ETSI TS 132 255 V16.7.0 (2021-01)

5G;
Telecommunication management;
Charging management;
5G data connectivity domain charging;
Stage 2
(3GPP TS 32.255 version 16.7.0 Release 16)

Reference
RTS/TSGS-0532255vG70

Keywords
5G

ETSI

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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1 Scope.

The present document is part of a series of documents that specify charging functionality and charging management in 3GPP networks. The 3GPP core network charging architecture and principles are specified in TS 32.240 [1], which provides an umbrella for other charging management TSs that specify:

- the content of the CDRs per domain / subsystem / service (offline charging);
- the content of real-time charging messages per domain / subsystem / service (online charging);
- the functionality of online and offline charging for those domains / subsystems / services;
- the interfaces that are used in the charging framework to transfer the charging information (i.e. CDRs or charging events).

The complete document structure for these TSs is defined in TS 32.240 [1].

The present document specifies the converged offline and online charging description for the 5G Data Connectivity domain based on the functional stage 2 description in TS 23.501 [200], TS 23.502 [201] and TS 23.503 [202].

This charging description includes the converged offline and online charging architecture and scenarios specific to the 5G Data Connectivity domain, as well as the mapping of the common 3GPP charging architecture specified in TS 32.240 [1] onto the 5G Data Connectivity domain.

It further specifies the structure and content of the CDRs for offline charging, and the charging events for converged online and offline charging. The present document is related to other 3GPP charging TSs as follows:

- The common 3GPP charging architecture is specified in TS 32.240 [1].
- The parameters, abstract syntax and encoding rules for the CDRs are specified in TS 32.298 [51].
- A transaction based mechanism for the transfer of CDRs within the network is specified in TS 32.295 [54].
- The file based mechanism used to transfer the CDRs from the network to the operator's billing domain (e.g. the billing system or a mediation device) is specified in TS 32.297 [52].
- The services, operations and procedures of charging, using Service Based Interface are specified in TS 32.290 [57].
- The charging service of 5G system is specified in TS 32.291 [58].

All references, abbreviations, definitions, descriptions, principles and requirements, used in the present document, that are common across 3GPP TSs, are defined in TR 21.905 [100]. Those that are common across charging management in 3GPP networks/domains, services or subsystems are provided in the umbrella TS 32.240 [1] and are copied into clause 3 of the present document for ease of reading. Finally, those items that are specific to the present document are defined exclusively in the present document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 32.240: "Telecommunication management; Charging management; Charging architecture and principles".

[2] - [50] Void.

[51] 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description".

[52] 3GPP TS 32.297: "Telecommunication management; Charging management; Charging Data Record (CDR) file format and transfer".

[53] Void.

[54] 3GPP TS 32.295: "Telecommunication management; Charging management; Charging Data Record (CDR) transfer".

[55-56] Void.

[57] 3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".

[58] 3GPP TS 32.291: " Telecommunication management; Charging management; 5G system; Charging service, stage 3".

[59] - [99] Void.

[100] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[101] 3GPP TS 22.115: "Service aspects; Charging and billing".

[102] 3GPP TS 22.261: "Service requirements for next generation new services and markets".

[103] - [199] Void

[200] 3GPP TS 23.501:"System Architecture for the 5G System".

[201] 3GPP TS 23.502:"Procedures for the 5G System".

[202] 3GPP TS 23.503:"Policy and Charging Control Framework for the 5G System; Stage 2".

[203] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[204] - [299] Void

[300] - [399] Void.

[400] - [499] Void.

[500] - [599] Void.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [100] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [100].

3.2 Symbols

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

Bd Reference point for the CDR file transfer from the 5G Data connectivity CGF to the BD.
Ga Reference point for CDR transfer between a CDF and the CGF.
Nchf Service based interface exhibited by CHF.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [100] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [100].

5GC	5G Core Network
5GS	5G System
ABMF	Account Balance Management Function
AF	Application Function
AMF	Access and Mobility Management Function
ATSSS	Access Traffic Steering, Switching, Splitting
AUSF	Authentication Server Function
BD	Billing Domain
CCS	Converged Charging System
CDF	Charging Data Function
CGF	Charging Gateway Function
CHF	Charging Function
CP	Control Plane
CTF	Charging Trigger Function
DNN	Data Network Name
FBC	Flow Based Charging
GPSI	Generic Public Subscription Identifier
GUAMI	Globally Unique AMF Identifier
MA	Multi-Access
MPTCP	Multi-Path TCP Protocol
N3IWF	Non-3GPP InterWorking Function
NE	Network Element
NEF	Network Exposure Function
NF	Network Function
NRF	Network Repository Function
NSSF	Network Slice Selection Function
OCF	Online Charging Function
OCS	Online Charging System
PCC	Policy and Charging Control
PCF	Policy Control Function
PEI	Permanent Equipment Identifier
QBC	QoS flow Based Charging
QFI	QoS Flow Identifier
SCP	Service Communication Proxy
SDF	Service Data Flow
SMF	Session Management Function
SSC	Session and Service Continuity
SUPI	Subscription Permanent Identifier
TNAN	Trusted Non-3GPP Access Network
TNAP	Trusted Non-3GPP Access Point
UDM	Unified Data Management
UDR	Unified Data Repository
UPF	User Plane Function

4 Architecture considerations

4.1 High-level 5G System architecture

4.1.1 Non-roaming reference architecture

Figure 4.1.1.1 shows the 5G System high level architecture as defined in TS 23.501 [200] for 5G data connectivity, in the service-based representation for Control Plane (CP) Network Functions.

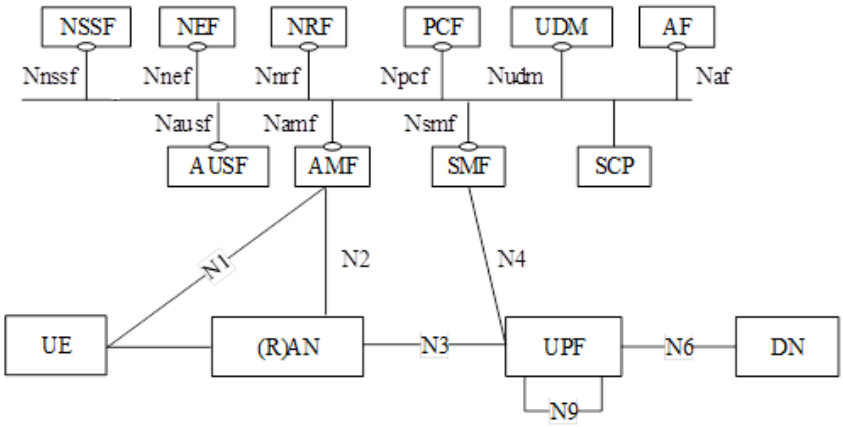

Figure 4.1.1.1: 5G System architecture

4.1.2 Roaming Home Routed reference architecture

Figure 4.1.2.1 shows the 5G System high level Roaming Home Routed architecture as defined in TS 23.501 [200] for 5G data connectivity, in the service-based representation for Control Plane (CP) Network Functions.

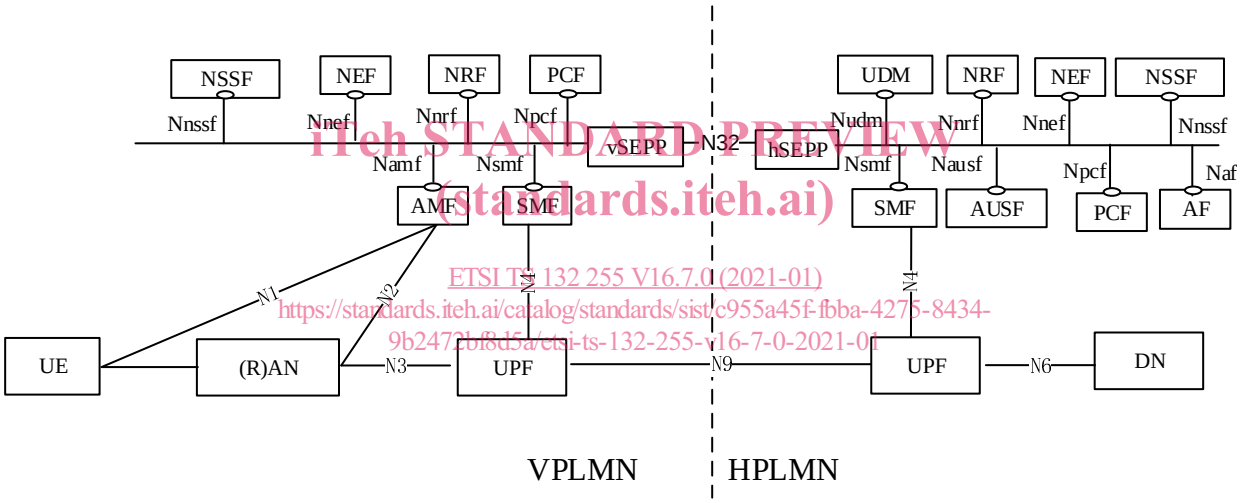

Figure 4.1.2.1: Roaming 5G System architecture - home routed scenario in service-based interface representation

4.1.3 Interworking with EPC architecture

Figure 4.1.3.1 shows the non-roaming architecture for interworking between 5GS and EPC/E-UTRAN as defined in TS 23.501 [200] for 5G data connectivity.

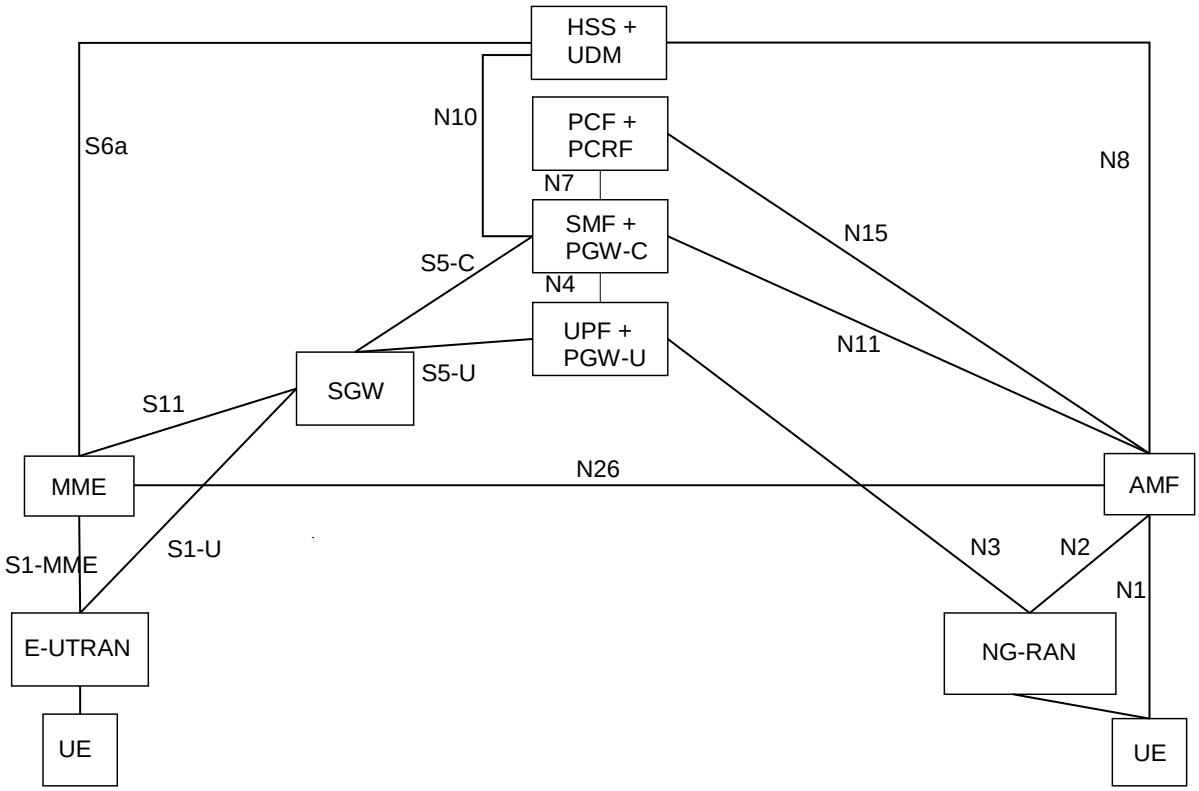

Figure 4.1.3.1: Non-roaming architecture for interworking between 5GS and EPC/E-UTRAN

NOTE: N26 interface is an inter-CN interface between the MME and 5GS AMF in order to enable interworking between EPC and the NG core. Support of N26 interface in the network is optional for interworking.

4.1.4 Architecture reference for Non-3GPP Accesses

Figure 4.1.4.1 shows the non-roaming architecture for Non-3GPP Accesses as defined in TS 23.501 [200] for 5G data connectivity.

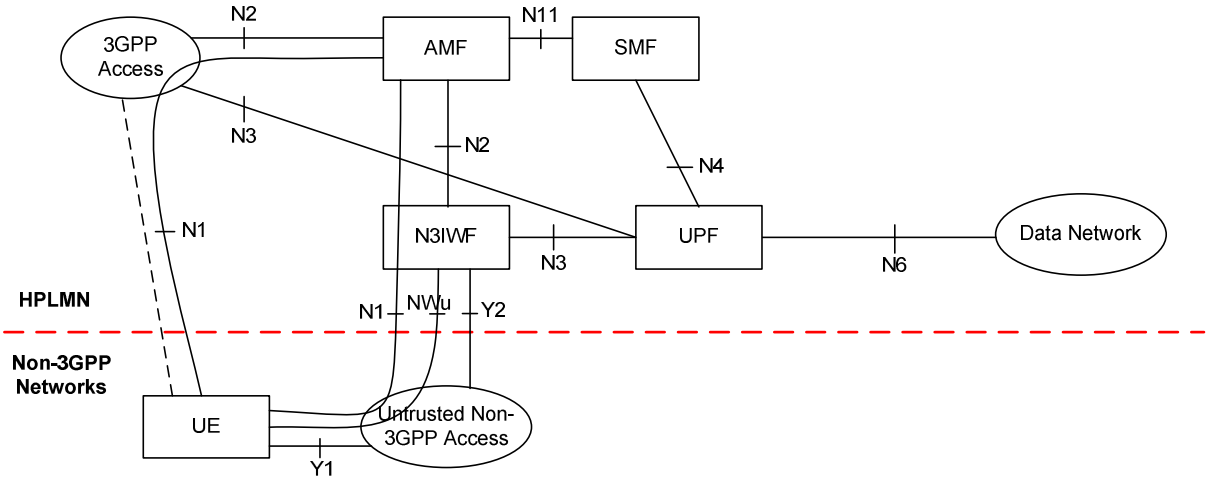

Figure 4.1.4.1: Non-roaming architecture for Untrusted Non-3GPP Accesses

This reference architecture supports service based interfaces for AMF, SMF and other NFs not represented in the figure.

Figure 4.1.4.2 shows the non-roaming architecture for 5G Core Network with trusted non-3GPP access as defined in TS 23.501 [200] for 5G data connectivity.

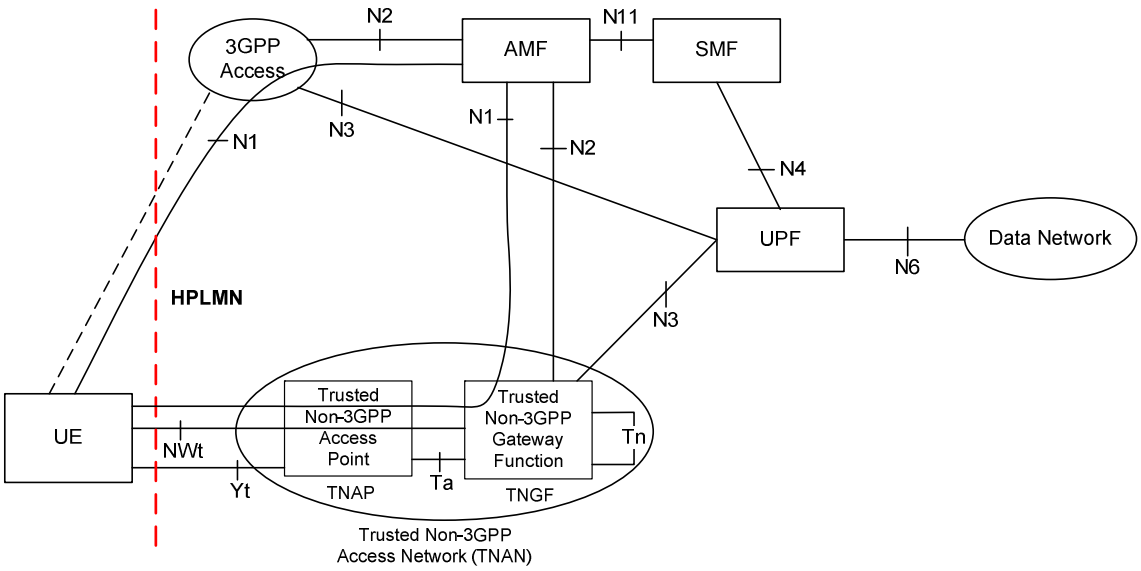

Figure 4.1.4.2: Non-roaming architecture for 5G Core Network with trusted non-3GPP access

The UE is connected to the 5G Core Network over non-3GPP access. This reference architecture supports service based interfaces for AMF, SMF and other NFs not represented in the figure.

4.1.5 Architecture for deployments topologies with specific SMF Service Areas

4.1.5.1 Non-roaming architecture with an I-SMF insertion without ULCL/BP

Figure 4.1.5.1 shows the 5G System high level non-roaming architecture, as defined in TS 23.501 [200], with an I-SMF insertion to the PDU Session without UL-CL/BP, using reference point representation.

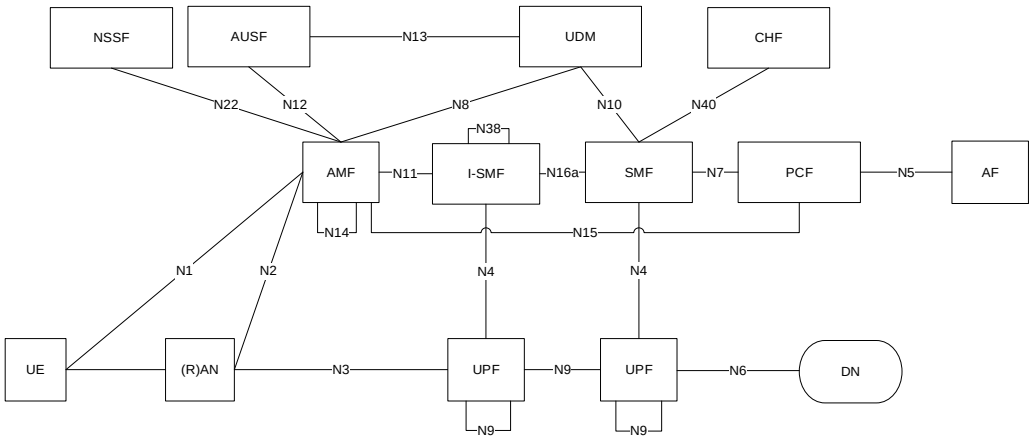

Figure 4.1.5.1: Non-roaming architecture with I-SMF insertion to the PDU Session in reference point representation, with no UL-CL/BP

4.1.5.2 Non-roaming architecture with an I-SMF insertion with ULCL/BP

Figure 4.1.5.2 shows the 5G System high level non-roaming architecture, as defined in TS 23.501 [200], for an I-SMF insertion to the PDU Session with UL-CL/BP, using reference point representation.

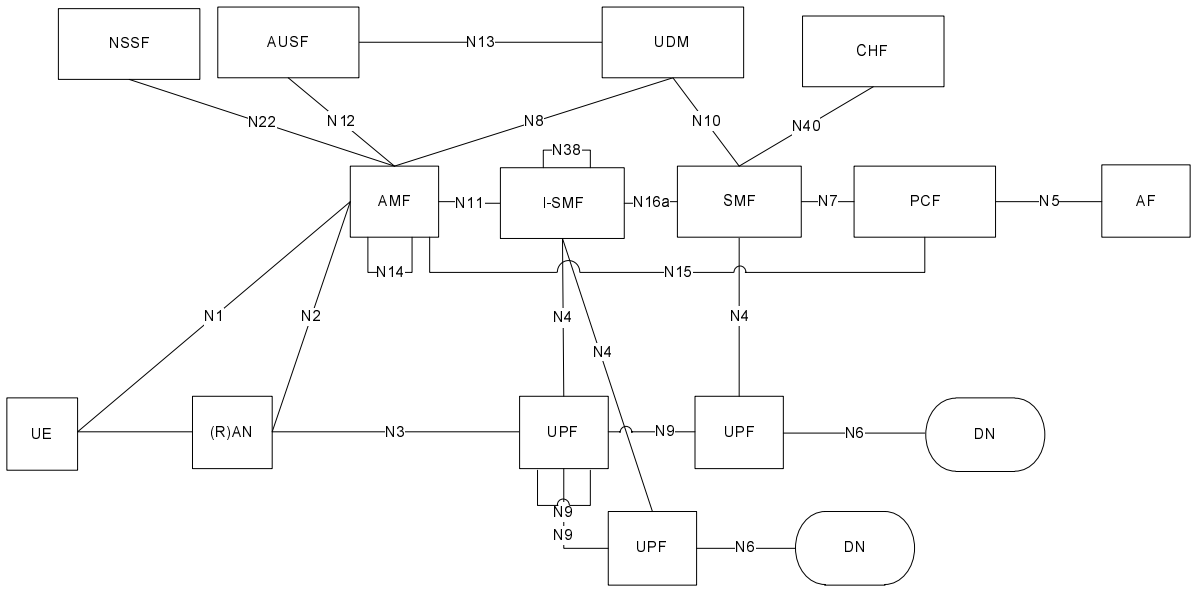

Figure 4.1.5.2: Non-roaming architecture with I-SMF insertion to the PDU Session in reference point representation, with UL-CL/BP

4.1.6 Architecture reference for ATSSS support

The 5G System Architecture references for the support of ATSSS in 5G data connectivity charging are specified in TS 23.501 [200]:

- Non-roaming: Figure 4.2.10-1.
- Roaming with Home-routed architecture - UE registered to the same VPLMN: Figure 4.2.10-2.
- Roaming with Home-routed architecture - UE registered to different PLMNs: Figure 4.2.10-3.

The Hybrid Access architecture of 5G-RG for the support of ATSSS in 5G data connectivity charging is defined in clause 4.1.7.

4.1.7 Architecture reference for Wireline Access network

Figure 4.1.7.1 shows the non- roaming architecture for 5G Core Network for 5G-RG with Wireline 5G Access network and NG RAN as defined in TS 23.501 [200] for 5G data connectivity.