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Network slice admission control charging
in the 5G System (5GS)
(3GPP TS 28.203 version 18.1.0 Release 18)**



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Foreword

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In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies the Converged Charging description for Network Slice Admission Control charging in the 5G System (5GS), based on Network Slice Admission Control Function (NSACF) of 5GS architecture and procedures specified in 3GPP TS 23.501 [3] and 3GPP TS 23.502 [4].

The charging aspect of Network Slice Admission Control charging is based on charging principles specified in 3GPP TS 32.240 [2].

The following functionalities of Network Slice Admission Control are within the scope:

- number of registered UEs per network slice;
- number of PDU Sessions per network slice.

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 TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 32.240: "Telecommunication management; Charging management; Charging architecture and principles".
- [3] 3GPP TS 23.501: "System Architecture for the 5G System (5GS)".
- [4] 3GPP TS 23.502: "Procedures for the 5G System".
- [5] 3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".
- [6] 3GPP TS 32.291: "Telecommunication management; Charging management; 5G system; Charging service, stage 3".
- [7] 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description".
- [8] 3GPP TS 32.295: "Telecommunication management; Charging management; Charging Data Record (CDR) transfer".
- [9] 3GPP TS 32.297: "Telecommunication management; Charging management; Charging Data Record (CDR) file format and transfer".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] 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 [1].

5G System: 3GPP system consisting of 5G Access Network (AN), 5G Core Network and UE

Network Slice: A logical network that provides specific network capabilities and network characteristics

PDU Session: Association between the UE and a Data Network that provides a PDU connectivity service

3.2 Symbols

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

Bnsac	Reference point for the CDR file transfer from the NSACF CGF to the BD.
Ga	Reference point for CDR transfer between a CDF and the CGF.
Nchf	Service based interface exhibited by CHF.
N102	Reference point between NSACF and the CHF.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] 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 [1].

3GPP	3 rd Generation Partnership Project
5GS	5G System
CCS	Converged Charging System
CDR	Charging Data Record
CGF	Charging Gateway Function
CHF	CHarging Function
IEC	Immediate Event Charging
NSAC	Network Slice Admission Control
NSACF	Network Slice Admission Control Function
PDU	Protocol Data Unit
PEC	Post Event Charging
PNI-NPN	Public Network Integrated NPN
SNPN	Stand-alone Non-Public Network
S-NSSAI	Single Network Slice Selection Assistance Information
SBI	Service Based Interface
SCUR	Session Charging with Unit Reservation
UE	User Equipment

4 Architecture considerations

4.1 High-level 5G System architecture

4.1.1 Non-roaming reference architecture

Figure 4.1.1-1 shows the Non-roaming 5G System high level architecture in the service-based representation, as defined in 3GPP TS 23.501 [3], with Network Slice Admission Control Function (NSACF):

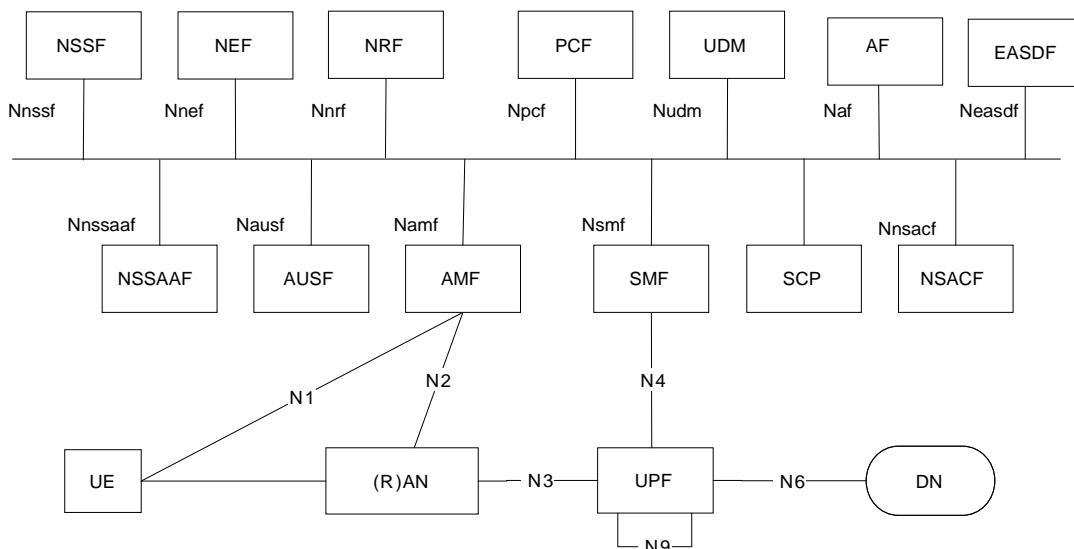


Figure 4.1.1-1: Non-Roaming 5G System architecture

4.2 Network Slice Admission Control converged charging architecture

4.2.1 Non-roaming

Architectural options for Network Slice Admission Control converged charging in service-based representation are depicted in figure 4.2.1-1.

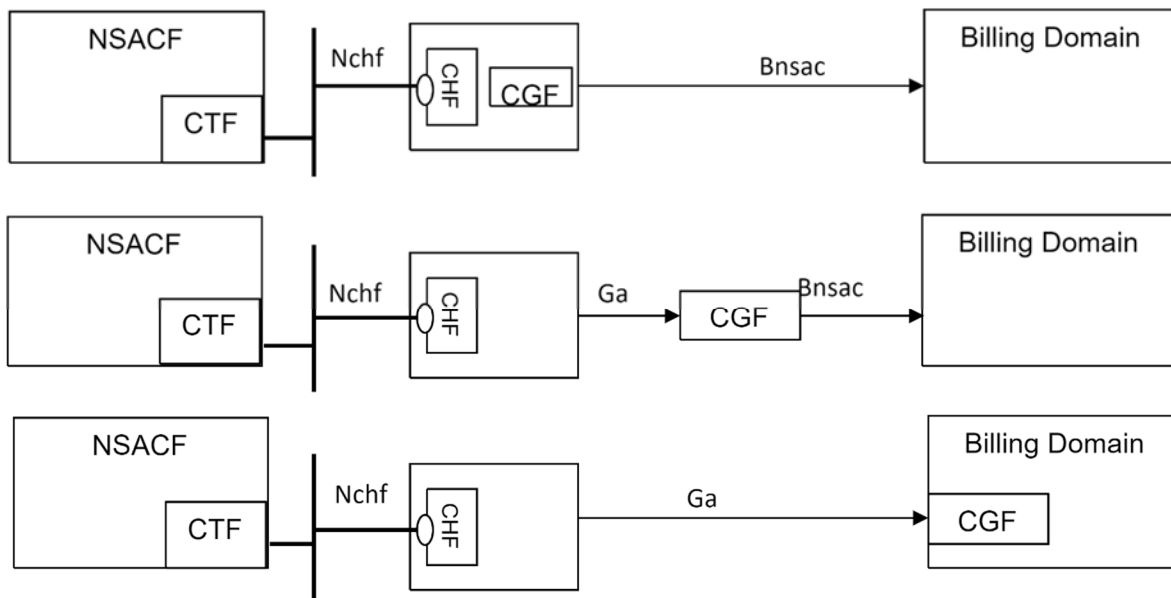


Figure 4.2.1-1: Non-Roaming Network Slice Admission Control converged charging architecture

Architectural options of figure 4.2.1-1 apply to any Network Slice Admission Control converged charging architecture of this clause.

Details on the interfaces and functions can be found in 3GPP TS 32.240 [2] for the general architecture components, Ga is described in clause 5.2.4 and Bnsac in clause 5.2.5 of the present document, and Nchf is described in 3GPP TS 32.290 [5].

Figure 4.2.1-2 shows the Network Slice Admission Control converged charging architecture in reference point representation for non-roaming:

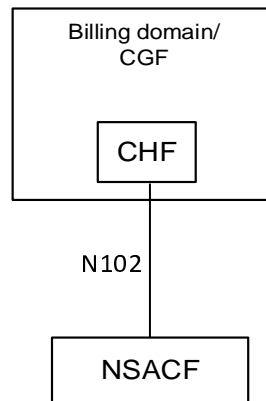


Figure 4.2.1-2: Non-Roaming Network Slice Admission Control converged charging architecture - reference point representation

5 Network Slice Admission Control charging principles and scenarios

5.1 Network Slice Admission Control charging principles

5.1.1 General

The charging functions specified for Network Slice Admission Control charging, are based on following functionalities supported by NSACF specified in 3GPP TS 23.501 [3]:

- monitoring and controlling the number of registered UEs per network slice;
- monitoring and controlling the number of established PDU Sessions per network slice.

In the present document, "Number of registered UEs per network slice" or "Number of UEs per network slice " refer to simultaneous number of UEs registered per network slice, and "Number of established PDU Sessions" or "Number of PDU Sessions" refer to simultaneous number of PDU Sessions established per network slice.

The identification of the subscription to the network slice is the S-NSSAI.

5.1.2 Requirements

The following are high-level charging requirements specific to Network Slice Admission Control charging:

- The NSACF shall support converged charging using service based interface.
- The NSACF shall support converged charging for number of UEs per S-NSSAI.
- The NSACF shall support converged charging for number of PDU Sessions per S-NSSAI.

5.1.3 Charging information

The charging information for Network Slice Admission Control charging are:

- S-NSSAI;
- number of UEs;
- number of PDU Sessions.

5.1.4 CHF selection

The CHF selection by the NSACF is based on the following options and with this priority order (highest to lowest):

- NRF based discovery;
- pre-configured CHF address(s).

5.2 Network Slice Admission Control charging converged charging scenarios

5.2.1 Basic principles

5.2.1.1 General

Network Slice Admission Control converged charging, may be performed by the NSACF interacting with the Charging Function (CHF) using Nchf specified in 3GPP TS 32.290 [5] and 3GPP TS 32.291 [6].

The S-NSSAI may be used to identify the tenant e.g. Stand-alone Non-Public Network (SNPN) or Public Network Integrated NPN (PNI-NPN). To provide the data required for the management activities outlined in GPP TS 32.240 [2], the NSACF shall be able to perform converged charging for each of the following:

- Charging information related to number of UEs per S-NSSAI.
- Charging information related to number of PDU Sessions per S-NSSAI.

The NSACF shall be able to perform converged charging by interacting with the CHF, for charging data related to number of UEs and number of PDU Sessions. The Charging Data Request and Charging Data Response are exchanged between the NSACF and the CHF, based on IEC, PEC, ECUR or SCUR scenarios as specified in 3GPP TS 32.290 [5]. The Charging Data Request is issued by the NSACF towards the CHF when certain conditions (chargeable events) are met.

Whether network slice admission control converged charging per S-NSSAI is active or inactive, which charging scenarios (IEC, PEC, ECUR or SCUR) is applied, and the threshold of NSAC Unit per S-NSSAI for initial, upward/downward crossed, and termination are based on configuration.

Converged charging uses centralized or decentralized unit determination and centralized rating scenarios for session based convergent charging specified in 3GPP TS 32.290 [5].

A detailed formal description of the converged charging parameters defined in the present document is to be found in 3GPP TS 32.291 [6].

A detailed formal description of the CDR parameters defined in the present document is to be found in 3GPP TS 32.298 [7].

5.2.1.2 Applicable triggers in the NSACF

5.2.1.2.1 General

When a charging event is issued towards the CHF, it includes details of charging information such as S-NSSAI.

Each trigger condition (i.e. chargeable event) defined for the Network Slice Admission Control converged charging functionality with the associated behaviour when they are met, is specified in the present document, and the basic trigger mechanism is specified in the 3GPP TS 32.290 [5].

For session based charging the following applies:

- A Charging Data Request [Initial] is invoked by the NSACF towards the CHF when a trigger for "initial" is met for an S-NSSAI, and no charging session exists for this S-NSSAI.
- A Charging Data Request [Termination] is invoked by the NSACF towards the CHF when a trigger for "termination" is met for an S-NSSAI.
- A Charging Data Request [Update] is invoked by the NSACF towards the CHF, when any trigger which is not a trigger for "initial" nor a trigger for "termination" is met, and the charging session exists for an S-NSSAI.

For event based charging, when a trigger for threshold reached is met for an S-NSSAI, and the converged charging is activated, the following applies:

- In IEC mode, the Charging Data Request [Event] is sent towards the CHF.
- In ECUR mode, the NSACF invokes a Charging Data Request [Initial] towards the CHF to get authorization to allow the new allocated units for the updated threshold request, and sends Charging Data Request [Termination] towards the CHF to inform that the new allocated units is accepted by NSACF.
- In PEC mode, the Charging Data Request [Event] is sent towards the CHF when the event completed, e.g. used threshold.

Table 5.2.1.2.1-1 summarizes the set of default trigger conditions which shall be supported by the NSACF when charging is active for the corresponding NSACF functionality, with the associated Charging Data Request message sent from NSACF towards the CHF.

"NSAC units" refers to "Number of UEs" or "Number of PDU sessions".

Table 5.2.1.2.1-1: Default trigger conditions in NSACF

Trigger Conditions	Trigger level	Default category	CHF allowed to change category	CHF allowed to enable and disable	Message when "immediate reporting" category
Initial					
NSAC units threshold reached for initial	-	Immediate	Not Applicable	Not Applicable	SCUR: Charging Data Request [Initial]
Change of charging conditions					
NSAC units threshold upwards reached	-	Immediate	Yes	Yes	IEC: Charging Data Request [Event] ECUR: Charging Data Request [Initial]
NSAC units threshold crossed upwards	-	Immediate	Yes	Yes	PEC: Charging Data Request [Event] SCUR: Charging Data Request [Update]
NSAC units threshold crossed downwards	-	Immediate	Yes	Yes	PEC: Charging Data Request [Event] SCUR: Charging Data Request [Update]
Quota management					
NSAC units quota threshold reached	-	Immediate	Not Applicable	Yes	SCUR: Charging Data Request [Update]
NSAC units quota exhausted	-	Immediate	Not Applicable	Yes	
Expiry of NSAC units quota validity time	-	Immediate	Not Applicable	Yes	
Expiry of NSAC units quota holding time	-	Immediate	Not Applicable	Yes	
Re-authorization request by CHF	-	Immediate	Not Applicable	Not Applicable	
Termination					
NSAC units threshold reached for termination	-	Immediate	Not Applicable	Not Applicable	SCUR: Charging Data Request [Termination]
NSAC check and update completed	-	Immediate	Not Applicable	Not Applicable	ECUR: Charging Data Request [Termination]
Abort charging request from the CHF	-	Immediate	Not Applicable	Not Applicable	SCUR: Charging Data Request [Termination]
Network slice termination	-	Immediate	Not Applicable	Not Applicable	PEC: Charging Data Request [Event] SCUR: Charging Data Request [Termination]

Table 5.2.1.2.1-2 details the set of trigger conditions and NSACF behaviour for SCUR.

Table 5.2.1.2.1-2: Chargeable events and their related actions in NSACF for SCUR

Chargeable event	Conditions	NSACF action
Initial		
NSAC units threshold reached for initial	If no charging session exist for the S-NSSAI	Charging Data Request [Initial] with a possible request to allocate NSAC units quota for later use.
	If the charging session exists for the S-NSSAI	The trigger will be ignored
Change of charging conditions		
NSAC units threshold crossed upwards	If the category is set to "immediate reporting"	Charging Data Request [Update] with a possible request to allocate NSAC units quota. Close the counts and start new counts with time stamps
	If the category is set to "deferred reporting"	Close the counts and start new counts with time stamps

Chargeable event	Conditions	NSACF action
Initial		
NSAC units threshold crossed downwards	If the category is set to "immediate reporting"	Charging Data Request [Update] Close the counts and start new counts with time stamps
	If the category is set to "deferred reporting"	Close the counts and start new counts with time stamps
Quota management		
NSAC units quota threshold reached	If the corresponding trigger is enabled	Charging Data Request [Update] with a possible request to allocate NSAC units quota Close the counts and start new counts with time stamps
NSAC units Quota exhausted	If the corresponding trigger is enabled	Charging Data Request [Update] with a possible request NSAC units quota. Close the counts and start new counts with time stamps
Expiry of NSAC units quota validity time	If the corresponding trigger is enabled	Charging Data Request [Update] with a possible request NSAC units quota. Close the counts and start new counts with time stamps
Expiry of NSAC units quota holding time	If the corresponding trigger is enabled	Charging Data Request [Update] with a possible request NSAC units quota. Close the counts and start new counts with time stamps
Re-authorization request by CHF	If the corresponding trigger is enabled	Charging Data Request [Update] with a possible request NSAC units quota. Close the counts and start new counts with time stamps
Termination		
NSAC units threshold reached for termination	If the charging session exists for the S-NSSAI, and when NSAC units="Number of UEs", the Number of PDU sessions threshold for termination is active and not reached.	The trigger will be ignored
	If the charging session exists for the S-NSSAI, and when NSAC units="Number of PDU sessions", the Number of UEs threshold for termination is active and not reached.	The trigger will be ignored
	If the charging session exists for the S-NSSAI, and when NSAC units="Number of UEs", the Number of PDU sessions threshold for termination is active and reached.	Charging Data Request [Termination] Close the counts with time stamps
	If the charging session exists for the S-NSSAI, and when NSAC units="Number of PDU sessions", the Number of UEs threshold for termination is active and reached.	Charging Data Request [Termination] Close the counts with time stamps
Abort charging request from the CHF		Charging Data Request [Termination] Close the counts with time stamps
Network slice termination		Charging Data Request [Termination] Close the counts with time stamps

5.2.1.3 Quota management

The quota management functionality is supported in Network Slice Admission Control converged charging, to allow controlling fluctuating number of simultaneous UEs and/or PDU sessions per S-NSSAI does not exceed CCS allocated numbers. There is a difference between quota that can be consumed in a cumulative manner e.g., seconds, bytes, and quota that can be used temporarily like allocated simultaneous UEs and PDU sessions per S-NSSAI for NSACF charging. The quota that can be consumed in a cumulative manner is requested as requested unit, reported as used unit and granted as granted unit. The quota that can be used in a temporary manner is requested as allocate Unit, reported as allocated unit, and granted as allocated unit in NSACF charging. The new allocated unit override previous allowed unit in the NSACF.

The NSACF is configured with maximum numbers for simultaneous UEs and PDU sessions per S-NSSAI. The CCS can, based on internal criteria, allocate quota of number of UEs and PDU sessions based on its own maximum numbers.

5.2.2 Message flows

5.2.2.1 General

The flows in the present document specify the interaction between the NSACF and the CHF for as Network Slice Admission Control converged charging functionality, in different scenarios, based on 3GPP TS 23.501 [3] and 3GPP TS 23.502 [4] procedures and flows.

This interaction is based on Charging Data Request /Response specified in 3GPP TS 32.290 [5], exchanged between the NSACF embedding the CTF and the CHF. The following scenarios are supported:

- PEC;
- IEC;
- ECUR;
- SCUR.

As a general principle, the steps in the figures for the message flows below correspond to the steps of figures in 3GPP TS 23.502 [4], which is the reference. The present document specifies the charging specific extension part.

5.2.2.2 Number of UEs per network slice charging from NSACF

5.2.2.2.1 General

The subclause below describes the Network Slice for Admission Control charging for Number of UEs per network slice.

5.2.2.2.2 Number of UEs per network slice – IEC charging

The following figure 5.2.2.2.2-1 describes a Network Slice Admission Control charging for Number of UEs per network slice message flow in IEC charging, based on figure 4.2.11.2-1 of 3GPP TS 23.502 [4] description:

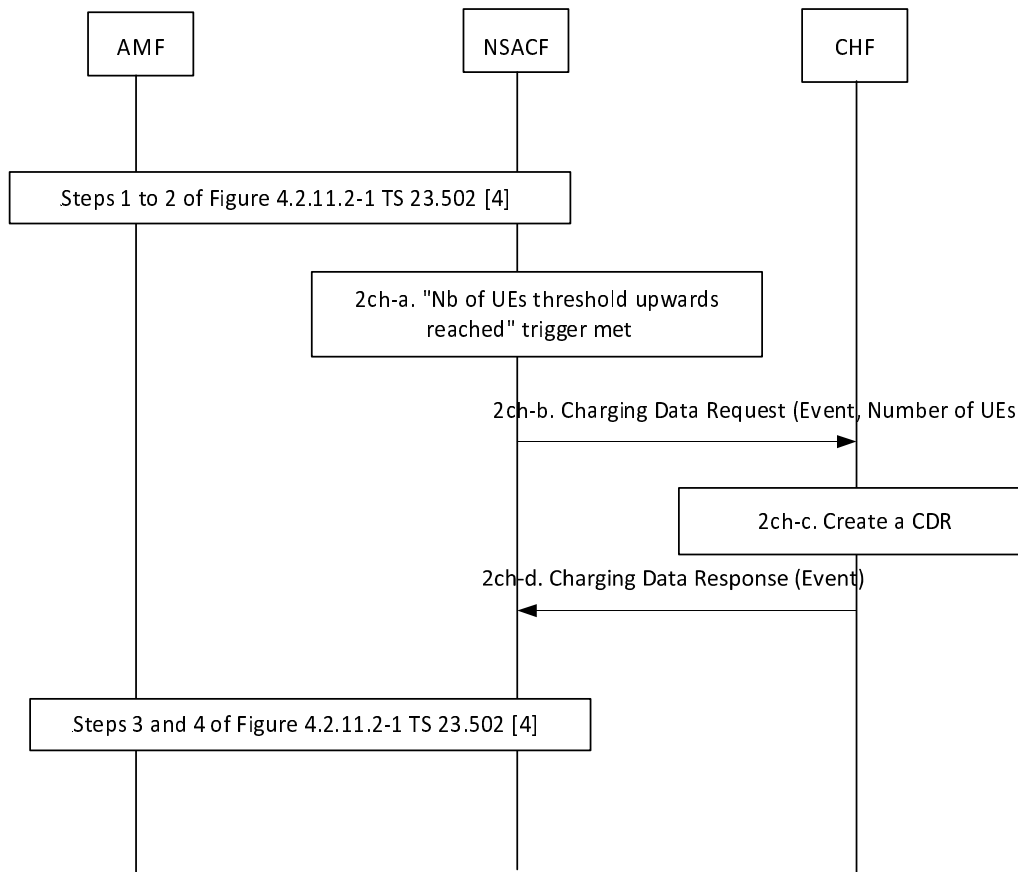


Figure 5.2.2.2.2-1: Number of UEs per S-NSSAI – IEC charging

Steps 1 to 2: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1 Number of UEs per network slice availability check and update procedure.

2ch-a: For a particular S-NSSAI, e.g. the "Nb of UEs threshold upwards reached" trigger is met.

2ch-b: The NSACF sends Charging Data Request [Event] to CHF with "Number of UEs" in the Allocate Unit.

2ch-c: The CHF creates a CDR for this "Number of UEs" for the S-NSSAI.

2ch-d: CHF provides response to NSACF.

Steps 3 and 4: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1 Number of UEs per network slice availability check and update procedure.

5.2.2.2.3 Number of UEs per network slice – PEC

The following figure 5.2.2.2.3-1 describes a Number of UEs per network slice charging message flow in PEC, based on figure 4.2.11.2-1 of 3GPP TS 23.502 [4] description:

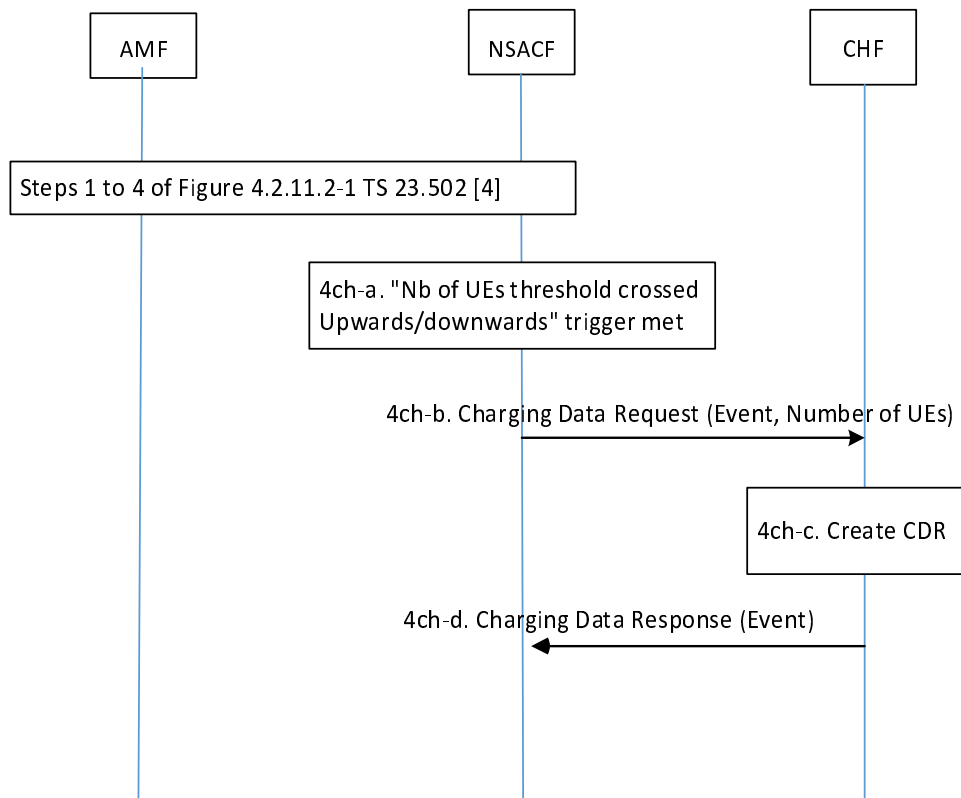


Figure 5.2.2.2.3-1: Number of UEs per S-NSSAI – PEC

Steps 1 to 4: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1 Number of UEs per network slice availability check and update procedure.

4ch-a: For a particular S-NSSAI, e.g. the "Nb of UEs threshold crossed upwards/downwards" trigger is met.

4ch-b: The NSACF sends Charging Data Request [Event] to CHF with "Number of UEs".

4ch-c: The CHF creates a CDR for this "Number of UEs" for the S-NSSAI.

4ch-d: CHF provides response to NSACF.

5.2.2.2.4 Number of UEs per network slice – ECUR

The following figure 5.2.2.2.4-1 describes a Number of UEs per network slice charging message flow in ECUR, based on figure 4.2.11.2-1 of 3GPP TS 23.502 [4] description:

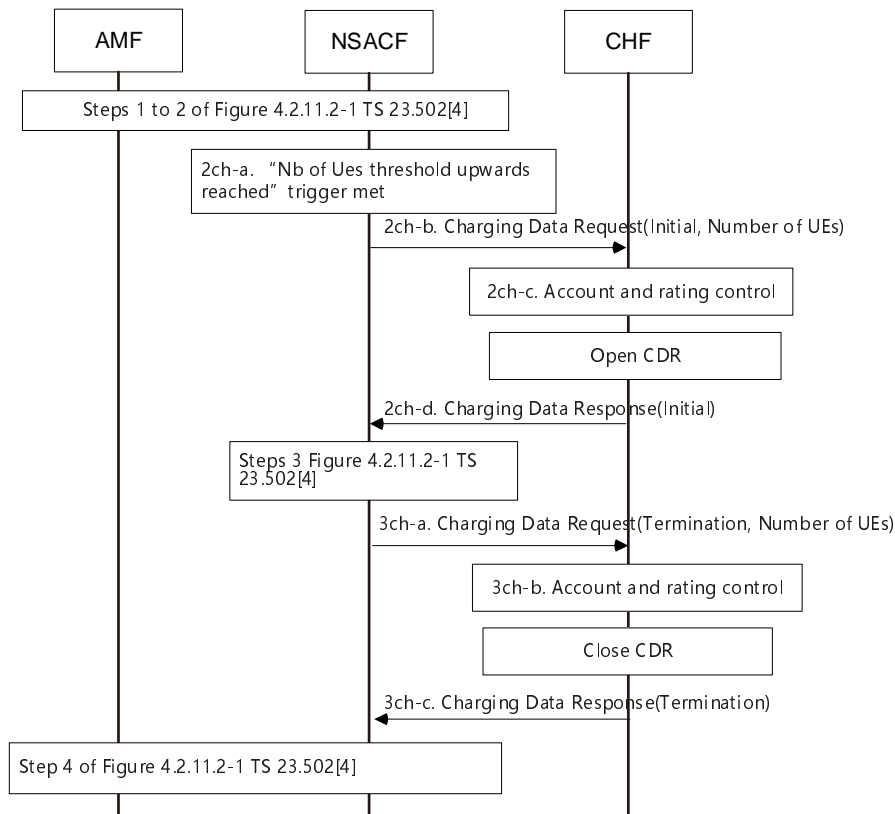


Figure 5.2.2.2.4-1: Number of UEs per S-NSSAI – ECUR

Steps 1 to 2: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1 Number of UEs per network slice availability check and update procedure.

2ch-a: For a particular S-NSSAI, e.g. the "Nb of UEs threshold upwards reached" trigger is met.

2ch-b: The NSACF sends Charging Data Request [Initial] to CHF with "Number of UEs", in the allocated unit, to be granted authorization.

2ch-c: Account, Rating, reservation control by the CHF. The CHF opens a CDR

2ch-d: CHF provides response to NSACF, which may provide the granted threshold in the allocated unit. The previous number of UEs threshold is overridden by the granted threshold.

3: NSACF check and update completed.

3ch-a: The NSACF sends Charging Data Request [Termination] to CHF with "Number of UEs" in the allocated unit, which is triggered by "NSAC units threshold upwards completed".

3ch-b: Account, Rating Control by the CHF. The CHF closes the CDR

3ch-c: CHF provides response to NSACF.

4: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1.

5.2.2.3 Number of PDU sessions per network slice charging from NSACF

5.2.2.3.1 General

The subclause below describes the Network Slice Admission Control charging for Number of PDU sessions per network slice.

5.2.2.3.2 Number of PDU sessions per network slice – PEC

The following figure 5.2.2.3.2-1 describes a Number of PDU sessions per network slice charging message flow in PEC, based on figure 4.2.11.4-1 of 3GPP TS 23.502 [4] description.

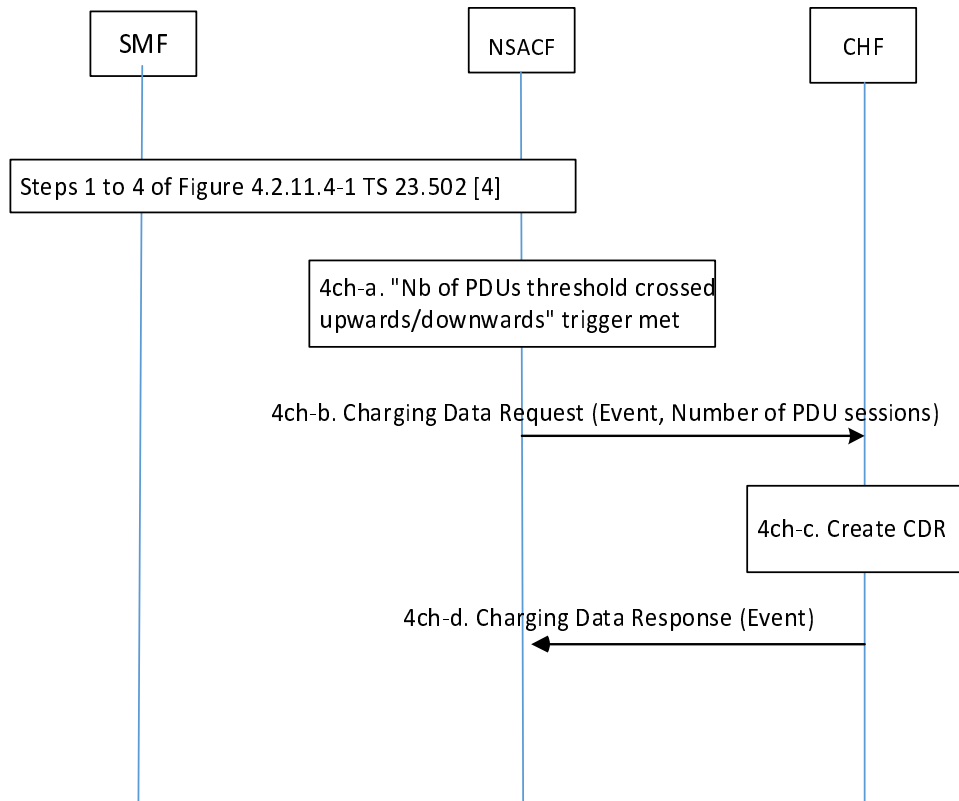


Figure 5.2.2.3.2-1: Number of PDU sessions per S-NSSAI – PEC

Steps 1 to 4: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1 Number of PDU sessions per network slice availability check and update procedure.

4ch-a: For a particular S-NSSAI, e.g. the "Nb of PDU sessions threshold crossed upwards/ downwards" trigger is met.

4ch-b: The NSACF sends Charging Data Request [Event] to CHF with "Number of PDU sessions".

4ch-c: The CHF creates a CDR for this "Number of PDU sessions" for the S-NSSAI.

4ch-d: CHF provides response to NSACF.

5.2.2.3.3 Number of PDU sessions per network slice – IEC

The following figure 5.2.2.3.3-1 describes a Number of PDU sessions per network slice charging message flow in IEC, based on figure 4.2.11.4-1 of 3GPP TS 23.502 [4] description:

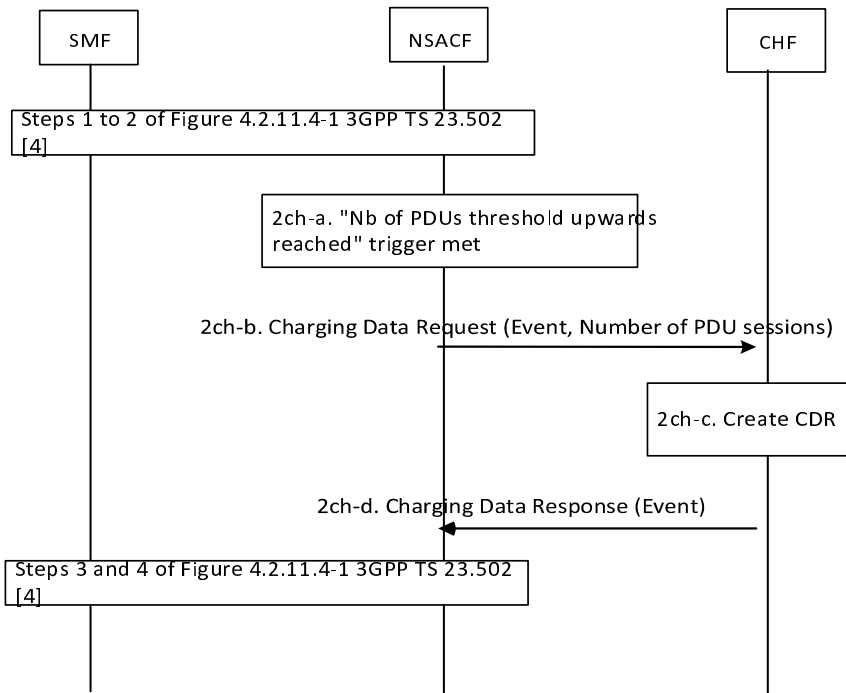


Figure 5.2.2.3.3-1: Number of PDU sessions per S-NSSAI – IEC

Steps 1 to 2: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1 Number of PDU sessions per network slice availability check and update procedure.

2ch-a: For a particular S-NSSAI, e.g. the "Nb of PDU sessions threshold upwards reached" trigger is met.

2ch-b: The NSACF sends Charging Data Request [Event] to CHF with "Number of PDU sessions " in the Allocate Unit.

2ch-c: The CHF creates a CDR for this " Number of PDU sessions" for the S-NSSAI.

2ch-d: CHF provides response to NSACF.

Steps 3 and 4: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1 Number of PDU sessions per network slice availability check and update procedure.

5.2.2.3.4 Number of PDU sessions per network slice – ECUR

The following figure 5.2.2.3.4-1 describes a Number of PDU sessions per network slice charging message flow in ECUR, based on figure 4.2.11.4-1 of 3GPP TS 23.502 [4] description.

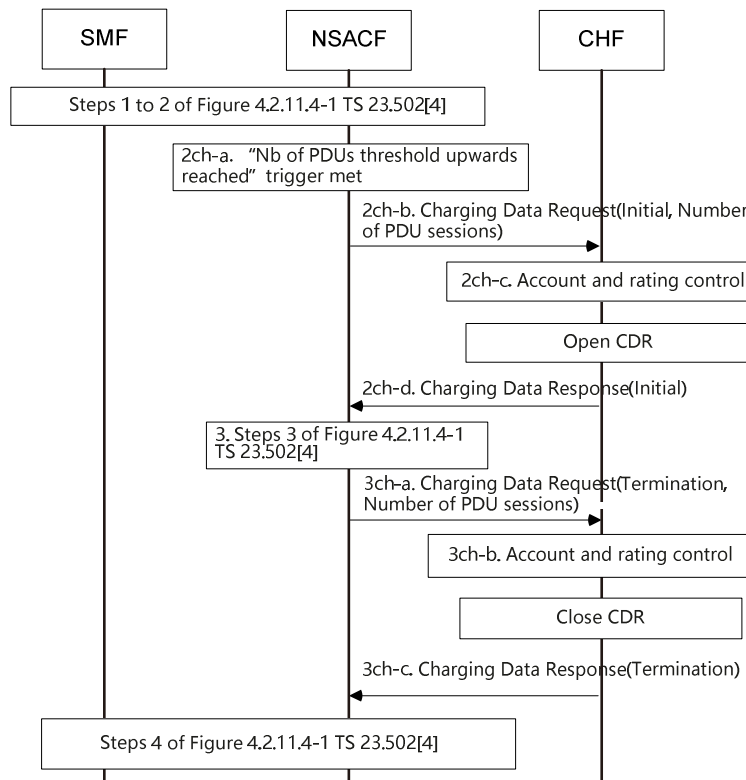


Figure 5.2.2.3.4-1: Number of PDU sessions per S-NSSAI – ECUR

Steps 1 to 2: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1 Number of PDU sessions per network slice availability check and update procedure.

2ch-a: For a particular S-NSSAI, e.g. the "Nb of PDUs threshold upwards reached" trigger is met.

2ch-b: The NSACF sends Charging Data Request [Initial] to CHF with "Number of PDU sessions" in the allocated unit to be granted authorization.

2ch-c: Account, Rating, reservation control by the CHF. The CHF opens a CDR.

2ch-d: CHF provides response to NSACF, which may provide the granted threshold in the allocated unit. The previous number of UEs threshold is overridden by the granted threshold.

3: NSACF check and update completed.

3ch-a: The NSACF sends Charging Data Request [Termination] to CHF with "Number of PDU sessions" in the allocated unit, which is triggered by "NSAC units threshold upwards completed".

3ch-b: Account, Rating Control by the CHF. The CHF closes the CDR.

3ch-c: CHF provides response to NSACF.

4: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1.

5.2.2.4 Number of UEs and Number of PDU sessions per network slice charging from NSACF – single charging session

5.2.2.4.1 General

The subclause below describes the Network Slice Admission Control charging for Number of UEs and Number of PDU sessions per network slice in SCUR with a single charging session for the S-NSSAI, based on figure 4.2.11.2-1 and figure 4.2.11.4-1 of 3GPP TS 23.502 [4] description.

5.2.2.4.2 Number of UEs and Number of PDU sessions per network slice charging – initial

The following figure 5.2.2.4.2-1 describes Network Slice Admission Control charging for Number of UEs and Number of PDU sessions per network slice charging session initiation message flows in SCUR:

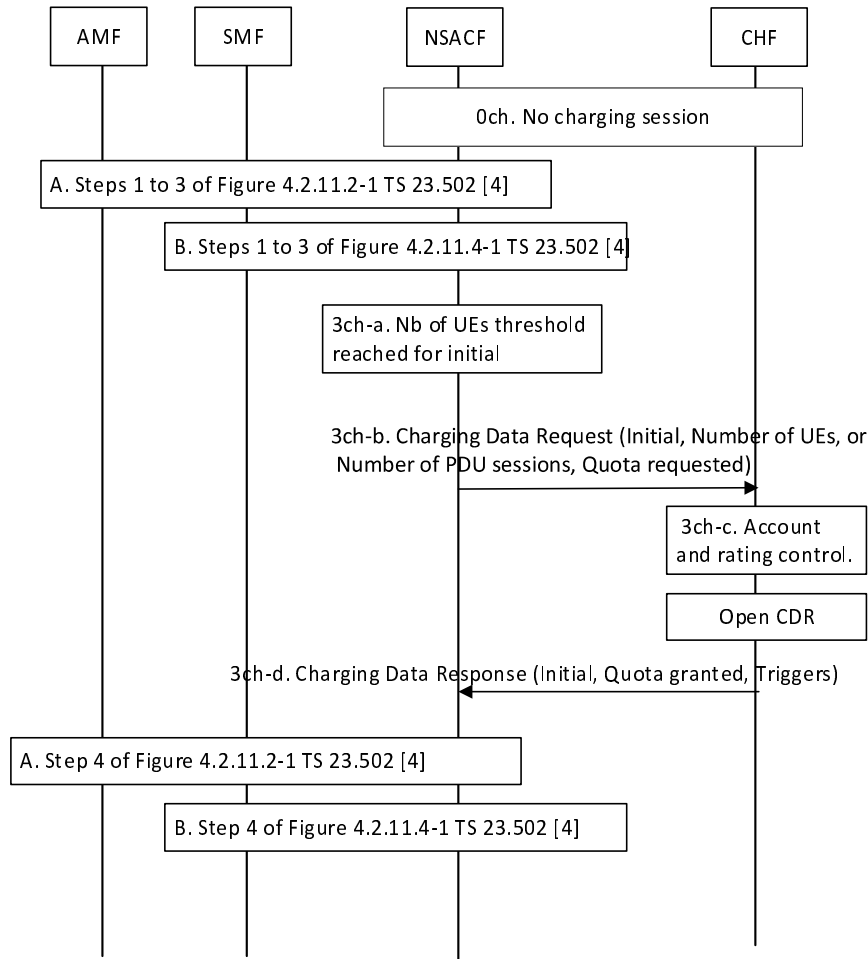


Figure 5.2.2.4.2-1: Number of UEs and Number of PDU sessions per S-NSSAI – SCUR - initial

Och. No charging session exists for the S-NSSAI.

A.Steps 1 to 3: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1 Number of UEs per network slice availability check and update procedure.

B.Steps 1 to 3: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1 Number of PDU sessions per network slice availability check and update procedure.

A and B occurs in parallel and asynchronously from each other.

3ch-a: For a particular S-NSSAI, one of the Nb of UEs threshold or Nb of PDU sessions trigger reached for initial.

3ch-b: The NSACF sends Charging Data Request [Initial] to CHF and, depending on the trigger:

if "Nb of UEs threshold reached for initial", sends the "Number of UEs" and may request for a "Number of UEs Quota limit",

if "Nb of PDU sessions threshold reached for initial", sends the "Number of PDU sessions" and may request for a "Number of PDU sessions Quota limit".

3ch-c: Account, Rating Control by the CHF. The CHF opens a CDR.

3ch-d: CHF provides response to NSACF and may include quota granted and new triggers setting.

A.Step 4: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1.

B.Step 4: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1.

5.2.2.4.3 Number of UEs and Number of PDU sessions per network slice charging – update

The following figure 5.2.2.4.3-1 describes Network Slice Admission Control charging for Number of UEs and Number of PDU sessions per network slice charging session update message flows in SCUR:

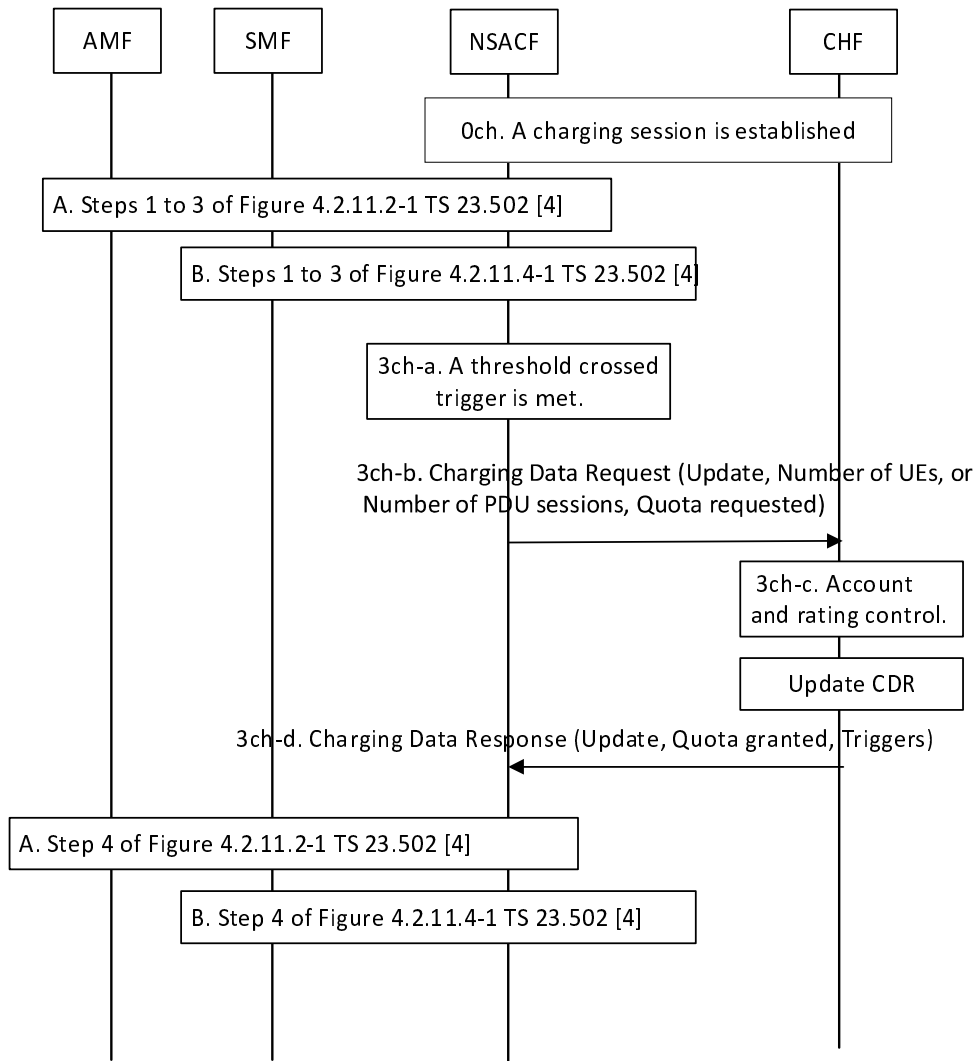


Figure 5.2.2.4.3-1: Number of UEs and Number of PDU sessions per S-NSSAI – SCUR - update

Och. A charging session is established for the S-NSSAI.

A.Steps 1 to 3: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1 Number of UEs per network slice availability check and update procedure.

B.Steps 1 to 3: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1 Number of PDU sessions per network slice availability check and update procedure.

A and B occurs in parallel and asynchronously from each other.

3ch-a: For a particular S-NSSAI, one of the trigger related to "Nb of UEs or Nb of PDU sessions threshold crossed upwards/downwards" or granted quota is met.

3ch-b: The NSACF sends Charging Data Request [update] to CHF and, depending on the trigger:

if "Nb of UEs" trigger, sends the "Number of UEs" and may request for a "Number of UEs Quota limit",

if "Nb of PDU sessions" trigger, sends the "Number of PDU sessions" and may request for a "Number of PDU sessions Quota limit".

3ch-c: Account, Rating Control by the CHF. The CHF updates the CDR.

3ch-d: CHF provides response to NSACF and may include quota granted and new triggers setting.

A.Step 4: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1.

B.Step 4: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1.

5.2.2.4.4 Number of UEs and Number of PDU sessions per network slice charging – termination

The following figure 5.2.2.4.4-1 describes Network Slice Admission Control charging for Number of UEs and Number of PDU sessions per network slice charging session termination message flows in SCUR:

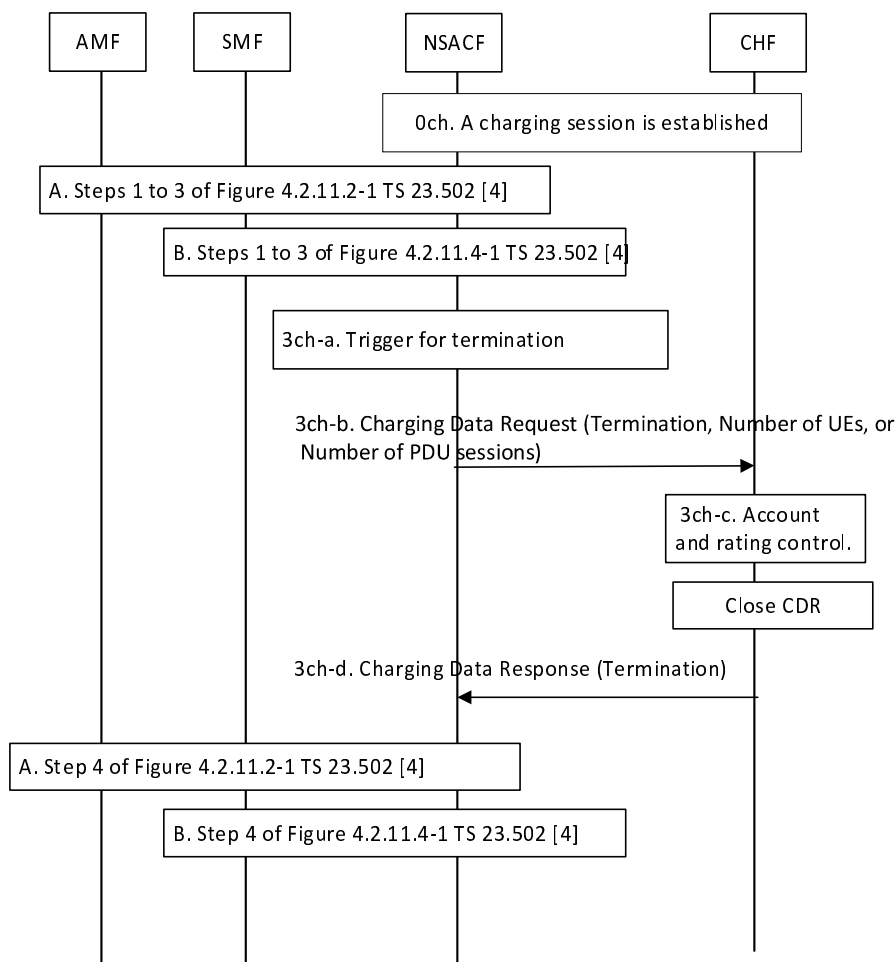


Figure 5.2.2.4.4-1: Number of UEs and Number of PDU sessions per S-NSSAI – SCUR - termination

Och. A charging session is established for the S-NSSAI.

A.Steps 1 to 3: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1 Number of UEs per network slice availability check and update procedure.

B.Steps 1 to 3: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1 Number of PDU sessions per network slice availability check and update procedure.

A and B occurs in parallel and asynchronously from each other.

3ch-a: For a particular S-NSSAI, the "Nb of UEs and Nb of PDU sessions threshold reached for termination.

3ch-b: The NSACF sends Charging Data Request [Termination] to CHF and, depending on the trigger:

if "Nb of UEs" trigger, sends the "Number of UEs".

if "Nb of PDU sessions" trigger, sends the "Number of PDU sessions".

3ch-c: Account, Rating Control by the CHF. The CHF closes the CDR.

3ch-d: CHF provides response to NSACF

A.Step 4: per 3GPP TS 23.502 [4] Figure 4.2.11.2-1.

B.Step 4: per 3GPP TS 23.502 [4] Figure 4.2.11.4-1.

5.2.3 CDR generation

5.2.3.1 Introduction

The CHF CDRs for Network Slice Admission Control charging are generated by the CHF to collect charging information that they subsequently transfer to the Charging Gateway Function (CGF).

The following clauses describe in detail the conditions for generating the CHF CDR, which shall be supported by the CHF.

5.2.3.2 Triggers for CHF CDR

5.2.3.2.1 General

A Network Slice Admission Control charging CHF CDR is used to collect charging information related to Network Slice Admission Control chargeable events for PEC, IEC, ECUR and SCUR scenarios.

A partial records mechanism applies in the CHF for SCUR scenarios.

5.2.3.2.2 Triggers for CHF CDR generation

A CHF CDR shall be generated by the CHF for each received Charging Data Request [Event].

5.2.3.2.3 Triggers for CHF CDR opening

A CHF CDR shall be opened when the CHF receives Charging Data Request [Initial] with charging information added.

5.2.3.2.4 Triggers for CHF CDR charging information addition

When the CHF receives Charging Data Request[Update], with the trigger conditions different from those of Table 5.2.3.2.5-1, the received charging information shall be added to the CHF CDR, and the CDR shall remain open.

5.2.3.2.5 Triggers for CHF CDR partial record closure

When the CHF receives Charging Data Request [Update], with the trigger conditions of Table 5.2.3.2.5-1, the charging information shall be added in the CHF CDR, before the CDR is closed and a subsequent CHF CDR shall be opened with an incremented Sequence Number.

Table 5.2.3.2.5-1: Triggers for CHF CDR partial record closure

Trigger Conditions
Quota management
Number of UEs quota exhausted
Number of PDU sessions quota exhausted

5.2.3.2.6 Triggers for CHF CDR closure

When the CHF receives Charging Data Request [Termination], the charging information shall be added in the CHF CDR and the CDR shall be closed.

5.2.4 Ga record transfer flows

Details of the Ga protocol application are specified in 3GPP TS 32.295 [8].

5.2.5 Bnsac CDR file transfer

Details of the Bnsac protocol application are specified in 3GPP TS 32.297 [9].

6 Definition of charging information

6.1 Data description for network slice admission control charging

6.1.1 Message contents

6.1.1.1 General

The Charging Data Request and Charging Data Response are specified in subclause 5.1.2.2.1 of 3GPP TS 32.290 [5].

Table 6.1.1.1-1 describes the use of these messages for network slice admission control charging.

Table 6.1.1.1-1: Network slice admission control charging messages reference table

Message	Source	Destination
Charging Data Request	NSACF	CHF
Charging Data Response	CHF	NSACF

The following clauses describe the different fields used in the Charging Data messages and the category in the tables is used according to the charging data configuration defined in clause 5.4 of 3GPP TS 32.240 [2].

6.1.1.2 Charging Data Request message

Table 6.1.1.2-1 illustrates the basic structure of a Charging Data Request message from the NSACF as used for network slice admission control.

Table 6.1.1.2-1: Charging Data Request message contents

Information Element	Converged Charging Category	Description
Session Identifier	O _C	Described in 3GPP TS 32.290 [5]
NF Consumer Identification	M	Described in 3GPP TS 32.290 [5] and holds the identifier of the NSACF
NF Functionality	M	Described in 3GPP TS 32.290 [5].
NF Name	O _C	Described in 3GPP TS 32.290 [5].
NF Address	O _C	Described in 3GPP TS 32.290 [5].
NF PLMN ID	O _C	Described in 3GPP TS 32.290 [5].
Charging Identifier	O _M	Described in 3GPP TS 32.290 [5].
Invocation Timestamp	M	Described in 3GPP TS 32.290 [5].
Invocation Sequence Number	M	Described in 3GPP TS 32.290 [5].
Retransmission Indicator	O _C	Described in 3GPP TS 32.290 [5].
One-time Event	O _C	Described in 3GPP TS 32.290 [5].
One-time Event Type	O _C	Described in 3GPP TS 32.290 [5].
Notify URI	O _C	Described in 3GPP TS 32.290 [5].
Supported Features	O _C	Described in 3GPP TS 32.290 [5].
Service Specification Information	O _C	Described in 3GPP TS 32.290 [5].
Multiple Unit Usage	O _M	Described in 3GPP TS 32.290 [5].
Rating Group	O _M	Described in 3GPP TS 32.290 [5].
Allocate Unit	O _C	This field holds the new allowed units to be allocated, overriding previous allowed units.
Allocate Unit Indicator	O _M	This field indicates on whether the allowed units to be allocated are determined by CHF or supplied by the NSACF.
NSAC Container Information	O _C	This field holds the network slice admission control specific Allocate Unit described in clause 6. 2.1.3.
Allocated Unit	O _C	This field holds the Allocated Unit.
Quota management Indicator	O _C	Described in 3GPP TS 32.290 [5].
Triggers	O _C	Described in 3GPP TS 32.290 [5].
Trigger Timestamp	O _C	Described in 3GPP TS 32.290 [5].
Local Sequence Number	O _M	Described in 3GPP TS 32.290 [5].
NSAC Container Information	O _C	This field holds the network slice admission control specific units in use described in clause 6.2.1.3.
S NSSAI	M	This field holds the Single Network Slice Selection Assistance Information identifying the network slice.
NSAC Charging Information	O _M	This field holds NSAC specific information described in clause 6.2.1.2

6.1.1.3 Charging data response message

Table 6.1.1.3-1 illustrates the basic structure of a Charging Data Response message from the CHF to the NSACF as used for network slice admission control.

Table 6.1.1.3-1: Charging Data Response message contents

Information Element	Converged Charging Category	Description
Session Identifier	O _C	Described in 3GPP TS 32.290 [5].
Invocation Timestamp	M	Described in 3GPP TS 32.290 [5].
Invocation Result	O _C	Described in 3GPP TS 32.290 [5].
Invocation Sequence Number	O _M	Described in 3GPP TS 32.290 [5].
Session Failover	O _C	Described in 3GPP TS 32.290 [5].
Supported Features	O _C	Described in 3GPP TS 32.290 [5].
Multiple Unit Information	O _C	Described in 3GPP TS 32.290 [5].
Result Code	O _C	Described in 3GPP TS 32.290 [5].
Rating Group	O _M	Described in 3GPP TS 32.290 [5].
Allocated Unit	O _C	This field holds the Allocated Unit.
NSAC Container Information	O _C	This field holds the network slice admission control specific Allocated Unit described in clause 6.2.1.3.
Validity Time	O _C	Described in 3GPP TS 32.290 [5].
Triggers	O _C	Described in 3GPP TS 32.290 [5] and holds the network slice admission control specific triggers described in clause 5.2.1.

6.1.2 Ga message contents

See clause 5.2.4.

6.1.3 CDR description on the B_{nsac} interface

6.1.3.1 General

This clause describes the CDR content and format generated for Network Slice Admission Control charging.

The following tables provide a brief description of each CDR parameter. The category in the tables is used according to the charging data configuration defined in clause 5.4 of 3GPP TS 32.240 [2]. Full definitions of the CDR parameters, sorted by the name in alphabetical order, are provided in 3GPP TS 32.298 [7].

6.1.3.2 Network Slice Admission Control charging CHF CDR data

If enabled, CHF CDRs for Network Slice Admission Control charging shall be produced for each Network Slice Admission Control on simultaneous number of UEs and simultaneous number of PDU Sessions under quota management, and reporting defined triggers.

The fields of Network Slice Admission Control charging CHF CDR are specified in table 6.1.3.2-1.

Table 6.1.3.2-1: Network Slice Admission Control charging CHF record data

Field	Category	Description
Record Type	M	Described in 3GPP TS 32.298 [7]
Recording Network Function ID	O _M	Described in 3GPP TS 32.298 [7]
Charging Session Identifier	O _C	Described in 3GPP TS 32.298 [7]
NF Consumer Information	M	This field holds the information of the entity that used the charging service (i.e. NSACF).
NF Functionality	M	This field holds the type of functionality the NF provides: i.e. NSACF
NF Name	O _C	This field holds the name of the NSACF.
NF Address	O _C	This field holds the IP Address of the used NSACF.
NF PLMN ID	O _C	This field holds the PLMN identifier (MCC MNC) of the NSACF.
Charging Identifier	O _M	Charging identifier for correlation between different records.
Triggers	O _C	This field holds the triggers that are common to all Multiple Unit Usage. Can be the same as in Used Unit Container.
List of Multiple Unit Usage	O _C	Described in 3GPP TS 32.298 [7]
Rating Group	M	Described in 3GPP TS 32.298 [7]
Allocated Unit	O _C	This field holds the Allocated Unit.
Quota management Indicator	O _C	Described in 3GPP TS 32.298 [7]
Triggers	O _C	This field holds the triggers that caused the Used Unit Container to be reported and holds the Network Slice Admission Control specific triggers described in clause 5.2.1.
Trigger Timestamp	O _C	Described in 3GPP TS 32.298 [7]
NSAC Container Information	O _C	This field holds the Network Slice Admission Control specific units in use described in clause 6.2.1.3.
Local Sequence Number	O _M	Described in 3GPP TS 32.298 [7]
Record Opening Time	M	Described in 3GPP TS 32.298 [7]
Duration	M	Described in 3GPP TS 32.298 [7]
Record Sequence Number	C	Described in 3GPP TS 32.298 [7]
Cause for Record Closing	M	Described in 3GPP TS 32.298 [7]
Diagnostics	O _M	Described in 3GPP TS 32.298 [7]
Local Record Sequence Number	O _M	Described in 3GPP TS 32.298 [7]
Record Extensions	O _C	Described in 3GPP TS 32.298 [7]
S NSSAI	M	This field holds the Single Network Slice Selection Assistance Information identifying the network slice.
NSAC Charging Information	O _M	This field holds NSAC specific information described in clause 6.2.1.2

6.2 Network slice admission control charging specific parameters

6.2.1 Definition of network slice admission control charging information

6.2.1.1 General

The Charging Information parameter used for Network slice admission control charging is provided in the following clauses.

6.2.1.2 Definition of network slice admission control charging information

Specific charging information used for Network slice admission control charging is provided within the NSAC Charging Information.

The detailed structure of the NSAC Charging Information can be found in table 6.2.1.2-1.

Table 6.2.1.2-1: Structure of NSAC Charging Information

Information Element	Category	Description
NSAC charging indicator	O _M	This field holds an indicator on whether the request is related to NSAC Charging.

6.2.1.3 Definition of NSAC Container Information

Specific charging information used for Network slice admission control charging is provided within the NSAC Container Information.

The detailed structure of the NSAC Container Information can be found in table 6.2.1.3-1.

Table 6.2.1.3-1: Structure of NSAC Container Information

Information Element	Category	Description
Nb of UEs	OC	This field holds the simultaneous number of registered UEs in the S-NSSAI
Nb of PDUs	OC	This field holds the simultaneous number of established PDU sessions in the S-NSSAI

6.2.2 Detailed message format for converged charging

The following clause specifies per Operation Type the charging data that are sent by NSACF for Network Slice Admission Control converged charging.

The Operation Types are listed in the following order: I (Initial)/U (Update)/T (Termination)/E (Event). Therefore, when all Operation Types are possible it is marked as IUTE. If only some Operation Types are allowed for a node, only the appropriate letters are used (i.e. IUT or E) as indicated in the table heading. The omission of an Operation Type for a particular field is marked with "-" (i.e. IU-E). Also, when an entire field is not allowed in a node the entire cell is marked as "-".

Table 6.2.2-1 defines the basic structure of the supported fields in the *Charging Data Request* message for Network Slice Admission Control converged charging.

Table 6.2.2-1: Supported fields in Charging Data Request message

Information Element	Functionality of NSACF	Network Slice Admission Control
	Supported Operation Types	I/U/T/E
Session Identifier		IUT-
NF Consumer Identification		IUTE
NF Functionality		IUTE
NF Name		IUTE
NF Address		IUTE
NF PLMN ID		IUTE
Charging Identifier		IUT-
Invocation Timestamp		IUTE
Invocation Sequence Number		IUTE
Retransmission Indicator		IUT-
One-time Event		E
One-time Event Type		E
Notify URI		IU--
Supported Features		IUTE
Service Specification Information		IUTE
Multiple Unit Usage		IUTE
Rating Group		IUTE
Allocate Units		IU--
NSAC Container Information		IU--
Allocated Unit		IUTE
Quota management Indicator		-UT-
Triggers		IUTE
Trigger Timestamp		IUTE
NSAC Container Information		IUTE
Local Sequence Number		IUTE
S NSSAI		IUTE
NSAC Charging Information		IUTE

Table 6.2.2-2 defines the basic structure of the supported fields in the *Charging Data Response* message for Network Slice Admission Control converged charging.

Table 6.2.2-2: Supported fields in Charging Data Response message

Information Element	Functionality of NSACF	Network Slice Admission Control
	Supported Operation Types	I/U/T/E
Session Identifier		IUT-
Invocation Timestamp		IUTE
Invocation Result		IUTE
Invocation Sequence Number		IUTE
Session Failover		IUTE
Supported Features		IUTE
Multiple Unit Information		IU--
Result Code		IU--
Rating Group		IU--
Allocated Units		IU--
NSAC Container Information		IU--
Validity Time		IU--
Triggers		IU--
NSAC Container Information		IU--

6.2.3 Formal Network Slice Admission Control charging parameter description

6.2.3.1 Network Slice Admission Control CHF CDR parameters

The detailed definitions, abstract syntax and encoding of the Network Slice Admission Control charging CHF CDR parameters are specified in 3GPP TS 32.298 [7].

6.2.3.2 Network Slice Admission Control resources attributes

The detailed definitions of resources attributes used for Network Slice Admission Control charging are specified in 3GPP TS 32.291 [6].

6.3 Bindings for Network Slice Admission Control converged charging

This mapping between the Information Elements, resource attributes and CHF CDR parameters for Network Slice Admission Control converged charging is described in clause 7 of 3GPP TS 32.291 [6].

Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2023-03	SA5#147					Initial skeleton	0.0.0
2023-03	SA5#147	S5-232093 S5-232215 S5-232740 S5-232741				Introduction of the References Introduction of the Terms Introduction of the Scope Introduction of the Abbreviations	0.1.0
2023-04	SA5#148e	S5-233376 S5-233657 S5-233658 S5-233659 S5-233660				Introduce Architecture Introduce message flows Introduce charging principles Introduce charging scenarios principles Introduce triggers	0.2.0
2023-05	SA5#149	S5-234407 S5-234461 S5-234468 S5-234469 S5-234470 S5-234471 S5-234472				Introduce Nb of PDUs IEC message flow Solve Editor's Note on charged party Introduce Nb of UEs PEC message flow Introduce Nb of UEs ECUR message flow Introduce Nb of PDUs PEC message flow Introduce Nb of PDUs ECUR message flow Introduce message flows SCUR	0.3.0
2023-06	SA5#150	S5-235764 S5-235758 S5-235125 S5-235759 S5-235760 S5-235761 S5-235763 S5-235765				Clarify triggers and solve Editor's Note Introduce CDR generation Introduce Ga record and CDR file transfer Correction on Number of UEs per network slice flow description Introduce definition of charging information Introduce NSACF specific charging information Update of quota management for NSACF Update of basic principles for NSACF	0.4.0
2023-09	SA#101	SP-230931				Presented for information	1.0.0
2023-10	SA5#151	S5-236282 S5-236284 S5-236897 S5-236898 S5-236899 S5-236900 S5-236902 S5-236288 S5-236298 S5-236903 S5-236300				Introduce Reference Point for NSACF Solve Editor's Note - partial CDRs Solve Editor's Note - trigger description table Solve Editor's Note on Abort Clarification on the quota management Solve Editor's Note - charging information Introduction of Detailed message format for converged charging Introduction of Bindings for NS admission control converg. charging Introduction of CHF selection Introduction of CDR description Introduction of Formal network slice admission control charging parameter description Incorporate comments from Edithelp	1.1.0
2023-11	SA5#152	S5-237996 S5-237997 S5-237998 S5-237999 S5-238000 S5-238001				Clarify IEC and ECUR scenarios Addition of ECUR in triggers table Update for the event based charging Update Charging principle for NSACF Charging Clarify Quota management description Clarification on the reporting in charging data message	1.2.0
2024-02	SA5#153	S5-240696 S5-240698 S5-240699 S5-240706				Refinement on NSACF Charging information Update triggers for ECUR Clarification on charging scenarios for the NSACF charging Clarify basic principles	1.3.0
2024-03	SA#103	SP-240255				Presented for approval	2.0.0
2024-03	SA#103					Upgrade to change control version	18.0.0
2024-06	SA#104	SP-240826	0002	1	F	Rel-18 CR 28.203 Clarification on the quota for the NSACF charging	18.1.0
2024-06	SA#104	SP-240826	0003	1	F	Rel-18 CR 28.203 Clarification on triggers for NSACF	18.1.0

History

Document history		
V18.0.0	May 2024	Publication
V18.1.0	July 2024	Publication