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Network slice performance and analytics charging
in the 5G System (5GS);
Stage 2
(3GPP TS 28.201 version 19.2.0 Release 19)**



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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

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- 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 is part of a series of documents that specify charging aspects of network slicing.

The present document includes the charging aspects of network slice performance and analytics, including charging scenarios, data and way of data transfer specific for the network slice.

The architecture for network slice charging follows common architecture and concepts specified in TS 32.240 [1].

The charging aspect of network slice charging on PDU session charging is specified in TS 32.255 [15].

The network slice performance and analytics charging collects and processes charging information related to performance metrics of a network slice.

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]. 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] - [14]	Void
[15]	3GPP TS 32.255: "Telecommunication management; Charging management; 5G data connectivity domain charging; Stage 2".
[16] - [49]	Void.
[50]	3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".
[51]	3GPP TS 32.291: "Telecommunication management; Charging management; 5G system; Charging service, stage 3".
[52] - [54]	Void.
[55]	3GPP TS 32.295: "Telecommunication management; Charging management; Charging Data Record (CDR) transfer".
[56]	3GPP TS 32.297: "Telecommunication management; Charging management; Charging Data Record (CDR) file format and transfer".
[57]	3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description".
[58] - [99]	Void.

[100]	3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
[101] - [149]	Void.
[150]	3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".
[151] - [199]	Void.
[200]	3GPP TS 28.202: "Charging management; Network slice management charging in the 5G System (5GS); Stage 2".
[201] - [249]	Void.
[250]	3GPP TS 28.533: "Management and orchestration; Architecture framework".
[251]	3GPP TS 28.532: "Management and orchestration; Generic management services".
[252]	3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".
[253] - [269]	Void.
[270]	3GPP TS 28.552: "Management and orchestration; 5G performance measurements".
[271]	3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".
[272] - [299]	Void.
[300]	3GPP TS 29.510: "5G System; Network function repository services; Stage 3".
[301] - [400]	Void.
[401] - [499]	Void.
[500]	GSMA NG.116: "Generic Network Slice Template".

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 [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:

Bns	Reference point for the CDR file transfer from the network slice CGF to the BD.
Ga	Reference point for CDR transfer between a CDF and the CGF.
Nchf	Service based interface exhibited by CHF.
Nnwdaf	Service based interface exhibited by NWDAF.

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].

CEF	Charging Enablement Function
CGF	Charging Gateway Function
CHF	Charging Function
MnS	Management Service
NSPA	Network Slice Performance and Analytics
NWDAF	Network Data Analytics Function
PEC	Post Event Charging
POP	Participating Operator

4 Architecture considerations

4.1 High-level description

4.1.1 Network slice charging architecture

The architecture for network slice charging follows common architecture and concepts specified in TS 32.240 [1].

The network slice charging shall support charging of network slice management specified in TS 28.202 [200] and performance and analytics based charging in the present document.

The NWDAF is part of the architecture specified in TS 23.501 [2] and the figure 4.1.1-1 shows the Network Data Analytics Exposure architecture specified in TS 23.288 [150].

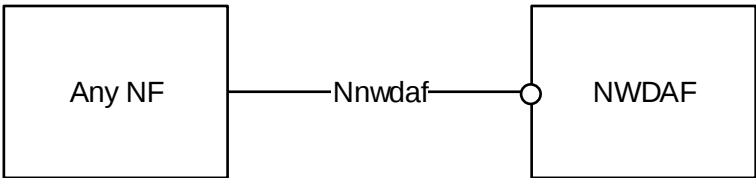


Figure 4.1.1-1: Network Data Analytics Exposure architecture

The figure 4.1.1-2 shows the management service which offers management capabilities, specified in TS 28.533 [250] clause 4.

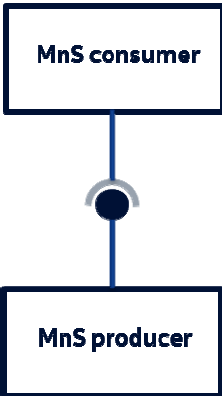


Figure 4.1.1-2: Management Service

4.2 Network slice performance and analytics charging architecture

4.2.1 High level network slice performance and analytics architecture

The scope of the present document is network slice performance and analytics charging, the details for other type of network slice charging are defined in TS 32.255 [15] and TS 28.202 [200].

4.2.2 Converged charging architecture

The architectural options for network slice performance and analytics converged charging are depicted in figure 4.2.2-1.

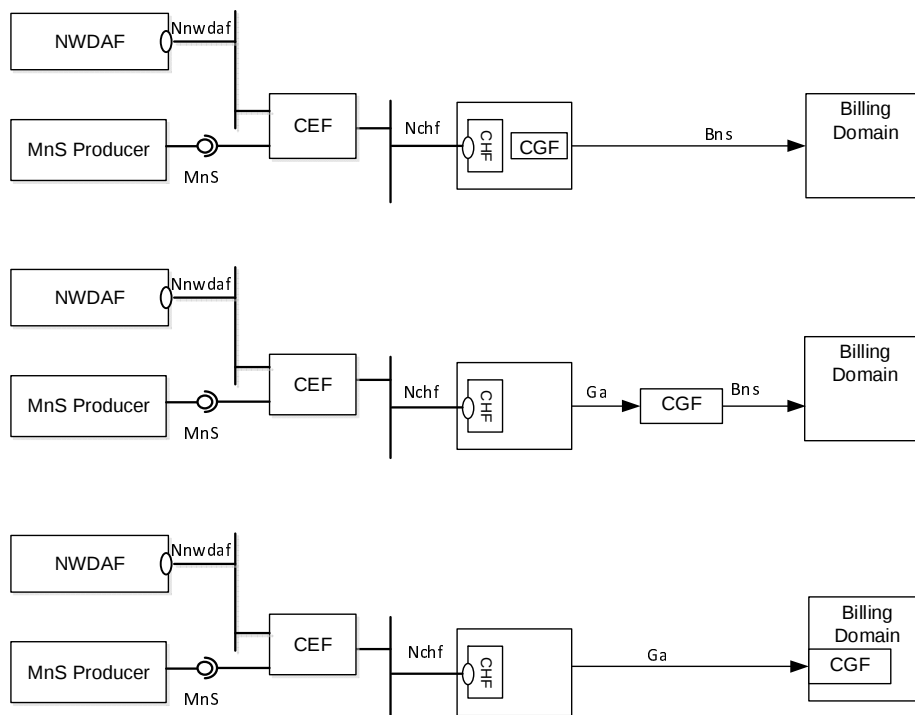


Figure 4.2.2-1: Network slice performance and analytics converged charging architecture

The Charging Enablement Function (CEF):

- subscribes to notifications by consuming management services or services exposed by other functions, for receiving required charging information from the services.
- unsubscribes to notifications by consuming management services or services exposed by other functions, for cancelling the subscription to performance and analytics information.
- determines the occurrence of chargeable events. When it determines that a chargeable event has occurred it then triggers charging by consuming the Nchf services.

Charging information addressed by the CEF in the present document, are related to performance and analytics for network slices.

The MnS producer is defined in TS 28.533 [250]: the MnS producer in the present document is the producer of performance MnS.

For network slice performance and analytics converged charging the CEF is a consumer of either one or both:

- performance management service (MnS) for network slice exposed by the MnS Producer, specified in TS 28.532 [253];

- Network Data Analytics service (Nnwdaf) for network slice exposed by the Network Data Analytics Function (NWDAF), described in TS 23.288 [150].

And the CEF is a consumer of:

- charging (Nchf) service.

The general architecture components can be found in TS 32.240 [1].

Ga is described in clause 5.2.4 and Bns in clause 5.2.5 of the present document, and Nchf is described in TS 32.290 [50].

For MOCN performance converged charging, the CEF is a consumer of:

- performance management service (MnS) for gNB performance measurement exposed by the MnS Producer, specified in TS 28.552 [270];

5 Network slice performance and analytics charging principles and scenarios

5.1 Network slice performance and analytics charging principles

5.1.1 General

Performance and analytics based charging shall be achieved by subscription to the performance metrics or analytics information of a specific network slice and report them to CHF for charging purpose. The detail of performance and analytics information is specified in the clause 5.1.3.

Network slice performance and analytics charging shall support collection of network slice performance metrics related to network slice charging based on network slice performance and analytics charging requirements.

5.1.2 Requirements

The following are high-level charging requirements specific to the network slice performance and analytics charging:

- The CEF shall support subscription to specific network slice performance and analytics information.
- The CEF shall support reporting charging information based on network slice performance and analytics information.
- The CEF shall support reporting performance and analytics charging information per network slice.
- The CEF shall support PEC scenario to report performance and analytics charging information.

NOTE: The CEF shall support MOCN performance measurement.

5.1.3 Network slice performance and analytics charging information

The following is a non-exhaustive list related to one or more of the performance and analytics inputs relevant to charging for network slice:

- Latency as defined in clause 6.3, TS 28.554 [271]
- Throughput as defined in clause 6.3, TS 28.554 [271]
- Maximum packet loss rate as defined in GSMA NG.116 [500]
- Service Experience statistics information as defined in clause 6.4, TS 23.288 [150]
- The number of PDU sessions as defined in clause 6.4, TS 28.554 [271]

- The number of registered subscribers as defined in clause 6.2, TS 28.554 [271]
- Load level information as defined in clause 6.3, TS 23.288 [150].
- Estimated Energy Consumption as defined in clause 6.7.3.3, TS 28.554 [271].

5.1.4 NWDAF discovery

The NWDAF service discovery by the CEF is specified in TS 29.510 [300].

5.1.5 CHF selection

The CHF selection, i.e. CHF address determination, by the CEF is done based on the following and with this priority order (highest to lowest):

- NRF based discovery;
- pre-configured CHF address in the CEF.

5.2 Network slice performance and analytics charging scenarios

5.2.1 Basic principles

5.2.1.1 General

Network slice performance and analytics charging is performed by the CEF interacting with CHF using Nchf specified in TS 32.290 [50] and TS 32.291 [51]. In order to provide the data required for the charging management activities outlined in TS 32.240 [1], the CEF shall be able to perform converged charging for each of the following:

- the performance and analytics information obtained from NWDAF.
- the performance and analytics information obtained from MnS;

The CEF shall be able to obtain performance and analytics information from the NWDAF and/or MnS as follows:

- The Subscribe/Notify are exchanged between the CEF and the NWDAF using the Nnwdaf service. The interactions are issued by the CEF towards the NWDAF when certain conditions are met.
- The Subscribe/Notify are exchanged between the CEF and the MnS producer. The interactions are issued by the CEF when certain conditions are met.

The CEF shall be able to perform converged charging by interacting with CHF, for charging data related to network slice performance and analytics. The Charging Data Request and Charging Data Response are exchanged between the CEF and the CHF, based on PEC scenarios specified in TS 32.290 [50]. The Charging Data Request is issued by the CEF towards the CHF when certain conditions (chargeable events) are met.

The charging information is collected per Single Network Slice Selection Assistance Information (S-NSSAI).

The services provided by NWDAF are defined in the TS 23.288[150] and the services provided by MnS producer are defined in the TS 28.533 [250]. The charging functionalities for network slice performance and analytics, i.e. CEF functionality, charging events and charging procedures, are defined in the following clauses.

Whether performance and analytics charging for an S-NSSAI in the CEF is active or not is based on configuration. Which performance and analytics information is obtained from NWDAF or MnS by the CEF is based on configuration.

The configuration may be per S-NSSAI, detailed information about the configuration or provisioning of the configuration is outside the present document.

The contents and purpose of each charging event that triggers interaction with CHF, as well as the chargeable events that trigger them, are described in clauses 5.2.2.

A detailed formal description of the converged charging parameters to CHF defined in the present document can be found in TS 32.291 [51].

A detailed formal description of the CDR parameters defined in the present document can be found in TS 32.298 [57].

5.2.1.2 Applicable triggers in network slice performance and analytics charging

Triggers for CEF to invoke a Charging Data Request [Event] towards the CHF are defined as following trigger conditions.

When a charging event is issued towards the CHF, it includes details such as Single Network Slice Selection Assistance Information (S-NSSAI). Table 5.2.1.2-1 summarizes the set of default trigger conditions and their category which shall be supported by the CEF.

Table 5.2.1.2-1: Default Trigger conditions in CEF

Trigger Conditions	Trigger level	Default category	CHF allowed to change category	CHF allowed to enable and disable	Message when "immediate reporting" category
Expiry of time limit per S-NSSAI	-	Immediate	Not Applicable	Not Applicable	Charging Data Request [Event]
Threshold reached for a performance indicator (e.g. load level per S-NSSAI)	-	Immediate	Not Applicable	Not Applicable	Charging Data Request [Event]
Limit reached for number of notify events per subscription made by CEF	-	Immediate	Not Applicable	Not Applicable	Charging Data Request [Event]
Limit reached for number of notify events per S-NSSAI	-	Immediate	Not Applicable	Not Applicable	Charging Data Request [Event]
NOTE 1: In addition, there may be operator specific triggers.					
NOTE 2: The threshold and limit is default configured and updated based on the configuration.					

The CDR generation mechanism processed by the CHF upon receiving Charging Data Request [Event] issued by the CEF for these chargeable events, is specified in clause 5.2.3.

5.2.2 Message flows

5.2.2.1 General

The message flows in the present document specify the interaction for performance and analytics charging functionality, based on the performance and analytics information from NWDAF and MnS.

The charging interaction is based on Charging Data Request /Response messages specified in TS 32.290 [50], exchanged between the CEF and the CHF.

One source of performance and analytics information is based on the messages specified in TS 23.288 [150], exchanged between the CEF and NWDAF.

Another source of performance and analytics information is based on the messages specified in TS 28.532 [251], exchanged between the CEF and MnS.

5.2.2.2 Analytics and performance charging from CEF

5.2.2.2.1 General

The clause below describes analytics and performance charging from CEF scenarios.

5.2.2.2.2 General analytics and performance charging – PEC

The following figure 5.2.2.2.2-1 describes analytics and performance charging:

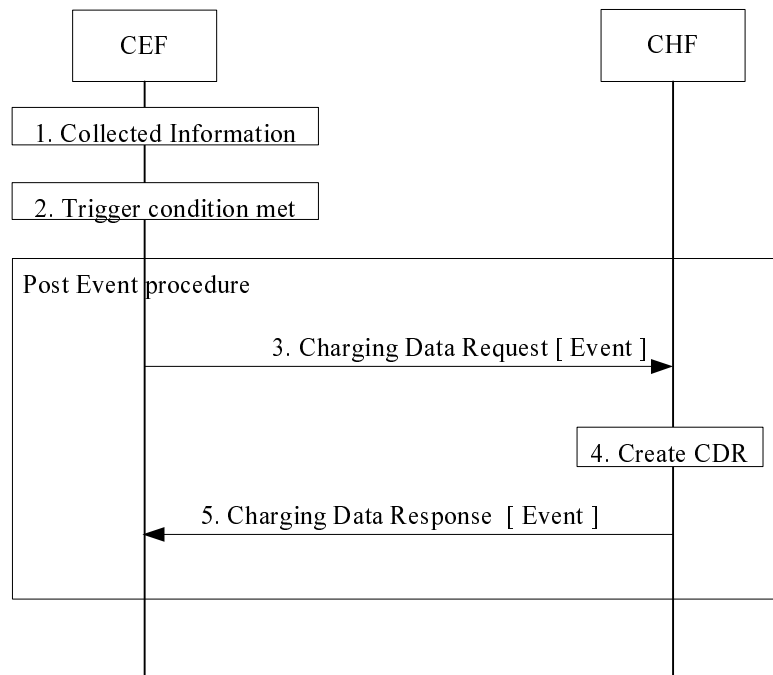


Figure 5.2.2.2.2-1: Analytics and performance reporting

- 1) **Collection of analytics and performance information:** Collection of information related to the network slice analytics and performance is done by the CEF.
- 2) **Trigger condition met:** the CEF determines based on the collected information and the trigger conditions that a report of charging information to the CHF is needed.
- 3) **Charging Data Request [Event]:** The CEF generates charging data related to the collected information and sends the charging data request for the CHF to process the related charging data for CDR generation purpose.
- 4) **Create CDR:** the CHF stores received information and creates a CDR related to the event.
- 5) **Charging Data Response [Event]:** The CHF informs the CEF on the result of the request.

5.2.2.3 Network Slice data analytics subscription from NWDAF

5.2.2.3.1 General

The clause below describes network data analytics subscription scenarios. The CEF acts as a NWDAF Service Consumer and uses the Nnwdaf_AnalyticsSubscription service to subscribe to the applicable analytics information required for the chargeable events, based on clause 6.1.1 in TS 23.288 [150].

5.2.2.3.2 Network slice performance and analytics information Subscribe/Notify

The following figure 5.2.2.3.2-1 procedure is used by CEF to subscribe/unsubscribe at NWDAF to be notified on performance and analytics information, using Nnwdaf_AnalyticsSubscription service for Network Slice defined in TS 23.288 [150].

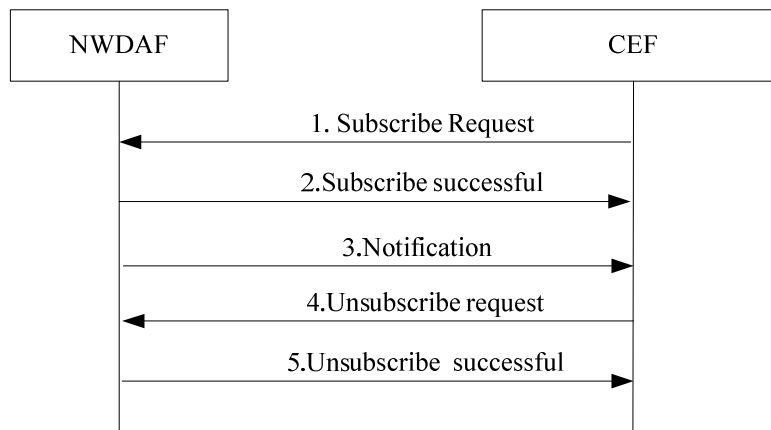


Figure 5.2.2.3.2-1: Analytics and performance from NWDAF

- 1) Subscribe Request:** the CEF decides to start the collection of performance and analytics information and subscribes to performance and analytics information from NWDAF with the performance indicator, S-NSSAI and subscription condition (e.g. Start time, stop time).
- 2) Subscribe Respond:** the NWDAF responses the subscription successful.
- 3) Notification:** based on the subscription of performance and analytics information, the NWDAF notifies the CEF with the performance and analytics information.

NOTE: There might be several “notification” during the subscription.

- 4) Unsubscribe Request:** the CEF cancels the subscription to performance and analytics information.
- 5) Unsubscribe Respond:** the NWDAF responses the unsubscription successful.

The CEF could update the subscription during the duration of the subscription.

5.2.2.4 Network slice performance and analytics subscription using MnS

5.2.2.4.1 General

CEF may support subscription to network slice performance information using MnS. The clauses below describes message flow of network slice performance and analytics charging using MnS defined in clause 11.3.1 in TS 28.532 [251] (e.g. Subscribe operation, unsubscribe operation and notifyFileReady).

5.2.2.4.2 Network slice performance and analytics information Subscribe/Notify

The following figure 5.2.2.4.2-1 procedure is used by CEF to subscribe/unsubscribe the performance and analytics information using MnS.

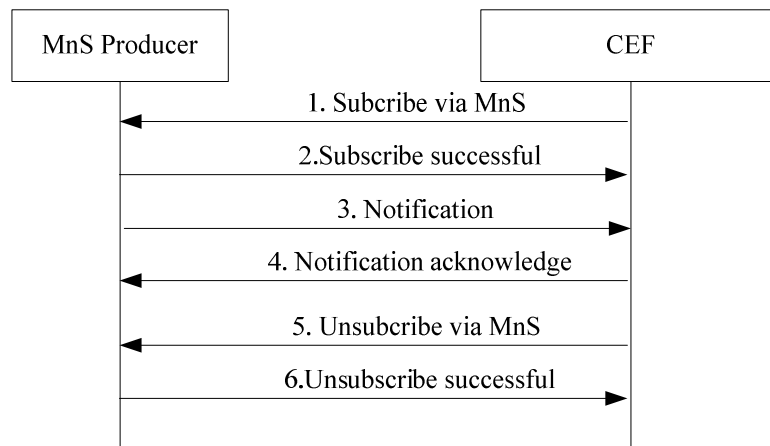


Figure 5.2.2.4.2-1: Performance and analytics information from MnS Producer

- 1) **Subscribe Request:** The CEF decides to start the collection of performance and analytics information and subscribes to performance and analytics information using MnS with the performance indicator, S-NSSAI and subscription condition (e.g. Start time, stop time).
- 2) **Subscribe Respond:** the MnS producer responds the subscription successful.
- 3) **Notification:** Based on the subscription of performance and analytics information, the MnS producer notifies the CEF with the performance and analytics information.

NOTE: There might be several “notification” during the subscription.

- 4) **Notification Acknowledge:** the CEF sends the acknowledge notification.
- 5) **Unsubscribe Request:** the CEF cancels the subscription to performance and analytics information.
- 6) **Unsubscribe Respond:** the MnS producer responds the unsubscription successful.

The CEF could update the subscription during the duration of the subscription

5.2.2.5 5G MOCN performance charging from CEF

5.2.2.5.1 General

The flow for 5G MOCN network sharing performance charging scenarios follows the flow in clause 5.2.2.2.2.

5.2.3 CDR generation

5.2.3.1 Introduction

The network slice performance and analytics CHF CDRs 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 network slice performance and analytics 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 performance and analytics CHF CDR is used to capture charging information related to network slice performance and analytics or network sharing chargeable events for PEC.

5.2.3.2.2 Triggers for CHF CDR generation

A network slice performance and analytics CHF CDR is generated by the CHF for each received Charging Data Request [Event].

5.2.4 Ga record transfer flows

Details of the Ga protocol application are specified in TS 32.295 [55].

5.2.5 Bns CDR file transfer

Details of the Bns protocol application are specified in TS 32.297 [56].

6 Definition of charging information

6.1 Data description for network slice performance and analytics charging

6.1.1 Message contents

6.1.1.1 General

The Charging Data Request and Charging Data Response are specified in clause 5.1.2.2.1 of TS 32.290 [50].

Table 6.1.1.1-1 describes the use of these messages for network slice performance and analytics charging.

Table 6.1.1.1-1: network slice performance and analytics charging messages reference table

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

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 TS 32.240 [1].

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 CEF as used for performance and analytics based charging.

Table 6.1.1.2-1: Charging Data Request message contents

Information Element	Category for converged charging	Description
Tenant Identifier	O _M	This field if present is the identifier of subscriber of network slice and may in the case of 5G MOCN network sharing represent the participating operator, e.g. PLMN Id.
NF Consumer Identification	M	Described in TS 32.290 [57].
NF Functionality	M	Described in TS 32.290 [57].
NF Name	O _C	Described in TS 32.290 [57].
NF Address	O _C	Described in TS 32.290 [57].
NF PLMN ID	O _C	Described in TS 32.290 [57].
Invocation Timestamp	M	Described in TS 32.290 [57].
Invocation Sequence Number	M	Described in TS 32.290 [57].
One-time Event	O _C	Described in TS 32.290 [57].
One-time Event Type	O _C	Described in TS 32.290 [57].
Service Specification Information	O _C	Described in TS 32.290 [57].
Multiple Unit Usage	O _C	Described in TS 32.290 [57], with the exception that quota management is not applicable.
Rating Group	M	Described in TS 32.290 [57].
Used Unit Container	O _C	Described in TS 32.290 [57].
Local Sequence Number	O _M	Described in TS 32.290 [57].
NSPA Container Information	O _C	This field holds the network slice performance and analytics container specific information described in clause 6.2.1.3.
Network Sharing Container Information	O _C	This field holds 5G MOCN network sharing container specific information described in clause 6.2.1.5.
NSPA Charging Information	O _C	This field holds the network slice information, which is reported to the CHF described in clause 6.2.1.2.
Network Sharing Charging Information	O _C	This field holds 5G MOCN network sharing specific information described in clause 6.2.1.4.

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 as used for performance and analytics based charging.

Table 6.1.1.3-1: Charging Data Response message contents

Information Element	Category for converged charging	Description
Session Identifier	O _C	Described in TS 32.290 [57].
Invocation Timestamp	M	Described in TS 32.290 [57].
Invocation Result	O _C	Described in TS 32.290 [57].
Invocation Sequence Number	M	Described in TS 32.290 [57].

6.1.2 Ga message contents

Details of the Ga message contents are specified in TS 32.295 [55].

6.1.3 CDR description on the B_{ns} interface

6.1.3.1 General

This clause describes the CDR content and format generated for performance and analytics based charging.

The following table 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 TS 32.240 [1]. Full definitions of the CDR parameters, sorted by the name in alphabetical order, are provided in TS 32.298 [57].

6.1.3.2 Network slice performance and analytics CHF CDR data

If enabled, network slice performance and analytics CDRs shall be produced for each network slice (i.e. S-NSSAI).

If enabled, network sharing CDRs shall be produced for each PLMN and optionally network slice (i.e. S-NSSAI).

The fields of network slice performance and analytics CHF CDR are specified in table 6.1.3.2-1.

Table 6.1.3.2-1: Network slice performance and analytics CHF record data

Field	Category	Description
Record Type	M	CHF record.
Recording Network Function ID	O _M	This field holds the name of the recording entity, i.e. the CHF id.
Tenant Identifier	O _M	This field if present is the identifier of subscriber of network slice..
NF Consumer Information	M	This field holds the information of the CEF that used the charging service.
NF Functionality	M	This field contains the function of the node (i.e. CEF)
NF Name	O _C	This field holds the name of the CEF used.
NF Address	O _C	This field holds the IP Address of the CEF used.
NF PLMN ID	O _C	This field holds the PLMN identifier (MCC MNC) of the CEF.
List of Multiple Unit Usage	O _M	This field holds a list of changes in charging conditions for one single Network Slice Selection Assistance. The list is categorized per rating group. Each change is time stamped.
Rating Group	O _M	This filed holds the rating group.
Used Unit Container	O _C	This field holds the information connected to the reported network slice.
Local Sequence Number	M	This field holds the container sequence number.
NSPA Container Information	O _C	This field holds the network slice performance and analytics container specific information described in clause 6.2.1.3.
Network Sharing Container Information	O _C	This field holds 5G MOCN network sharing container specific information described in clause 6.2.1.5.
NSPA Charging Information	O _M	This field holds the network slice performance and analytics charging information defined in clause 6.2.1.2.
Network Sharing Charging Information	O _C	This field holds 5G MOCN network sharing specific information described in clause 6.2.1.4.
Record Opening Time	M	Described in TS 32.298 [57].
Duration	M	Described in TS 32.298 [57].
Record Sequence Number	C	Described in TS 32.298 [57].
Cause for Record Closing	M	Described in TS 32.298 [57].
Local Record Sequence Number	O _M	Described in TS 32.298 [57].
Record Extensions	O _C	Described in TS 32.298 [57].

6.2 Network slice performance and analytics charging specific parameters

6.2.1 Definition of network slice performance and analytics charging information

6.2.1.1 General

The Charging Information parameter used for network slice performance and analytics charging is provided in the following clauses.

6.2.1.2 Definition of Performance and Analytics Charging Information

Specific charging information used for network slice performance and analytics charging is provided within the NSPA (Network Slice Performance and Analytics) Charging Information.

The detailed structure of the NSPA Charging information can be found in table 6.2.1.2-1.

Table 6.2.1.2-1: Structure of NSPA Charging Information

Information Element	Category	Description
Single NSSAI	M	This field holds network slice information the performance and analytics information belongs to.

6.2.1.3 Definition of NSPA Container Information

Specific charging information used for network slice performance and analytics charging is provided within the NSPA Container Information.

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

Table 6.2.1.3-1: Structure of NSPA Container Information

Information Element	Category	Description
Source NF Identification	OC	This field holds the information of the source network function that provide the analytics in this container, i.e., the information of NWDAF or MnS Producer.
Uplink Latency	O _c	This field holds uplink latency as described in TS 28.541 [252] clause 6.4 uLLatency attribute (see NOTE 1).
Downlink Latency	O _c	This field holds downlink latency as described in TS 28.541 [252] clause 6.4 dLLatency attribute.
Uplink Throughput	O _c	This field holds uplink throughput of one single network slice as described in TS 28.541 [252] clause 6.4 uLThptPerSlice attribute (see NOTE 2).
Downlink Throughput	O _c	This field holds downlink throughput of one single network slice as described in TS 28.541 [252] clause 6.4 dLThptPerSlice attribute
Maximum packet loss rate UL	O _c	This field holds maximum packet loss rate uplink as described in TS 28.541 [252] clause 5.4 maxPacketLossRateUI attribute (see NOTE 3).
Maximum packet loss rate DL	O _c	This field holds maximum packet loss rate downlink as described in TS 28.541 [252] clause 5.4 maxPacketLossRateDI attribute.
Service Experience statistics data	O _c	This field holds service experience statistics data as described in TS 23.288 [150]
Number of PDU sessions	O _c	This field holds the number of PDU sessions as described in TS 28.554 [271].
Number of registered Subscribers	O _c	This field holds the number of registered subscribers as described in TS 28.554 [271].
Load level	O _c	This field holds the load level as described in TS 23.288 [150].
Estimated Energy Consumption	O _c	This field holds the KPI that describe the estimated energy consumption of one single network slice during the measured period, as described in TS 28.554 [271] clause 6.7.3.3.
NOTE 1: For the backwards compatibility the Uplink Latency may be bound to Latency. NOTE 2: For the backwards compatibility the Uplink Throughput may be bound to Throughput. NOTE 3: For the backwards compatibility the Maximum packet loss rate UL may be bound to Maximum packet loss rate.		

6.2.1.4 Definition of Network Sharing Charging Information

Specific charging information used for 5G MOCN network sharing charging is provided within the Network Sharing Charging Information.

The detailed structure of the Network Sharing Charging Information can be found in table 6.2.1.4.1.

Table 6.2.1.4.1: Structure of Network Sharing Charging Information

Information Element	Category	Description
PLMN Identifier	M	This field holds POP PLMN that the performance information is related to.
Single NSSAI	O _c	This field holds network slice information the performance analytics information is related to.

6.2.1.5 Definition of Network Sharing Container Information

Specific charging information used for 5G MOCN network sharing charging is provided within the Network Sharing Container Information.

The detailed structure of the Network Sharing Container Information can be found in table 6.2.1.5.1.

Table 6.2.1.5.1: Structure of Network Sharing Container Information

Information Element	Category	Description
Downlink Data Volume	O _c	This field holds downlink cell PDCP SDU Data Volume as described in clause 5.1.3.6.2 of TS 28.552 [270].
Uplink Data Volume	O _c	This field holds uplink cell PDCP SDU Data Volume as described in clause 5.1.3.6.2 of TS 28.552 [270].
Number of PDU Sessions requested	O _c	This field holds the number of PDU sessions requested by the gNB as described in clause 5.1.1.5.1 of TS 28.552 [270].
Number of PDU Sessions successful	O _c	This field holds the number of PDU sessions successfully setup by the gNB from AMF as described in clause 5.1.1.5.2 of TS 28.552 [270].

6.2.2 Formal network slice performance and analytics charging parameter description

6.2.2.1 Network slice performance and analytics CHF CDR parameters

The detailed definitions, abstract syntax and encoding of network slice performance and analytics CHF CDRs parameters are specified in TS 32.298 [57].

6.2.2.2 Network slice performance and analytics resources attributes

The detailed definitions of resources attributes used for network slice performance and analytics charging are specified in TS 32.291 [51].

6.2.2.3 Network sharing CHF CDR parameters

The detailed definitions, abstract syntax and encoding of network sharing CHF CDRs parameters are specified in TS 32.298 [57].

6.2.2.4 Network sharing resources attributes

The detailed definitions of resources attributes used for network sharing charging are specified in TS 32.291 [51].

6.2.3 Detailed message format for converged charging

The following clause specifies per Operation Type the charging data that are sent by CEF for network slice performance and analytics converged charging.

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

Table 6.2.3-1 defines the basic structure of the supported fields in the *Charging Data Request* message for CEF converged charging.

Table 6.2.3-1: Supported fields in *Charging Data Request* message

Information Element	Performance and Analytics	CEF
	Supported Operation Types	E
Tenant Identifier		E
NF Consumer Identification		E
Invocation Timestamp		E
Invocation Sequence Number		E
One-time Event		E
One-time Event Type		E
Multiple Unit Usage		E
Rating Group		E
Used Unit Container		E
Local Sequence Number		E
NSPA Container Information		E
Network Sharing Container Information		E
NSPA Charging Information		
Single NSSAI		E
Network Sharing Charging Information		
PLMN Identifier		E
Single NSSAI		E

Table 6.2.3-2 defines the basic structure of the supported fields in the *Charging Data Response* message for CEF converged charging.

Table 6.2.3-2: Supported fields in *Charging Data Response* message

Information Element	Performance and Analytics	CEF
	Supported Operation Types	E
Session Identifier		E
Invocation Timestamp		E
Invocation Result		E
Invocation Sequence Number		E

6.3 Bindings for network slice performance and analytics converged charging

This mapping between the Information Elements, resource attributes and CHF CDR parameters for network slice performance and analytics or network sharing converged charging is described in clause 7 of TS 32.291 [51].

Annex A (informative): Change history

Change history							
Date	Meeting	Tdoc	CR	Rev	Cat	Subject/Comment	New version
2020-09	SA#89e					Upgrade to change control version including EditHelp review	16.0.0
2020-12	SA#90e	SP-201043	0002	1	F	Correction of the Category and Operation Types	16.1.0
2020-12	SA#90e	SP-201043	0004	-	F	Update description of Charging Enablement Function	16.1.0
2020-12	SA#90e	SP-201043	0006	-	F	Correction on sender of Charging Data Response message	16.1.0
2020-12	SA#90e	SP-201043	0007	-	F	Correction on NSPA Container Information in Charging Data Request message	16.1.0
2022-03	-	-	-	-	-	Update to Rel-17 version (MCC)	17.0.0
2023-09	SA#101	SP-230944	0009	1	F	Correct the NSPAContainerInformation for NSPA	17.1.0
2023-09	SA#101	SP-230940	0011	1	A	Correction on Charging Data message content for NSPA Charging	17.1.0
2024-04	-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0
2024-06	SA#104	SP-240808	0013	1	F	Rel-18 CR 28.201 Clarification on triggers for NSPA message content	18.1.0
2024-09	SA#105	SP-241188	0014	1	B	Rel-19 CR 28.201 Support the energy related information per network slice	19.0.0
2025-06	SA#108	SP-250525	0017	1	B	Rel-19 CR 28.201 Add charging architecture for MOCN	19.1.0
2025-06	SA#108	SP-250525	0018	1	B	Rel-19 CR 28.201 Add charging requirement for MOCN	19.1.0
2025-06	SA#108	SP-250557	0020	1	A	Rel-19 CR 28.201 Correction of NSPA Container Information reference	19.1.0
2025-06	SA#108	SP-250525	0021		B	Rel-19 CR 28.201 Addition of message flow for MOCN	19.1.0
2025-06	SA#108	SP-250557	0022		A	Rel-19 CR 28.201 Correction on NSPA charging information	19.1.0
2025-06	SA#108	SP-250525	0023		B	Rel-19 CR 28.201 Addition of charging information for MOCN	19.1.0
2025-09	SA#109	SP-251077	0024	1	C	Rel-19 CR 28.201 Addition on NSPA charging information	19.2.0
2025-09	SA#109	SP-251083	0026	-	A	Rel-19 CR 28.201 Correction on the message flow description of subscription using MnS	19.2.0
2025-09	SA#109	SP-251093	0027	1	B	Rel-19 CR 28.201 Correction to information for MOCN	19.2.0
2025-09	SA#109	SP-251093	0029	-	B	Rel-19 CR 28.201 Addition of CDR information for MOCN	19.2.0

History

Document history		
V19.2.0	October 2025	Publication