance with ES 283 003 [4]. The establishment of a trust relationship to the IM CN shall be by one of the 3 methods defined in ES 283 003 [4] (by ISIM, or if that is not present then by USIM, or if that is not present then by device-internal transmission of a private user identity, a public user identity and a home network domain name).

For authentication issues, see also clause 6.

- **Fixed device:** It can be a fixed corded phone, dual mode phone (equipped with 2G/3G and Wi-Fi/Bluetooth), PC, PDA (with IMS client soft phone), IP-PBX.
  The dual mode phone (mobile + wireless) is considered as a fixed device when it is attached by Wi-Fi/Bluetooth.

- **Mobile device:** It can be a mobile phone or a PC/PDA with 2G/3G interface.

- **Consumer Electronics:** They can be a STB, Media Servers or media players, etc.

Network Device:

It is a device that can be connected to the CPN infrastructure (e.g. network adapter and nodes as defined in clause 3).

Gateway:

CNG: It is the Customer Network Gateway to access the NGN side, as specified in TS 185 003 [6].

Table 4.1 classifies the customer devices in order to support the use case define in TS 185 005 [5]. Moreover the CNDs are related to a number of possible local physical interfaces: FXS, Ethernet, Wireless (with or without mobility), where mobility is defined as service and session continuity independently from the location.

In case of wired local access, both analogue and digital access are considered. Wired digital includes Ethernet and other technologies.

In table 4.1 the "X" means that the CND may be able to support a service or that local physical interface.

Table 4.1: Customer Network Devices classification

Device	Services						CPN interfaces			
Customer Network Device Type	Communi-cation service	Data service	Video Streaming	Presence	Messaging	Intra-Customer Environment	Wired analogue	Wired digital	Wireless not enabling mobility	Wireless enabling mobility
Non IMS capable										
Non IP (e.g., POTS, ISDN phone)	X					X	X	X		
IP (e.g. PC, PDA, IP-PBX, NAS, Printer)		X				X		X	X	
SIP (e.g. VideoPhone, PDA, STB)	X	X	X			X		X	X	
Consumer Electronics (e.g. STB, gaming console, NAS)		X				X		X	X	
Mobile 2G/ 3G Phone	X	X								X
IMS capable										
Fixed (e.g. Fixed phone, multi mode phone, PC, PDA (with IMS client soft phone), IP-PBX)	X	X	X	X	X	X		X	X	X
Mobile (mobile phone, PC/PDA with 2G/3G itf	X	X	X	X	X	X				X
Consumer Electronics (e.g. STB, etc.)			X			X		X	X	

The CNDs related to IP-TV are specified in TS 185 009 [i.1].

4.1 Non IMS capable CNDs

4.1.2 Non-IP CNDs

The non-IP devices include the POTS phone and ISDN devices; these type of devices can be connected to the NGN through the CNG or directly. In any case, the architecture of these devices is out of scope of the present document. The voice services on POTS/ISDN devices can be done in emulation [1], [2] and [3] or simulation mode on NGN. In next clause the impact on customer premises network is analyzed for both modes.

4.1.2.1 Non-IP CNDs connected to the NGN without a CNG

In this case the POTS and ISDN device is connected to the MG (Media Gateway) [3] via the Z interface for voice services, as shown in figure 4.1. In case of data services, for ISDN device, the S/T interface is needed.

The case of voice services for POTS/ISDN in PES scenario is shown in figure 4.1.

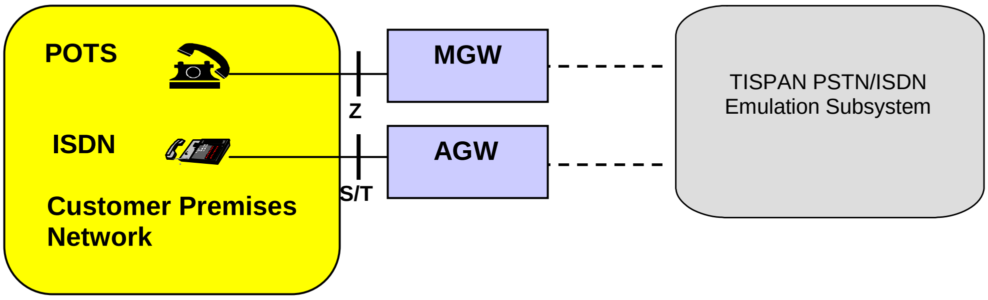

POTS
ISDN
Customer Premises Network
Z
S/T
MGW
AGW
TISPAN PSTN/ISDN Emulation Subsystem

Figure 4.1: Non-IP CNDs connected to the NGN network without a CNG (PES scenario)

The case of voice services for POTS/ISDN supported in the Core IMS scenario is shown in figure 4.2.

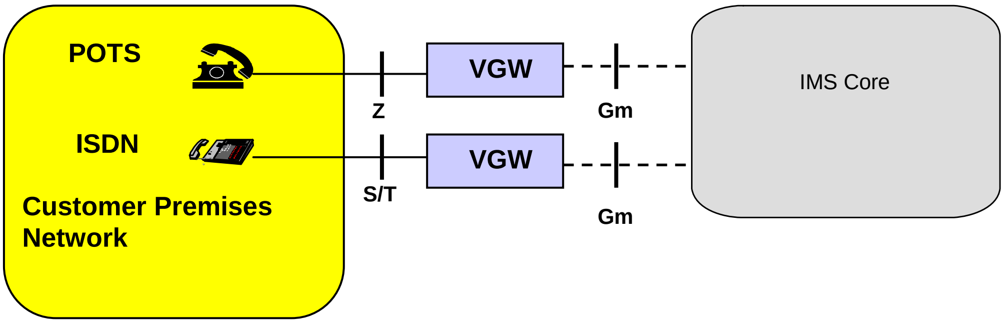


Figure 4.2: Non-IP CNDs connected to the NGN network without a CNG (Core IMS scenario)

4.1.2.2 Non-IP CNDs connected to the NGN through a CNG

In this case, the CNG includes all the CPN functionalities necessary to fulfil a service between the analogue or ISDN phone and the NGN network. The voice services can be based on PES or Core IMS scenario. The details of CNG architecture are specified in TS 185 003 [6].

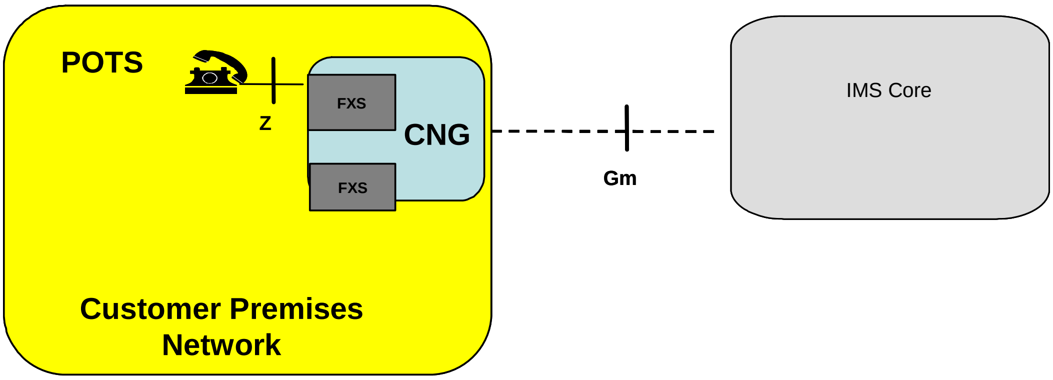


Figure 4.3: Non-IP CNDs connected to the NGN network trough a CNG (Core IMS scenario)

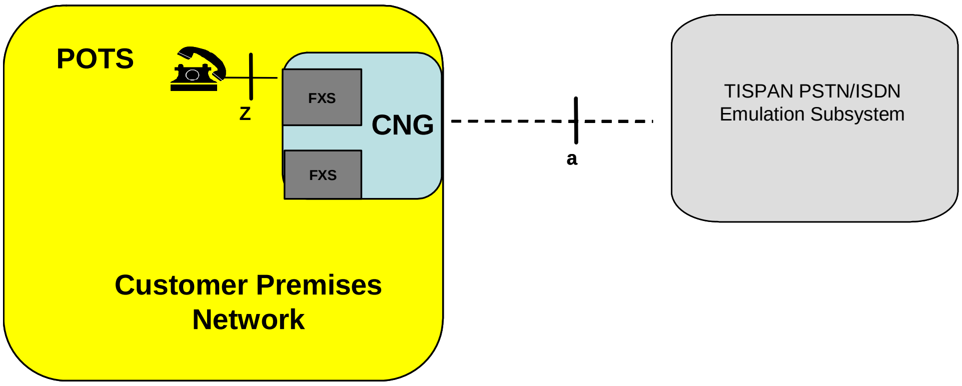

POTS
Z
FXS
FXS
CNG
a
TISPAN PSTN/ISDN Emulation Subsystem
Customer Premises Network

Figure 4.4: Non-IP devices connected to the NGN network trough a CNG (PES scenario)

In order to support the Z interfaces on FXS ports the CNG shall support protocol conversion as defined in TS 185 003 [6].

4.1.3 IP CNDs

These devices are able to get IP connectivity within the CPN, but they are not implementing the RFC 3261 [10] functionalities to manage signalling. This can be a communication device non compliant with RFC 3261 [10], but also devices not specifically devoted to communication services (for example: webcam with HTTP server, general purpose PC, etc.).

4.1.4 SIP IETF capable CNDs

4.1.4.1 Non-IMS SIP CND connected to the NGN through a CNG

A non-IMS SIP IETF device shall utilize the $G_{m'}$ reference point (instead of the $G_{\mathbf{m}}$ reference point that is utilized by IMS capable devices) in order to get a service from NGN-IMS. See figure 4.5.

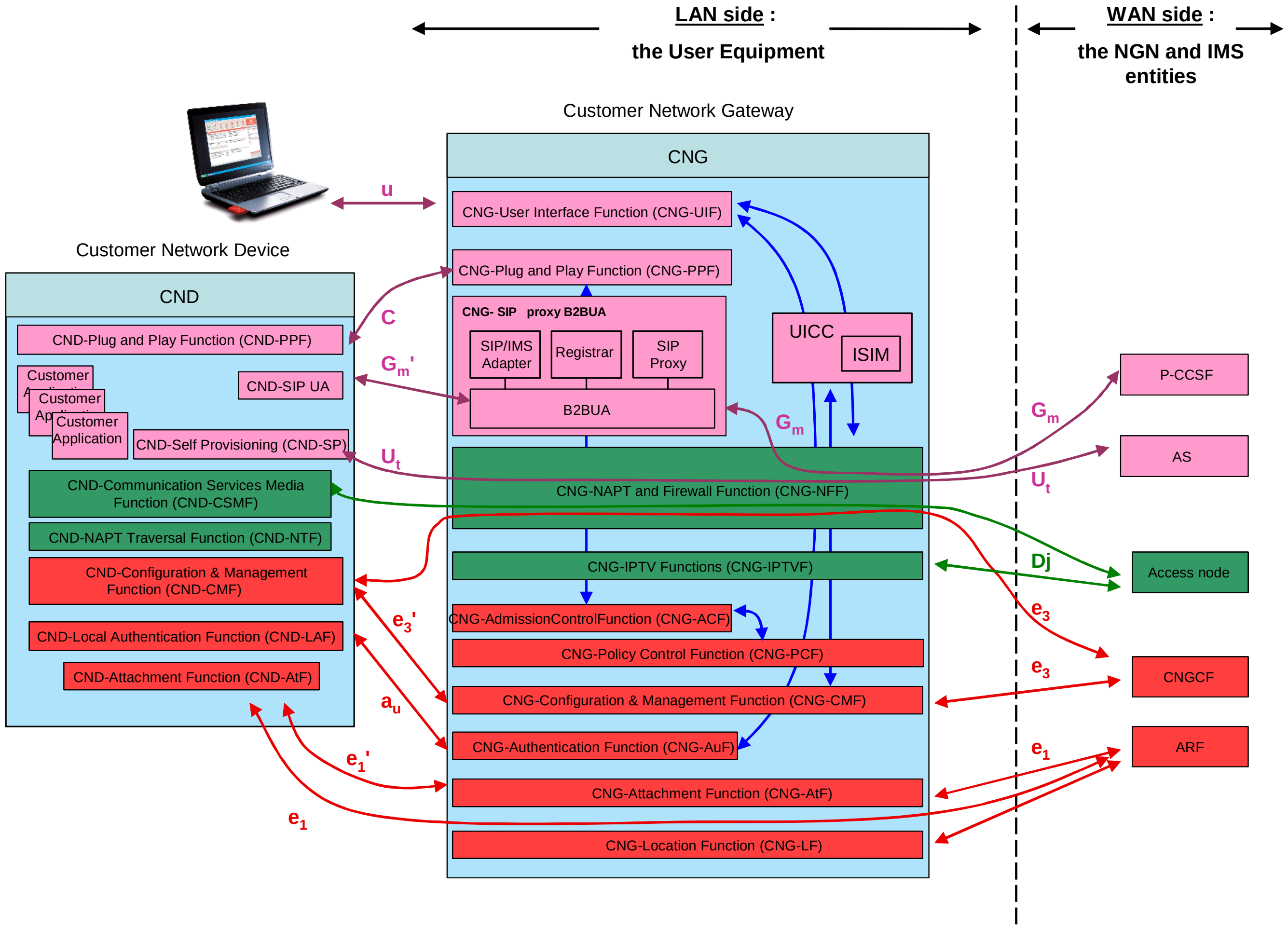

LAN side :
the User Equipment
WAN side :
the NGN and IMS entities
Customer Network Gateway
CNG
CNG-User Interface Function (CNG-UIF)
CNG-Plug and Play Function (CNG-PPF)
CNG- SIP proxy B2BUA
SIP/IMS Adapter
Registrar
SIP Proxy
B2BUA
UICC
ISIM
CNG-NAPT and Firewall Function (CNG-NFF)
CNG-IPTV Functions (CNG-IPTVF)
CNG-AdmissionControlFunction (CNG-ACF)
CNG-Policy Control Function (CNG-PCF)
CNG-Configuration & Management Function (CNG-CMF)
CNG-Authentication Function (CNG-AuF)
CNG-Attachment Function (CNG-AtF)
CNG-Location Function (CNG-LF)
Customer Network Device
CND
CND-Plug and Play Function (CND-PPF)
Customer Application
Customer Application
Customer Application
CND-SIP UA
CND-Self Provisioning (CND-SP)
CND-Communication Services Media Function (CND-CSMF)
CND-NAPT Traversal Function (CND-NTF)
CND-Configuration & Management Function (CND-CMF)
CND-Local Authentication Function (CND-LAF)
CND-Attachment Function (CND-AtF)
u
C
Gm'
Ut
e3'
au
e1'
e1
Gm
Gm
Ut
Dj
e3
e3
e1
P-CCSF
AS
Access node
CNGCF
ARF

Figure 4.5: SIP IETF CND connected to the NGN-IMS network through a CNG

4.1.5 Consumer Electronics

These types of CNDs are out of scope. The case of CND correlated to IPTV is detailed in TS 185 009 [i.1].

4.2 IMS capable CNDs

4.2.1 IMS Customer Network Device connected to the NGN through a CNG

In this case, the Customer Network Device includes all the service-related functionalities necessary to fulfil a service between itself and the NGN-IMS network, as shown in figure 4.6. The CNG offers the capabilities to support attachment and transport in case of IMS customer device connected via Wi-Fi/Bluetooth, Ethernet port (wired) or femto cell (for mobile devices).

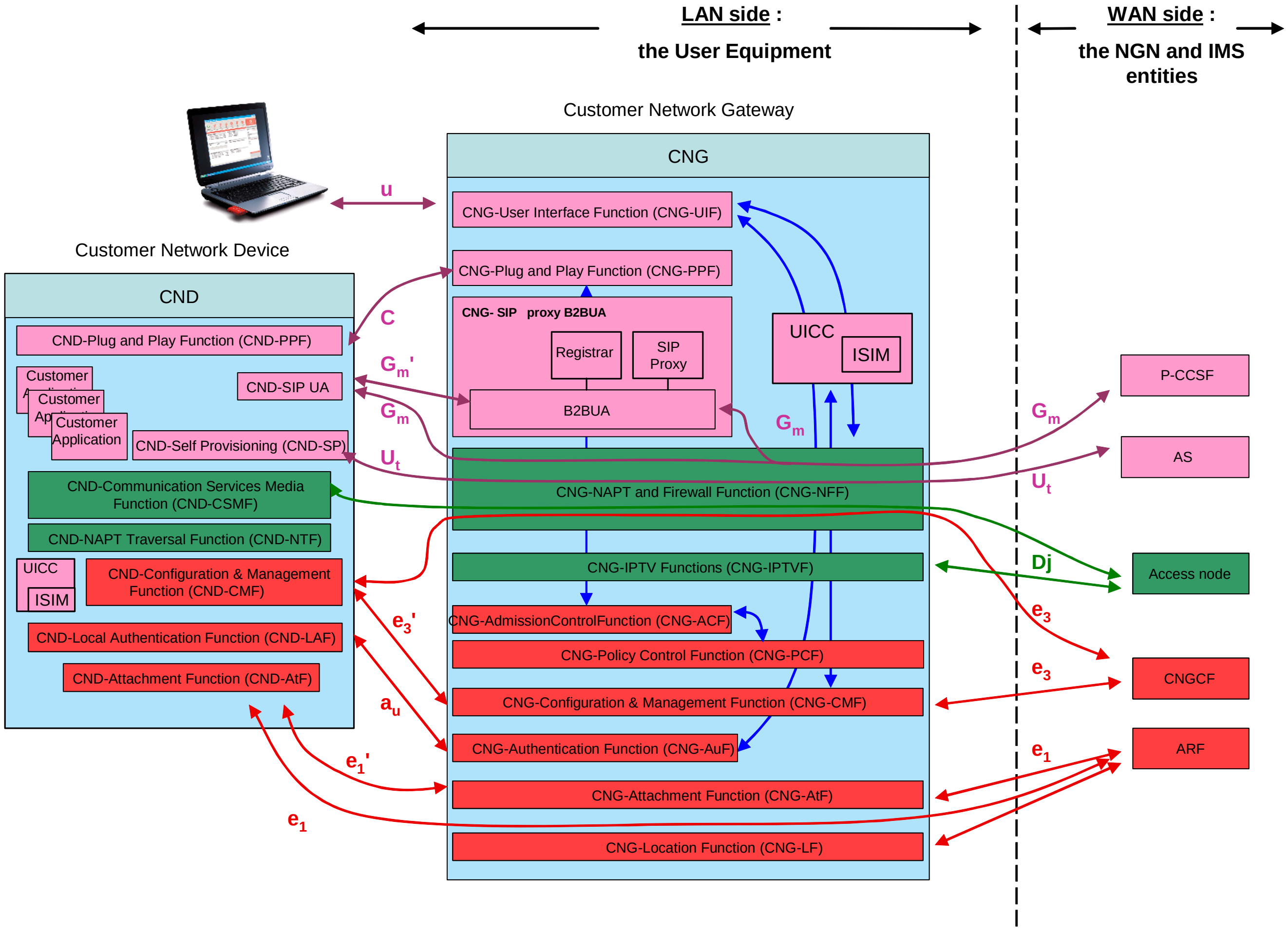

LAN side :
the User Equipment
WAN side :
the NGN and IMS entities
Customer Network Gateway
CNG
CNG-User Interface Function (CNG-UIF)
CNG-Plug and Play Function (CNG-PPF)
CNG- SIP proxy B2BUA
Registrar
SIP Proxy
B2BUA
UICC
ISIM
CNG-NAPT and Firewall Function (CNG-NFF)
CNG-IPTV Functions (CNG-IPTVF)
CNG-AdmissionControlFunction (CNG-ACF)
CNG-Policy Control Function (CNG-PCF)
CNG-Configuration & Management Function (CNG-CMF)
CNG-Authentication Function (CNG-AuF)
CNG-Attachment Function (CNG-AtF)
CNG-Location Function (CNG-LF)
Customer Network Device
CND
CND-Plug and Play Function (CND-PPF)
Customer Application
Customer Application
Customer Application
CND-SIP UA
CND-Self Provisioning (CND-SP)
CND-Communication Services Media Function (CND-CSMF)
CND-NAPT Traversal Function (CND-NTF)
UICC
ISIM
CND-Configuration & Management Function (CND-CMF)
CND-Local Authentication Function (CND-LAF)
CND-Attachment Function (CND-AtF)
u
C
Gm'
Gm
Ut
e3'
au
e1'
e1
Gm
Gm
Ut
Dj
e3
e3
e1
P-CCSF
AS
Access node
CNGCF
ARF

Figure 4.6: IMS CND connected to the NGN-IMS network through a CNG

4.2.2 Consumer Electronics

The definition of consumer electronics architecture is out of scope for the present document. The architecture of CND involved in IPTV services are covered in TS 185 009 [i.1]

4.3 IMS customer network device architecture

In the following clause a detailed description of the entities on figure 4.6 is given.

4.3.1 The Customer Network Devices- Network Attachment Subsystem entities (CND-NASS)

CND-CMF: Customer Network Device - Configuration and Management Function.

The CND-CMF entity shall enable the configuration of CND based on data obtained from the CNGCF. The CNG-CMF (in CNG) should be able particularly to store configuration information dedicated to several CNDs, after sending only one request to the CNGCF. As soon as one CND is connected, the CNG-CMF should be able to deliver configuration parameters to it is CND-CMF. Otherwise the CND-CMF can be directly accessed by the CNGCF without the CNG mediation.

The CND-CMF shall manage a mutual authentication between the CNGCF and the CND.

The CND-CMF shall enable the CND configuration and firmware upgrade.

The CND-CMF shall access the credential keys for authentication (via ISIM or stored parameters received from CNGF, e.g. for HTTP digest).

The CND-CMF should provide, for example, the functionality and interfaces of a DSL Forum Auto Configuration Client [7].

Finally, the CND-CMF should allow device maintenance from the NGN network, through the CNG-CMF, with the opportunity to do diagnostic and performance tests too.

Some authentication parameters may be stored in a UICC (containing the ISIM).

CND-AtF: Customer Network Device Attachment Function.

The CND-AtF entity shall store the private or public IP addresses sent by CNG-AtF or NASS (e.g. a DHCP client).

CND-LAF: Customer Network Device - Local Authentication Function.

The CND-LAF shall manage local authentication procedure to the CPN environment. For instance, a CND requesting for a CPN Wireless attachment should be authorized by the access point embedded in the CNG.

In order to ask for local authentication the CND-LAF interacts with the CNG-AuF.

The CNG-AuF can thus be configured by the user for such a case, by using the CNG User Interface Function (CNG-UIF).

4.3.2 The transfer level functions

CND-NTF: NAPT Traversal Function

The function shall allow the CNG-NFF (in CNG) traversal (as detailed in TR 187 008 [i.3]) and particularly maintain the binding between the SIP UA and the P-CSCF/C-BGF. The CND-NTF should also supply the SIP UA with the mapping made by the CNG on the NGN side so as to fill the SDP field of SIP messages sent by the CND.

4.3.3 The transport level functions

CND-CSMF: Customer Network Device-Communication Services Media Function

The CND-CSMF shall terminate the media flows.

In some cases the media flows may be encrypted.

4.3.4 The Customer Network Devices - Service-related Functional entities (CND-SF)

CND-SIP UA: Customer Network Device SIP UA

This block shall implement the G_m reference points on IMS customer devices. This SIP UA shall perform the service authentication and manage signalling flows securely.

CND-A: Customer Network Device Client Application

At least one CND-A shall be installed on CND to support a service. There can be on or more CND-As depending on the applications installed over CND. It is a client specific for application. This client can implement local application or network services through the use of SIP UA.

CND-SC: Customer Network Device Self Configuration

This functionality is optional. It implements the U_t reference point; the U_t enables the access to an Application Sever to support the user in configuration updates related to services.

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

The CNG-PPF in the CNG may obtain some device information (service discovery, description) and allow their control from the CND-PPF. Particularly, the CNG-PPF entity may allow a communication between many types of Customer Device within the CPN, not only conversational (based UPnP for instance).

5 Reference Points

5.1 Network attachment reference points

$e_{1'}$: The $e_{1'}$ reference point is defined between the CND and the CNG-AtF. The CNG-AtF provides IP addresses (IPv4 or IPv6 format) to the CND through the CND-AtF, it may also send some configuration information for the CND (typically through DHCP options).

The CND and CNG shall mutually exchange their hardware identities (e.g. MAC address, DeviceID, etc.) on $e_{1'}$ reference point. The CNG has to know which CNDs are behind itself within CPN and each CND has to know its CNG.

This reference point is mandatory if the CNG runs in a routed mode.

$e_{3'}$: The $e_{3'}$ reference point is defined between the CND and the CNG-CMF. The CNG-CMF may provide the CND with parameters that are pre-configured in the CNGCF and sent to the CNG through the e_3 reference point or, as an alternative, directly defined by the user. The CNG-CMF also configures the CNG, using information received from the CNGCF or supplied by the user himself.

The CNG-CMF also configures the CNG, it can also be provided by the CNGCF or the user himself.

Finally the CND-CMF should provide information on device status to allow the CNGCF to make some diagnostic and performance tests through the CNG-CMF.

To sum up, the $e_{3'}$ reference point support a variety of functionality to manage a collection of user equipment (CNG/CNDs), including the following capabilities:

- auto-configuration and service provisioning;
- software/firmware management;
- status and performance monitoring;
- diagnostics.

This reference point is recommended as the e_3 reference point could also be used. This reference point is recommended as integration of the mandatory e_3 interface described below.

In order to simplify the management functions on the CNG, the e_3 reference point can be implemented directly between CND and CNGCF as specified in ES 282 004 [12]. In this case, the direct reference point between CND and CNG, $e_{3'}$, could be limited to service provisioning functions; this may be required in addition or as an alternative to the corresponding functionalities on the e_3 reference point between CND and CNGCF.

a_u: The a_u reference point is defined between the Customer Network Device and the CNG-AuF. There may be two types of authentication/authorization, according to:

CPN pairing (attachment, encryption and security processes (WEP, WPA2 …)) based on specific CPN technologies (e.g. Wife SSID, PLC technology).

Access rights for some LAN services like the CNG Configuration (through the CNG-UIF).

This reference point is recommended, except if a wireless access point is embedded in the CNG in which case it is mandatory.

e_1: This reference point is based on TS 183 019 [13].

The e_1 reference point is dedicated to the network attachment of the User Equipment.

The e_1 reference point is mandatory (in coherence with WG2 specifications).

e_3: This reference point is based on ES 282 004 [12]:

The e_3 reference point is defined between the CNG-CMF and the CNGCF and should be extended also between the CNG-CMF and the CND for configuration purposes.

Through a remote management protocol it is possible to support a variety of functionalities to manage a collection of user equipment (CNG/Customer Network Devices), including the following capabilities:

- auto-configuration and service provisioning;
- software/firmware management;
- status and performance monitoring;
- diagnostics.

The e_3 implementation between the CNG-CMF and the CNGCF is mandatory (in coherence with WG2 specifications), whereas the e_3 implementation between the CNG-CMF and the CND-CMF is recommended, as $e_{3'}$ should be an alternative.

5.2 Transport level reference points

D_j: The D_j reference point is responsible for the exchange of media flows between the User Equipment (CNG or CND) and the C-BGF.

This reference point is mandatory. It is based on ES 282 001 [14].

5.3 Service layer reference points

G_m: The G_m reference point supports the communication between UE and the IMS, e.g. related to registration and session control.

G_m between the P-CSCF and the SIP proxy B2BUA is used to support several actions:

- send SIP messages to/from the NGN;
- call forking at the CNG level.

The protocol used for the G_m reference point is SIP.

To be noticed that the definition is extracted from ES 282 007 [11].

This reference point is in line with specifications:

- ES 283 003 [4];
- TS 182 012 [3];
- TS 131 103 [15].

This reference point is mandatory (in coherence with WG2 specifications).

$G_{m'}$: The $G_{m'}$ reference point supports the communication between one CND and the CNG, e.g. related to registration and session control.

The difference between G_m and $G_{m'}$ is related to the conformance to the IMS and to the need to go through the B2BUA to support local services. Further details about $G_{m'}$ possible implementations can be found in TR 185 007 [i.4].

This reference point is recommended (it shall be used in case a SIP B2BUA is implemented inside the CNG).

U_t: The U_t reference point enables the user to manage information related to his services, such a creation and assignment of Public Service Identities, management of authorization policies that are used e.g. by Presence service, conference policy management, etc.

This reference point is in line with ES 282 007 [11].

This reference point is optional (in coherence with WG2 specifications, see [11]).

u: The u reference point gives the possibility to one or several users authorized (via the CNG-AuF) to have access to the CNG Configuration, through the CNG-UIF. The liaison should be as secure as possible (using HTTPs for instance).

This reference point is recommended.

C: The C reference point is defined between the CNG-PPF and the CND-PPF.

It provides some CND information (service discovery, description) to the CNG and allows its control.

Also, a communication between many types of Customer Network Device within the CPN may be established through the C reference point, using UPnP for instance.

This reference point is optional.

6 Authentication issues

This clause is related to the authentication method used by customer network devices for registration and authentication on IMS core. The target authentication method is IMS AKA authentication based on ISIM/UICC, but in coherence with TS 187 001 [i.2] there are other two methods to be considered: HTTP Digest and NBA.

For that reason in the present document customer network devices, without UICC, that support HTTP Digest and NBA are considered as early deployments.

In these case of HTTP Digest or NBA a CND R2 shall be able to provide it is private and public identity in every method that requires authentication (e.g. REGISTER) in order to support shared public identity for multi device use case (shared IMPU). The CND that does not support this feature can be extended through a CNG.

In order to clarify the concept of early deployments some schemas are presented.

6.1 CNG based

In case of CNG in the CPN, the CNG can be add the private identity in the Authorization Header ES 283 003 [4], if needed, both for HTTP Digest and NBA authentication method.

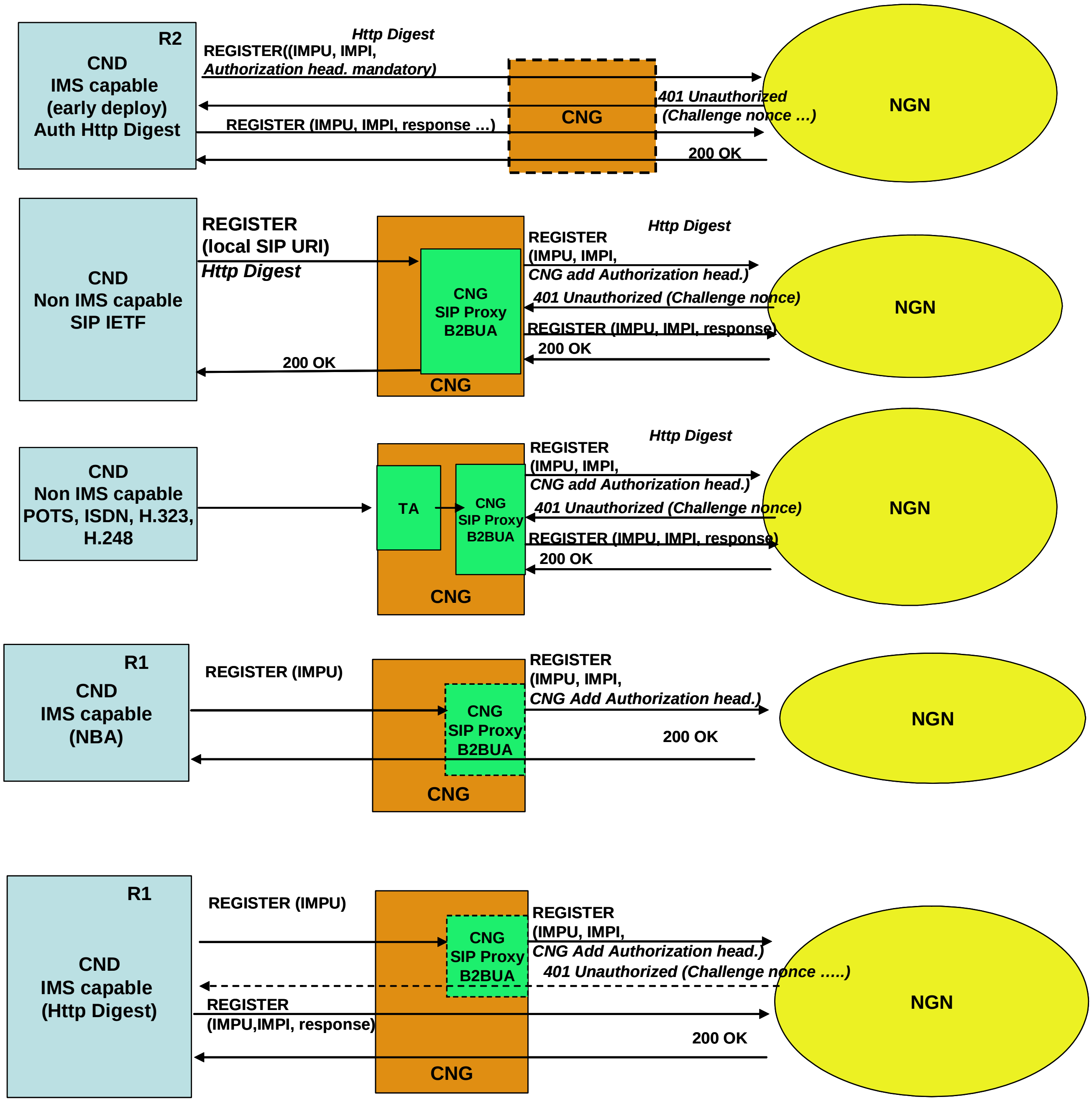


Figure 6.1: Early Deployments with CNG

In table 6.1 the functional block roles are summarized.

Table 6.1: Functional block rules for authentication (CNG based)

CND	CND => NGN	CNG	NGN
IMS Capable Early deployment R2 (HTTP Digest)	CND sends REGISTER with authorization header including IMPI.	Transparent.	NGN sends 401 unauthorized and challenge the CND.
Non IMS Capable SIP IETF (HTTP Digest)	CND sends REGISTER without authorization header.	The SIP UA (IETF) receives the REGISTER The B2BUA close the session with SIP IETF and open a new session with NGN adding the authorization head with CND's IMPI.	NGN sends 401 unauthorized and challenge the CND trough the B2BUA inside the CNG.
Non IMS Capable (POTS, ISDN, H323, H248)	CND generates local signalling to the Terminal Adapter (TA).	The B2BUA opens a new session with NGN adding the authorization head with CNG's IMPI.	NGN sends 401 unauthorized and challenge the CND trough the B2BUA inside the CNG.
IMS Capable R1 (NBA)	CND sends REGISTER without authorization header.	The B2BUA can modify the REGISTER to the NGN adding the authorization head with CND's IMPI.	The NGN does not challenge the CND because NBA is used.
IMS Capable R1 (HTTP Digest)	CND sends REGISTER without authorization header.	The B2BUA can modify the REGISTER to the NGN adding the authorization head with CND's IMPI.	NGN sends 401 unauthorized and challenge the CND.

6.2 Non CNG based

In case of no CNG is in CPN, for non CND R2 and non IMS capable CND it is impossible to add the Authorization Header to the message that requires authorization before the challenge, so these CNDs cannot be supported in shared IMPU use case [5].

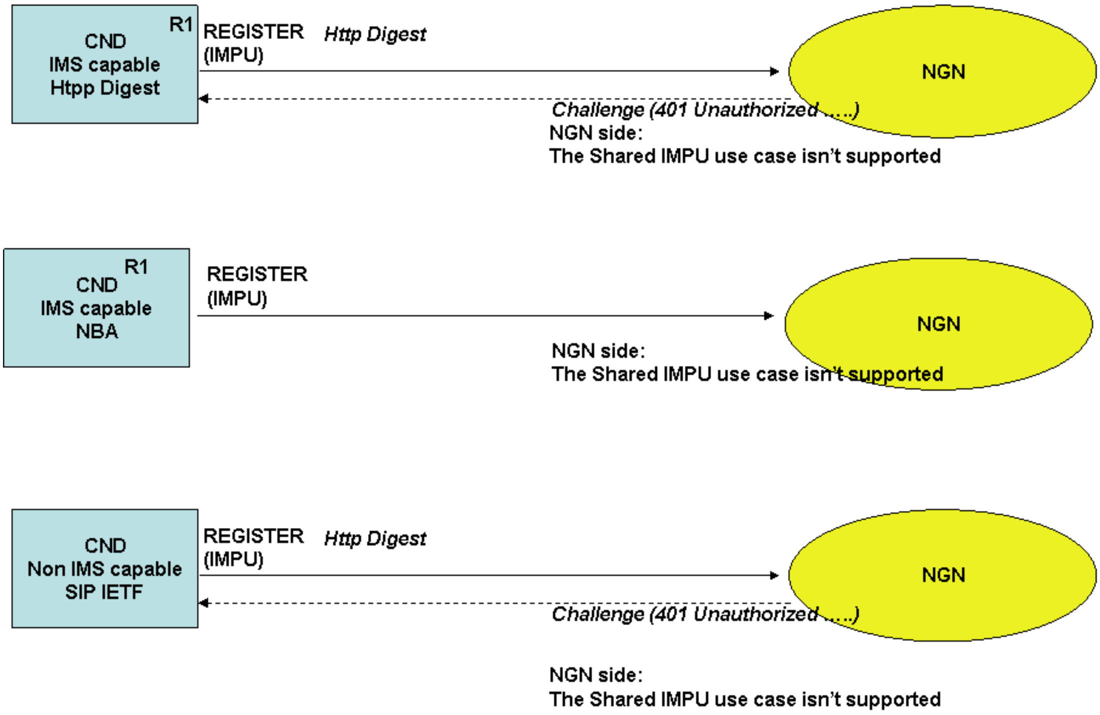

CND
IMS capable
Htpp Digest
R1
REGISTER Http Digest
(IMPU)
NGN
Challenge (401 Unauthorized .....)
NGN side:
The Shared IMPU use case isn't supported
R1
CND
IMS capable
NBA
REGISTER
(IMPU)
NGN
NGN side:
The Shared IMPU use case isn't supported
CND
Non IMS capable
SIP IETF
REGISTER Http Digest
(IMPU)
NGN
Challenge (401 Unauthorized .....)
NGN side:
The Shared IMPU use case isn't supported

Figure 6.2: Early Implementation without CNG in CPN

In table 6.2 the functional block roles are summarized:

Table 6.2: Functional block rules for authentication (without CNG)

CND	CND => NGN	NGN
IMS Capable R1 (HTTP Digest)	CND sends REGISTER without authorization header.	NGN should support a mechanism to queries the UPSF (TR 182 005 [i.5]), discover the auth schema to be used, and sends 401 unauthorized to challenge the CND because HTTP Digest is used.
Non IMS Capable SIP IEHTTPHTTP Digest)	CND sends REGISTER without authorization header.	NGN uses some GW to convert SIP IETF in SIP should support a mechanism to queries the UPSF, discover the auth schema to be used, and sends 401 unauthorized to challenge the CND because HTTP Digest is used.
IMS Capable R1 (NBA)	CND sends REGISTER without authorization header.	NGN should support a mechanism to queries the UPSF, discover the auth schema to be used. The NGN does not challenge the CND because NBA is used.

7 The CND Data Model

The CND should support the device data model proposed by DSL Forum, the TR-106 [9] (data model for a generic device).

The CND is needed to support the set of parameters defined by DSL Forum in TR-104 [8] (data model for VoIP functionalities).

8 Information Flows

NOTE: Information flows clause is non normative text reported in form of examples, to better understand the relationships between the CPN entities and functionalities.

8.1 Attachment Flows

8.1.1 Example of Information Flows on $e_{1'}$

The candidate on $e_{1'}$ is DHCP specified in RFC 2131 [16]. In figure 8.1 the basic information flow is given.

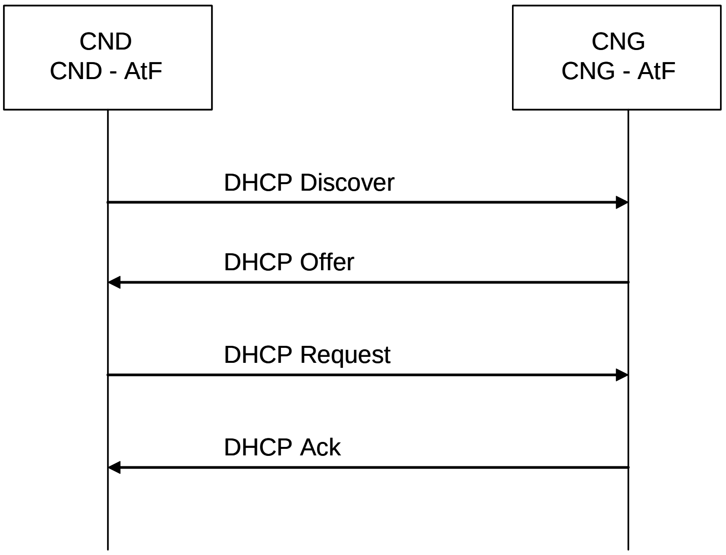


Figure 8.1: Information Flow on $e_{1'}$

In order to mutually exchange the hardware identities between the CND and the CNG, the hardware identity can be defined for example as in TR-069 [7] (DeviceId) and the DHCP Option 125 can be used for the CND-CNG association as specified in TR-069 [7], annex F.

8.2 Configuration and management flows

8.2.1 Example of management reference point selection

In this clause an example of a general way to select between e_3 and $e_{3'}$ is given.

CNG routed mode

Figure 8.2 shows the routed mode scenario; the main data exchanges in this flow are the following:

(1) The CNG sends on e_1 the request for IP address acquiring to the NASS, on the same e_1 the NASS replies with the IP address (if the CNG is authorized) and with some configuration data like CNGCF url and something else.

If the phase (1) is terminated without errors the CNG is attached to the access network.

(2) The CNG sends on e_3 the notification for acquiring configuration data like CNG id and credentials for authentication on NGN to the CNGCF. The CNGCF can send CNDs configuration data (if $e_{3'}$ is used on CNG) like identities, credentials and so on.

If the phase (2) is terminated without errors the CNG is configured and is certified as trusted for NGN and ready to start the registration procedure on NGN.

From that point is possible to attach CNDs on CNG.

(3) The CND sends on $e_{1'}$ the request for IP address acquiring to the CNG. More in general the CND send that request on $e_{1'}/e_1$ but in this case the CNG is configured in routed mode and it does not forward the request to the NASS. The CNG replies with an IP private address and with some configuration data, if available, like CNGCF url.

If the phase (3) is terminated without errors the CND is attached to the CNG and indirectly to the access network.

(4) If the CND supports the $e_{3'}$ then it sends the request for configuration data (for example identities and credentials) to the CNG. The CNG can reply with: the configuration data or not, or with error message.

(5) If the CND supports the e_3 then it sends the notification for configuration data to the CNGCF. The CNGCF check if the CND is already configured or not. If not, it sends configuration data. If the CND is configured via $e_{3'}$ then the e_3 is used for monitoring, firmware upgrading and so on.

If the phase (4)/(5) is terminated without errors the CND is configured and ready to start the registration procedure with NGN.

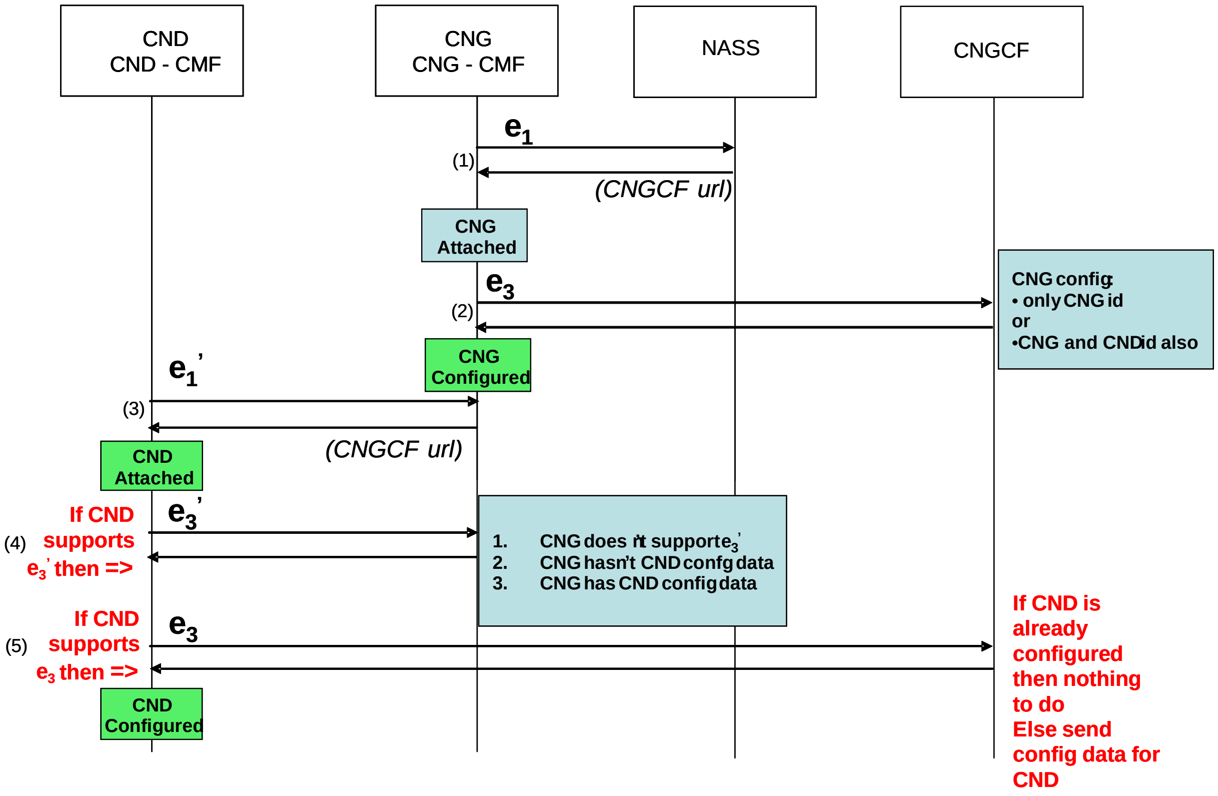

CND
CND - CMF
CNG
CNG - CMF
NASS
CNGCF
e1
(1)
(CNGCF url)
CNG Attached
e3
(2)
CNG config:
• only CNG id
or
•CNG and CND id also
e1'
(3)
CNG Configured
(CNGCF url)
CND Attached
If CND supports e3' then =>
(4)
e3'
1. CNG does n't support e3'
2. CNG hasn't CND confg data
3. CNG has CND config data
If CND supports e3 then =>
(5)
e3
If CND is already configured then nothing to do Else send config data for CND
CND Configured

Figure 8.2: Management flow with CNG routed mode

CNG bridged mode

In case of CNG bridged mode configuration (see figure 8.3), the phase (1) and (2) are not applicable, while the subsequent steps can be summarized in the following way:

(3) The CND on e_1 sends the request for IP address acquiring to the NASS. The NASS replies with the IP address and with some configuration data like CNGCF url.

If the phase (3) is terminated without errors the CND is attached to the network access.

(4) The CND sends the notification for configuration data to the CNGCF. The CNGCF replies with the configuration data.

If the phase (4) is terminated without errors the CND is ready to start the registration procedure on the NGN.

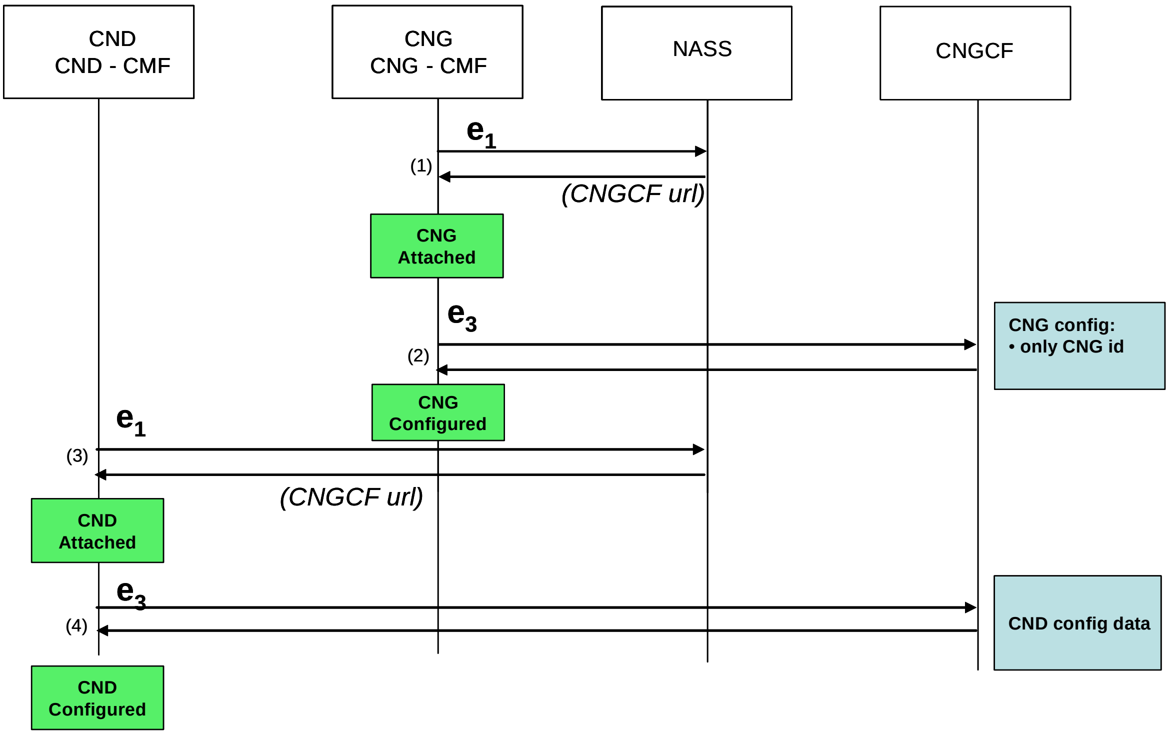


Figure 8.3: Management flow with CNG in bridged mode

8.2.2 Example of Information Flows on $e_{3'}$

The following information flow is an example of service provisioning functions supported by CNG (see figure 8.4).

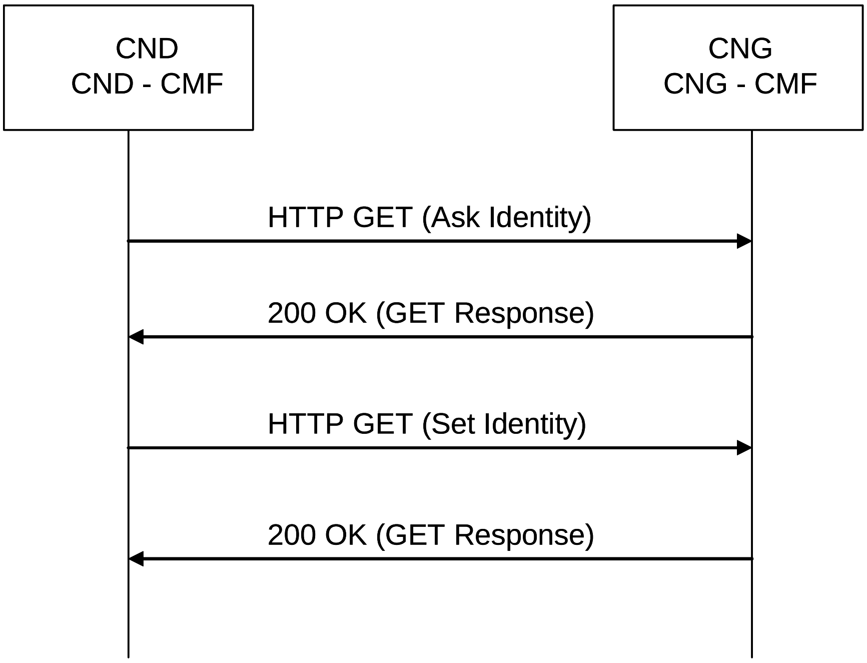


Figure 8.4: Provisioning on $e_{3'}$

With the first HTTP GET (Ask Identity), the CND asks the CNG for the list of available identities (tuples of IMPI, IMPU, etc.), and the CNG answers with the identities list in the HTTP GET Response. Then the CND chooses one identity and, in the second HTTP GET (Set Identity), provides the choice to the CNG, that answers for confirmation in the HTTP Get Response.

8.3 Signalling flows

The candidate on $G_{m'}$ is SIP specified in RFC 3261 [10], the one on $\mathbf{G_m}$ is SIP specified in TS 124 229 [17] and ES 283 003 [4].

8.3.1 CND attachment and NGN registration

The non-IMS devices considered in this case are devices associated to the VoIP phone number of the CNG.

Different kinds of devices (see table 4.1):

- Fixed or Wireless SIP phone.
- SIP Multi-mode (e.g. dual WI-Fi/3G phone).
- SIP soft phone on PC.
- Other: play station, STB, etc.

These SIP devices have a local SIP identity, as defined as local SIP URI (e.g. device kitchen) or public SIP URI (e.g. John123):

- The vendor provides a local SIP identity for all SIP devices. This enables "Plug and play" functionality. User does not need to configure the SIP device. By default, this local identity can be the MAC address.
- The user can change the local identity provided by the vendor to another local identity. The user may also be allowed to change the local identity to a public SIP URI. The customer can change this parameterization, and select a specific name or a local phone number for each device.

The attachment phase is defined in the following way (see figure 8.5):

1) In case $G_{m'}$ needs to be used (for local services), the DHCP server of the CNG will return the DHCP option 120 to the CND, standardized to provision CNG SIP proxy IP address or domain-name. This option will contain the IP address of the CNG on the CPN side (ex: 192.168.1.1).

2) The device registers locally to the CNG SIP-IMS proxy. SIP REGISTER message is sent with the local SIP URI of the device.

3) So as to allow the device to communicate through the NGN, the customer can configure the association between the local SIP URI of the device (pre-configured in the device) and the CNG's IMPU, or the device can use its own IMPU (public SIP URI pre-configured in the device) to send the register through the CNG SIP proxy. In those cases only one register has to be sent from the CNG to the NGN for multiple CND IMPUs within the CPN.

The authentication is handled directly by the CNG-SIP proxy B2BUA.

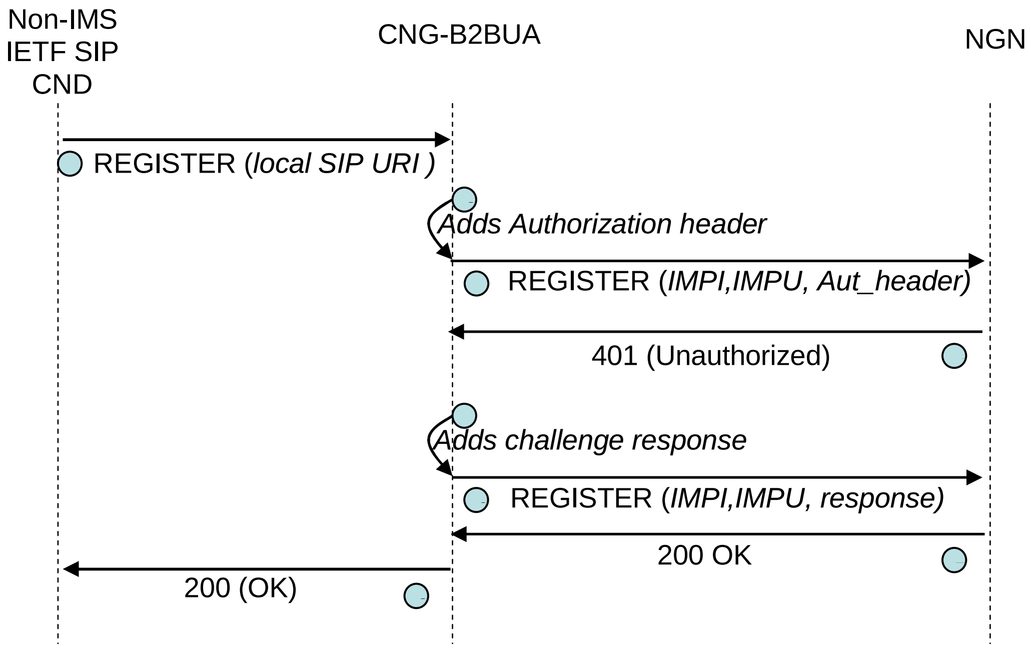
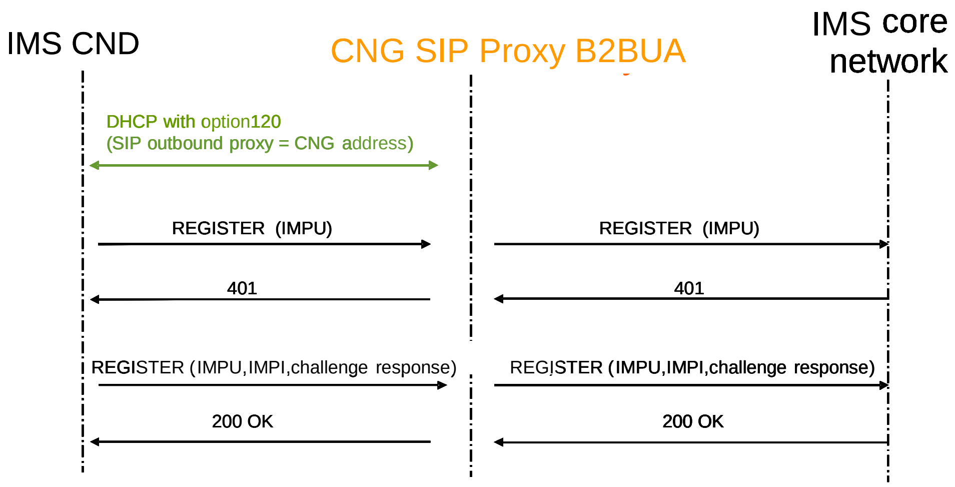

Non-IMS
IETF SIP
CND
CNG-B2BUA
NGN
REGISTER (*local SIP URI*)
Adds Authorization header
REGISTER (*IMPI,IMPU, Aut_header)*
401 (Unauthorized)
Adds challenge response
REGISTER (*IMPI,IMPU, response)*
200 OK
200 (OK)

Figure 8.5: Non IMS capable device Authentication trough CNG SIP Proxy

Other devices shall use their own IMPU (pre-configured in the device) to send the register directly to the NGN proxy through the CNG SIP proxy. It is the case for instance for a nomadic device which is not able to register locally at the CNG level as it does not use the option 120 to know its registrar already provisioned, but use the option 120 to discover the outbound proxy within the CNG.

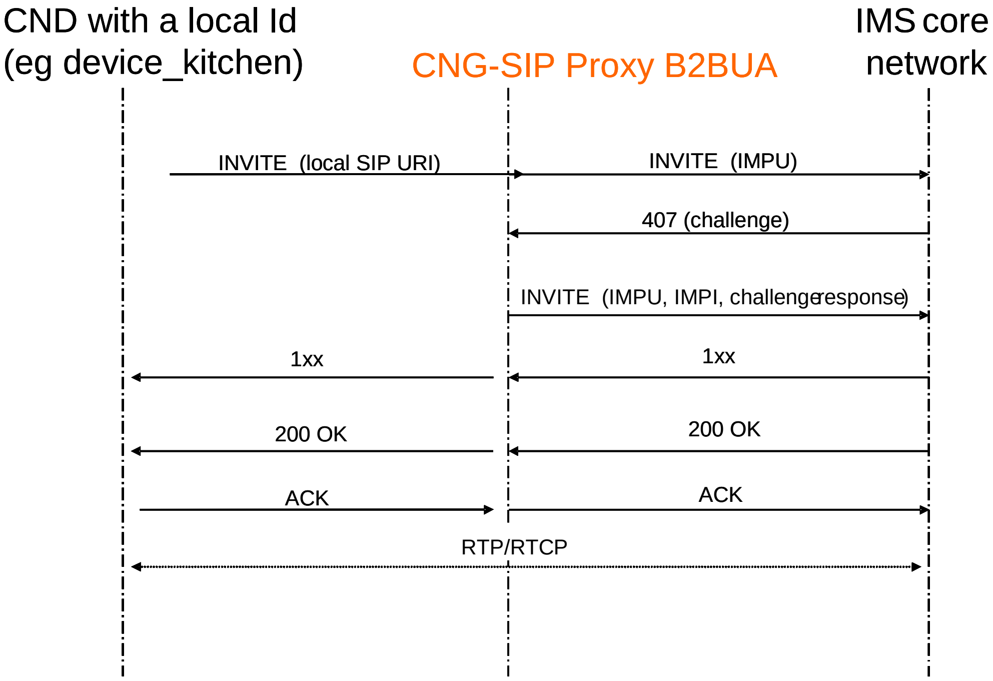

IMS CND
CNG SIP Proxy B2BUA
IMS core
network
DHCP with option120
(SIP outbound proxy = CNG address)
REGISTER (IMPU)
REGISTER (IMPU)
401
401
REGISTER (IMPU,IMPI,challenge response)
REGISTER (IMPU,IMPI,challenge response)
200 OK
200 OK

NOTE: This scenario is not possible in case of IMS device implementing the AKA authentication mechanisms (IPsec tunnel through the CNG).

Figure 8.6: IMS capable CND attachment and IMS registration

8.3.2 Outgoing call

The non-IMS device is provided with a public SIP URI or a local identity, as it is the case in figure 8.7.



NOTE: The 407 (challenge) is optional.

Figure 8.7:Outgoing Call trough CNG SIP Proxy

For non-IMS CND, the CNG SIP-SIP proxy can replace the device local IMPU with its own IMPU in the SIP INVITE, in case the CNG IMPU is associated with several CNDs (only one register is sent to the P-CSCF for several devices with the same tel number).

Figure 8.8 shows the case of IMS capable device:

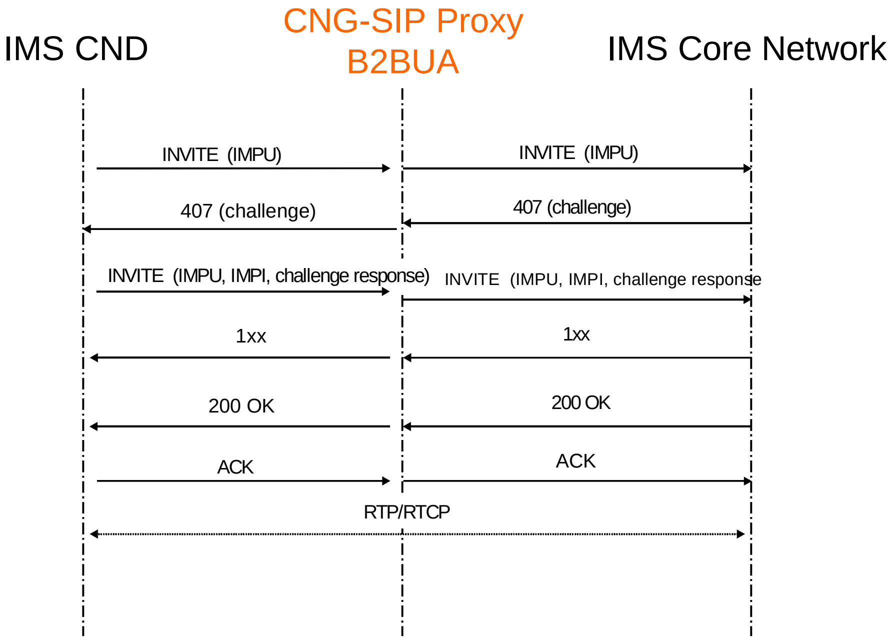


Figure 8.8: Outgoing call IMS capable device

8.3.3 Internal Call

The CNG SIP- proxy can route local call between 2 devices of the CPN.

No NGN resource is used to establish internal call.

SIP signalling is not forwarded to core network and media streams are kept on the CPN directly between endpoints.

The CNG SIP proxy identifies internal call after the analysis of the called party number.

The customer can dial:

- Directly the local identity of the device (e.g.: kitchen, dect, John, etc.).
- Or a private numbering plan. The commutation table is configurable for instance by the customer by the web server of the CNG (via U reference point).

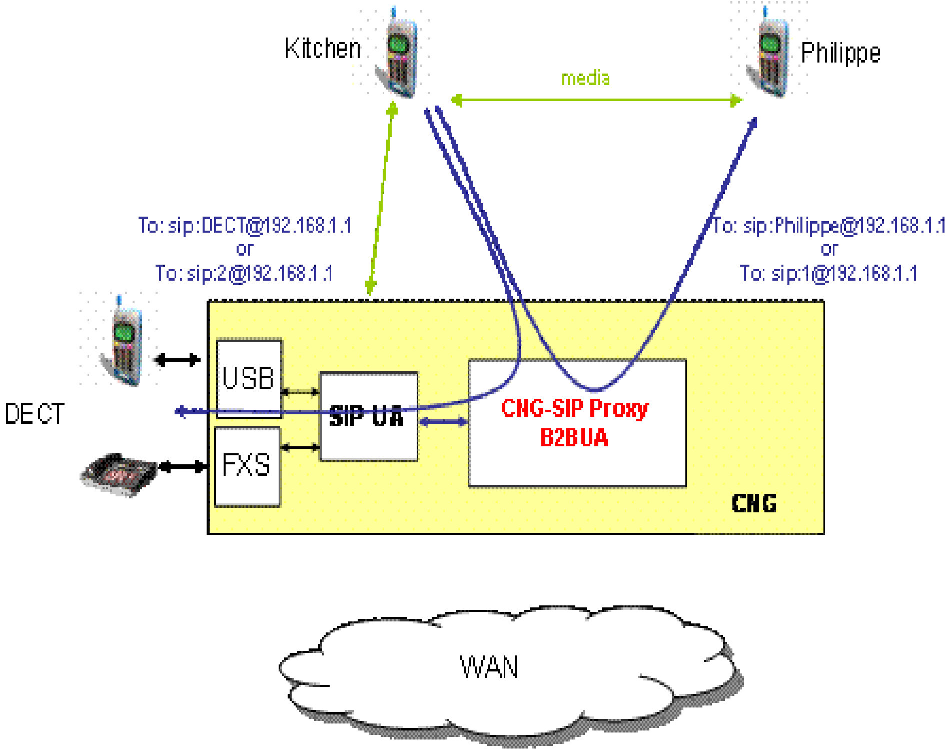


Figure 8.9: Internal Call Use Case

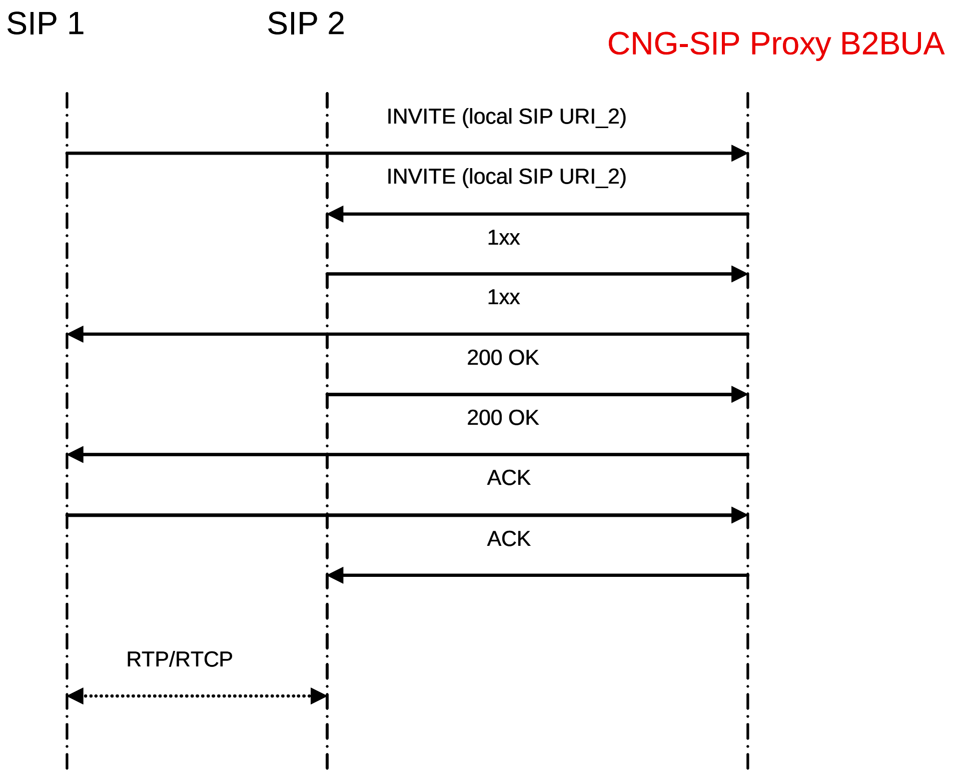


Figure 8.10: Internal call Information Flow

8.3.4 Admission Control (CNG-ACF)

The CNG-Admission Control Function (CNG-ACF) module calculates the available resources on the access line during the establishment of a new session, possibly limiting the number of sessions in advance, before the direct intervention of the RACS on the NGN side. As it has no means of reading signalling protocols other than unencrypted SIP, the result of this calculation may be wrong for the access line because of an underestimation of the total number of sessions. Still RACS will assure the proper result for the connection admission control over the access line and limit the session setup [i.5].

The module is considered as optional (as $G_{m'}$ and G_m interfaces related to the SIP proxy).

The objective is to guarantee the quality of service for each new session and existing sessions previously established.

The B2BUA extracts from SIP message the SDP offer and announced capabilities (codec audio, video, etc.).

It asks to CNG-ACF module if announced capabilities are compliant with the available resource.

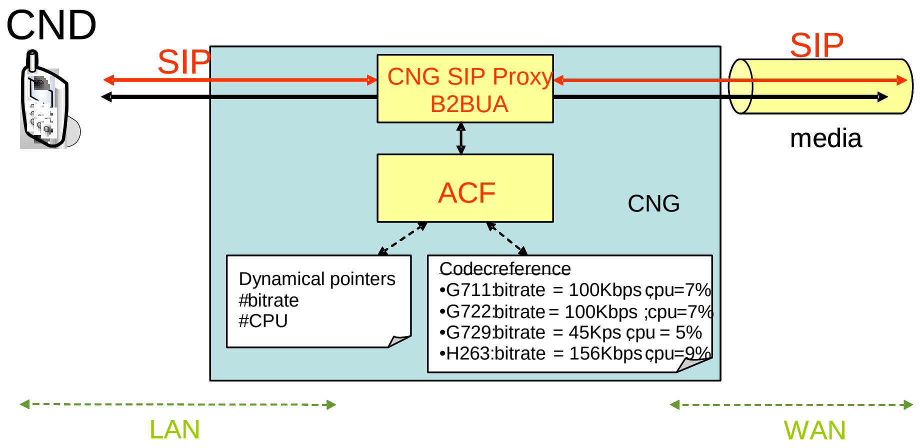
The CNG-ACF module returns 3 responses:

- **OK:**
  - The resource is available for all announced codecs.
  - The initial SIP message is forwarded without any change on SDP part.
- **OK with restriction:**
  - The initial SIP message is modified (incompatible codecs are suppressed from SDP part) and then forwarded.
  - The session can be established with an acceptable codec for network resource.

- **Not OK:**
  - The B2BUA rejects the session establishment.

NOTE: The SIP profiles can be different from one side of the B2BUA to another.

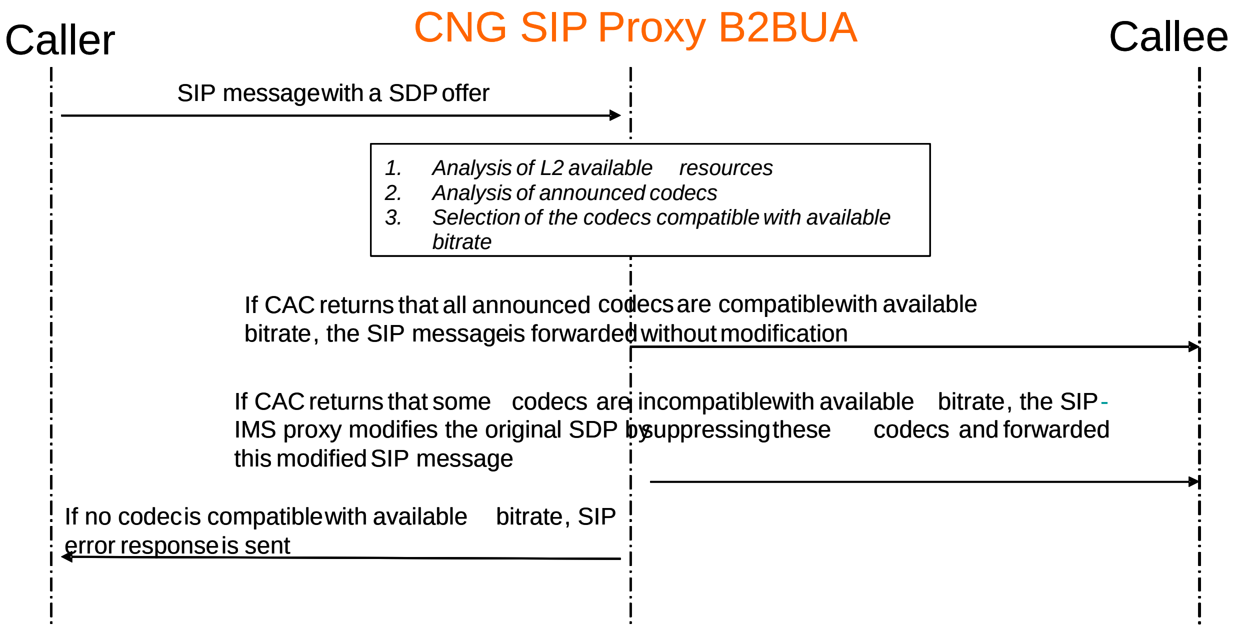
Make the media flows be direct between the device and the network.



Dynamical pointers
#bitrate
#CPU

Codecreference
•G711:bitrate = 100Kbps ;cpu=7%
•G722:bitrate = 100Kbps ;cpu=7%
•G729:bitrate = 45Kps ;cpu = 5%
•H263:bitrate = 156Kbps ;cpu=9%

Figure 8.11: CNG-Admission Control Function (ACF)



1. *Analysis of L2 available resources*
2. *Analysis of announced codecs*
3. *Selection of the codecs compatible with available bitrate*

If CAC returns that all announced codecs are compatiblewith available bitrate, the SIP messageis forwarded without modification

If CAC returns that some codecs are incompatiblewith available bitrate, the SIP-IMS proxy modifies the original SDP bysuppressingthese codecs and forwarded this modified SIP message

If no codecis compatiblewith available bitrate, SIP error responseis sent

Figure 8.12: Admission Control Information Flow

8.4 Remote Access information flows

8.4.1 Connection Setup

This clause describes one procedure where information of which CNDs are registered in the CNG and therefore accessible via Remote Access, is retrieved by the remote UE. The UE provides an application linking the procedures for Remote Access services.

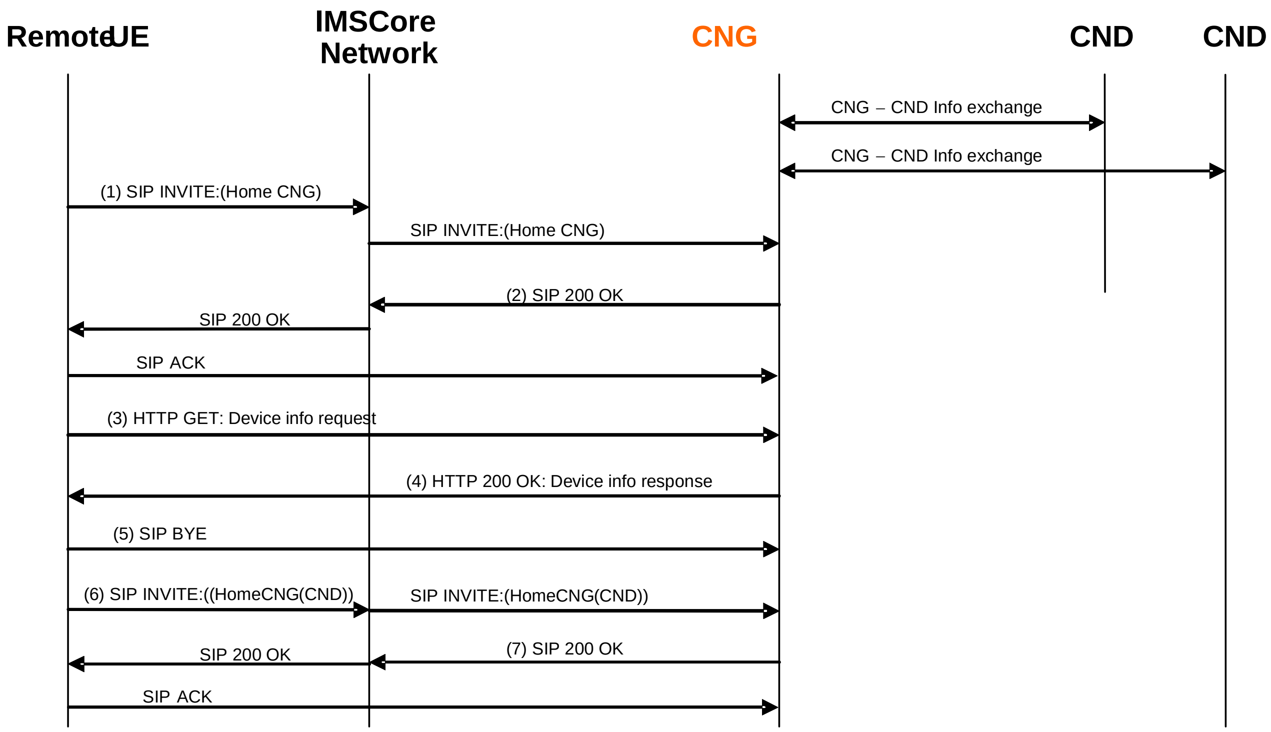


Figure 8.13: RA Connection Setup

Prerequisite, the CNDs in the CPN have to be registered (e.g. using UPnP or similar procedure) to the CNG before the following take place:

1) The remote access menu initiates SIP INVITE to the users home CNG. The request is granted by the IMS NW and sent to CNG.

2) CNG checks if the request shall be granted. It initiates mapping of addresses and ports and prepares for the remote access procedures by returning SIP 200 OK.

3) Optionally a secure tunnel is then setup between the remote UE and the CNG.

4) HTTP GET carries (e.g. DLNA or similar procedure) requesting CND information including device types and identities to be provided.

5) CNG checks its present CND registrations, DB info (e.g. DLNA or similar) and returns the CND's device type, identity and pointer to CND in HTTP 200 OK.

6) This session is terminated with SIP BYE.

7) The Remote UE now holds the list of available CNDs, their identities and types. The end user chooses the CND of interest and initiates a new session according to the following.

8) SIP INVITE is now sent addressing the CND (in the SDP part). The request is granted by the IMS NW and sent to the CNG.

9) CNG checks if the request shall be granted. It initiates mapping of addresses and ports and prepares for the remote access procedures by returning SIP 200 OK.

NOTE: This initiated session will be terminated (SIP BYE) in the end of the sequence. See last part of clauses 8.4.2 and 8.4.3.

8.4.2 Download of content

This clause describes the procedure where content is downloaded from a particular CND to the remote UE. The information about which CNDs are available has been retrieved during the connection setup procedure. The UE provides an application linking the procedures for Remote Access services.

Prerequisite is the RA Connection setup procedure displayed in clause 8.4.1:

1) The Remote UE points out the CND of interest using the path descriptor received under point 4 in clause 8.4.1.
2) CND sends an acknowledgement back to the Remote UE also indicating where to retrieve additional info.
3) The Remote UE sends a request (e.g. UPnP or similar) to the CND for additional device and service information.
4) CND responds with information about the services supported in the device.
5) The Remote UE browses the directories (e.g. with UPnP or similar procedure) where available content for download are located and makes a choice.
6) CND is responding with information (e.g. UPnP or similar) about the content URL/URI.
7) The Remote UE requests the download of data by addressing the content URL/URI.
8) The particular file is downloaded to the UE.
9) The connection is terminated with SIP BYE tearing down the session initiated by SIP INVITE in RA Connection setup described in clause 8.4.1, point 6.

In case of consecutive download requests the first four steps do not need to be repeated if the CND device and service information is cached in the Remote UE.

In the following flows (see figure 8.14) the HTTP protocol is shown as an example although other alternative choices could be considered.

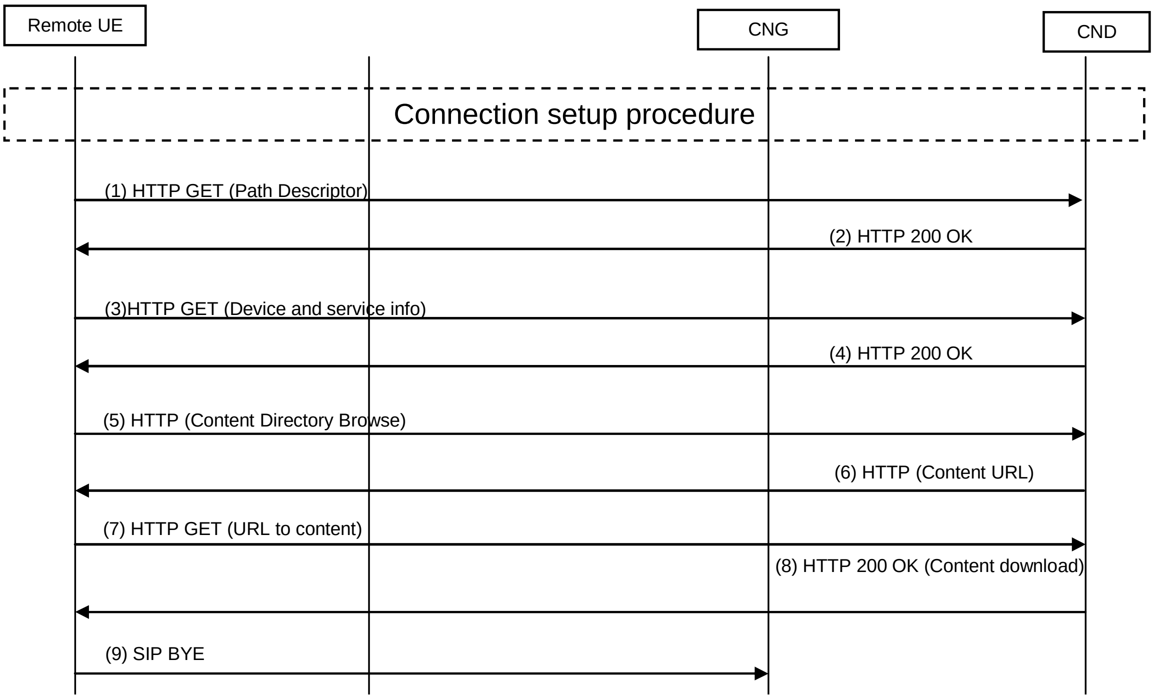

Remote UE
CNG
CND
Connection setup procedure
(1) HTTP GET (Path Descriptor)
(2) HTTP 200 OK
(3)HTTP GET (Device and service info)
(4) HTTP 200 OK
(5) HTTP (Content Directory Browse)
(6) HTTP (Content URL)
(7) HTTP GET (URL to content)
(8) HTTP 200 OK (Content download)
(9) SIP BYE

Figure 8.14: Download of content using HTTP

8.4.3 Upload of content

This clause describes the procedure where content is uploaded to a particular CND from the remote UE. The information about which CNDs are available has been retrieved during the connection setup procedure. The UE provides an application linking the procedures for Remote Access services.

Prerequisite is the RA Connection Setup procedure in clause 8.4.1:

1) The Remote UE points out the CND of interest using the path descriptor received under point 4 in clause 8.4.1.
2) CND sends an acknowledgement back to the Remote UE also indicating where to retrieve additional info.
3) The Remote UE sends a request (e.g. UPnP or similar) to the CND for additional device and service information.
4) CND responds with information about the services supported in the device.
5) The Remote UE browses the directories where content can be uploaded.
6) CND is responding with information about the content directory URL/URI.
7) The user selects the folder where content will be uploaded. An object is created for the pending file.
8) The Object description and URL/URI address is received by Remote UE.
9) The particular file (object) is uploaded to the CND.
10) CND is acknowledging the upload of content.
11) Disconnection is initiated with SIP BYE terminating the session initiated by SIP INVITE in RA Connection setup described in clause 8.4.1, point 6.

In case of consecutive upload requests the first four steps do not need to be repeated if the CND device and service information is cached in the Remote UE.

In the following flows the HTTP protocol is shown as an example although other alternative choices could be considered.

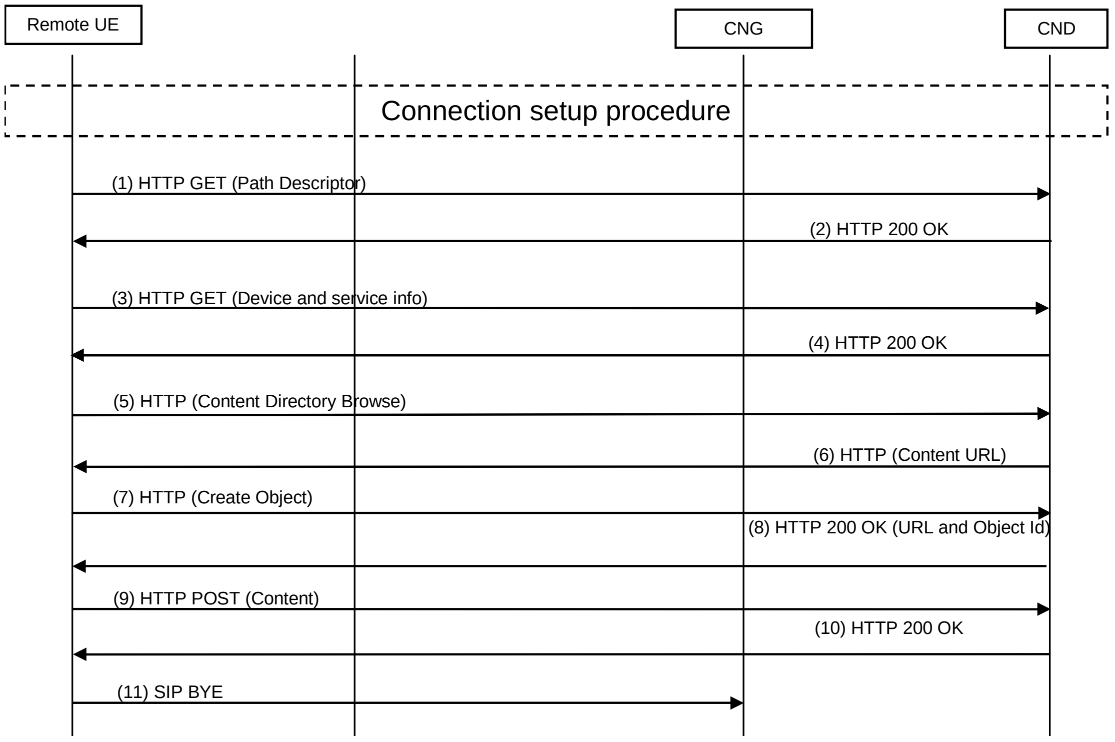

Remote UE
CNG
CND
Connection setup procedure
(1) HTTP GET (Path Descriptor)
(2) HTTP 200 OK
(3) HTTP GET (Device and service info)
(4) HTTP 200 OK
(5) HTTP (Content Directory Browse)
(6) HTTP (Content URL)
(7) HTTP (Create Object)
(8) HTTP 200 OK (URL and Object Id)
(9) HTTP POST (Content)
(10) HTTP 200 OK
(11) SIP BYE

Figure 8.15: Upload of content using HTTP

Annex A (informative): Bibliography

- HGI - Home Gateway Technical Requirements.
- ETSI TS 183 023: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); PSTN/ISDN simulation services; Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating NGN PSTN/ISDN Simulation Services".
- ETSI ES 282 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-system (RACS); Functional Architecture".

Annex B (informative): Change history

Date	WG Doc.	CR	Rev	CAT	Title / Comment	Current Version	New Version
28-05-08	17bTD202	001		F	ToC and figures Revision	2.0.0	2.0.1
28-05-08	17bTD259	002	2	F	Clarification on CNG Admission Control Function	2.0.0	2.0.1
28-05-08	17bTD261	003	1	F	Correction to change of local identity	2.0.0	2.0.1
28-05-08	17bTD262	004	1	F	Correction CND-PPCF	2.0.0	2.0.1
28-05-08	17bTD263	005	1	F	Correction of figure 4.6	2.0.0	2.0.1
02-07-08	18WTD121	006	1	F	Correction of the RA setup signalling flows – figure 8.13	2.0.1	2.0.2
11-07-08					All CRs approved at TISPAN#18	2.0.2	2.1.1
25-09-08	18bTD139r2	007		D	Clarifications in specification due to comments from HGI	2.1.1	2.1.2
					All CRs approved at TISPAN#19	2.1.2	2.2.1
					Publication	2.2.1	2.3.1

History

Document history		
V2.0.0	March 2008	Publication
V2.3.1	May 2009	Publication