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# Foreword

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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.

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# 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] - [299]	Void
[300] - [399]	Void.
[400] - [499]	Void.
[500] - [599]	Void.

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## 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
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
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
SMF	Session Management Function
SSC	Session and Service Continuity
SUPI	Subscription Permanent Identifier
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.

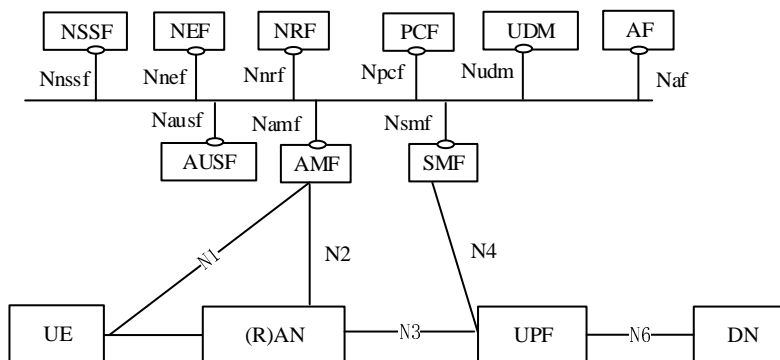


Figure 4.1.1.1: 5G System architecture

### 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.

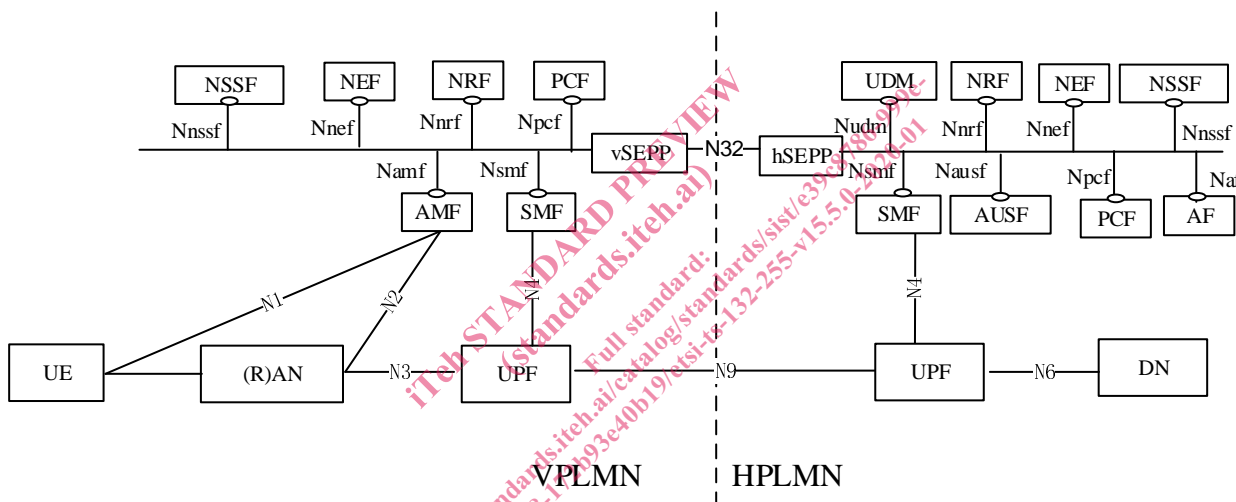


Figure 4.1.2.1: Roaming 5G System architecture - home routed scenario in service-based interface representation

### 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.

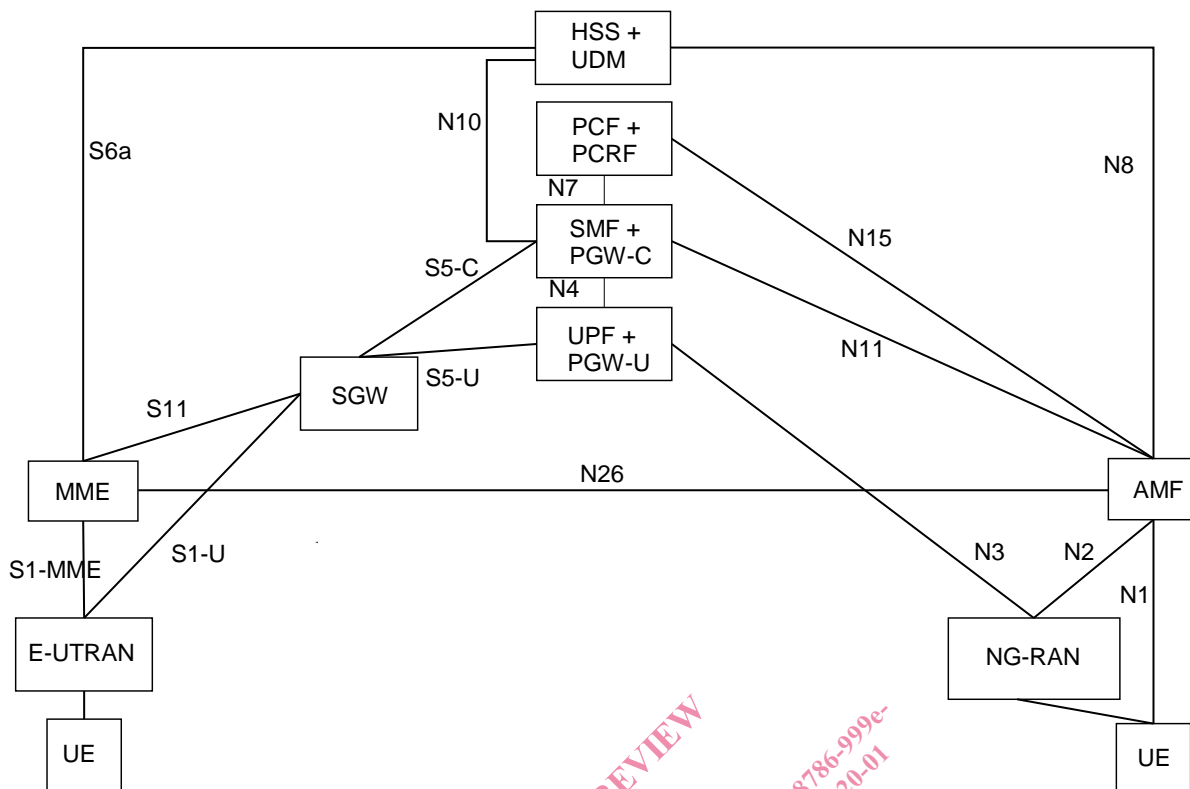


Figure 4.1.3.1: Non-roaming architecture for interworking between 5GS and EPC/E-UTRAN

#### 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.

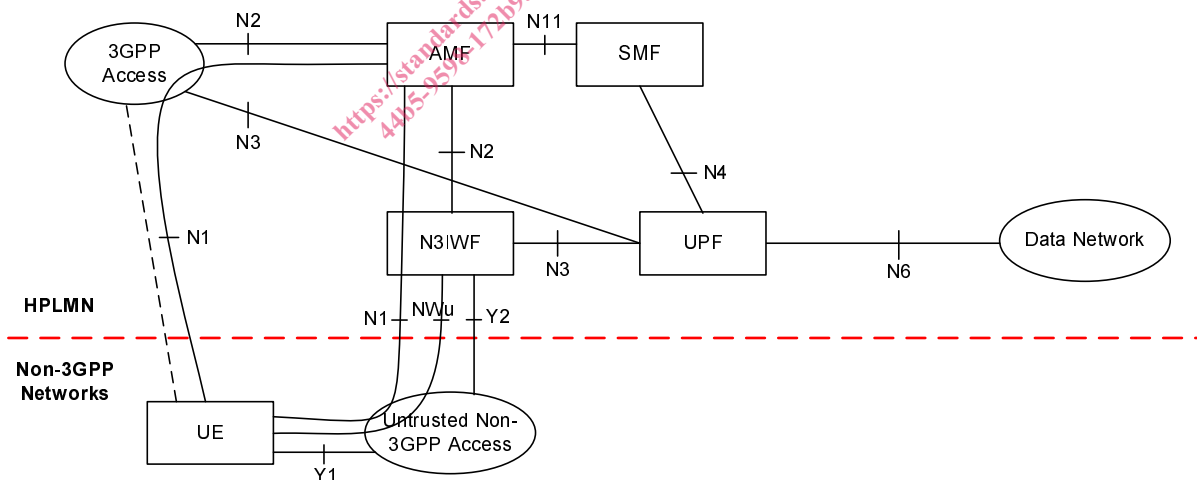


Figure 4.1.4.1: Non-roaming architecture for Non-3GPP Accesses

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

## 4.2 5G data connectivity domain converged charging architecture

The SMF embedding the CTF, generates charging events towards the CHF for PDU connectivity converged online and offline charging.

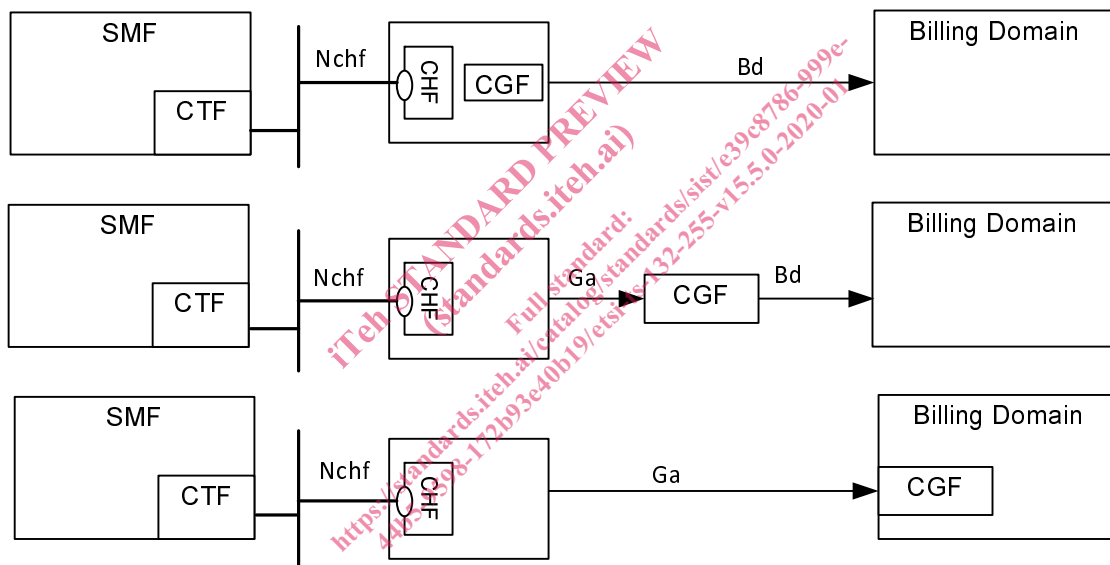
As described in TS 32.240 [1], the CTF generates charging events towards to the CHF for converged online and offline charging processing. The CDRs generation is performed by the CHF acting as a CDF, which transfers them to the CGF. Finally, the CGF creates CDR files and forwards them to the BD.

If the CGF is external, the CHF acting as a CDF, forwards the CDRs to the CGF across the Ga interface.

If the CGF is integrated, there is only one internal interface between the CHF and the CGF. In this case, the relationship between CHF and CGF is 1:1. An integrated CGF may support the Ga interface from other CDFs.

When an external CGF is used, this CGF may also be used by other, i.e. non-5GCS, network elements, according to network design and operator decision. It should be noted that the CGF may also be an integrated component of the BD – in this case, the Bd interface does not exist and is replaced by a proprietary solution internal to the BD.

Figure 4.2.1 depicts the architectural options for converged charging.



**Figure 4.2.1: 5G data connectivity converged charging architecture**

Nchf is described in clauses 5.2.1 and 5.2.2, Ga in clause 5.2.4 and Bd in clause 5.2.5.

## 5 5G data connectivity charging principles and scenarios

### 5.1 5G data connectivity charging principles

#### 5.1.1 General

The charging functions specified for the 5G data connectivity charging:

- PDU session in SMF, refer to TS 23.501 [200];