Multi-Access Gateway – controller

Release 25.3

Per Call Measurement Data Guide

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Nokia is committed to diversity and inclusion. We are continuously reviewing our customer documentation and consulting with standards bodies to ensure that terminology is inclusive and aligned with the industry. Our future customer documentation will be updated accordingly.

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1 Getting started

Find general information about this guide.

1.1 About this guide

This guide describes details pertaining to the Per Call Measurement Data (PCMD) service for the Nokia Multi-Access Gateway – controller (MAG-c) for the BNG CUPS solution.

This guide serves as the specification for the MAG-c PCMD, which is identical between all available product platforms. It provides concepts and descriptions of PCMD record generation, format, information elements and their value tables, Command Line Interface (CLI) syntax, and command usage.

This guide is organized into functional chapters and provides concepts and descriptions of the implementation flow, as well as CLI syntax and command usage.

Command outputs shown in this guide are examples only; actual displays may differ depending on supported functionality and user configuration.

The CLI trees and command descriptions can be found in the *MAG-c CLI Reference Guide*.

Note: This guide generically covers content for the release specified on the title page of the guide, and may also contain some content that will be released in later maintenance loads. See the applicable *MAG-c Release Notes* for information about features supported in each load of the software release.

Note: The information in this guide is intended to be used in conjunction with the SR OS software user guides. The SR OS software user guides describe SR OS service features that are supported by the MAG-c. See the *7450 ESS, 7750 SR, 7950 XRS, and VSR Documentation Suite Overview Card 20.10.R1* for specific guide titles.

1.2 Conventions

This section describes the general conventions used in this guide.

1.2.1 Precautionary and information messages

The following information symbols are used in the documentation.

DANGER: Danger warns that the described activity or situation may result in serious personal injury or death. An electric shock hazard could exist. Before you begin work on this equipment, be aware of hazards involving electrical circuitry, be familiar with networking environments, and implement accident prevention procedures.

WARNING: Warning indicates that the described activity or situation may, or will, cause equipment damage, serious performance problems, or loss of data.

Caution: Caution indicates that the described activity or situation may reduce your component or system performance.

Note: Note provides additional operational information.

Tip: Tip provides suggestions for use or best practices.

1.2.2 Options or substeps in procedures and sequential workflows

Options in a procedure or a sequential workflow are indicated by a bulleted list. In the following example, at step 1, the user must perform the described action. At step 2, the user must perform one of the listed options to complete the step.

Example: Options in a procedure

1. User must perform this step.
2. This step offers three options. User must perform one option to complete this step.
   - This is one option.
   - This is another option.
   - This is yet another option.

Substeps in a procedure or a sequential workflow are indicated by letters. In the following example, at step 1, the user must perform the described action. At step 2, the user must perform two substeps (a. and b.) to complete the step.

Example: Substeps in a procedure

1. User must perform this step.
2. User must perform all substeps to complete this action.
   a. This is one substep.
   b. This is another substep.

2 Introduction to PCMD

PCMD provides the ability to conduct per-session performance analysis of MAG-c functions. PCMD supports per-procedure analysis at per-session granularity.

2.1 PCMD overview

PCMD is a real-time diagnostics and troubleshooting tool that provides call-session and connection records for information such as duration, quality, disposition, and other important events that occur during the session, such as setup, failure, handover, and termination.

PCMD is used to evaluate the UE and the network node performance. For example, a call-flow procedure failure for the majority of UEs from a specific vendor can quickly reveal the root cause of a problem at the UE level.

When used for a specific scenario, PCMD provides the ability to find the root cause of a problem because of non-compliance in the network nodes. PCMD helps determine failure scenarios using end-to-end network-wide per-call measurements from multiple nodes. The end-to-end session data from the live network helps pinpoint the root causes of failures and facilitates quick responses, without recreating the scenarios in a lab environment.

PCMD data is generated on the MAG-c control plane (CP) and sent to a data collector node over a UDP stream. The call-data streaming enables performance and root-cause analysis of real-time network issues.

2.2 Feature summary

The MAG-c supports PCMD in the following networks:

- on the CP, in a 4G-CUPS network
- on the SMF, in a 5G network

The MAG-c PCMD features include:

- performance and fault management, real-time monitoring, and off-line troubleshooting
- detailed call-processing view per procedure and per session
- detailed information about all activities of every user
- optionally enabled by the user using CLI configuration
- data source:
  - external messages
  - session state
  - internal processing logic
  - data digested and enriched with application logic, unlike sniffer tools that operate agnostic of application logic and rely on packet-capture only

- live streaming of PCMD session records
- PCMD stream realized as a UDP stream of PCMD records (one PCMD IP/UDP packet may contain 1 to 11 or more PCMD records) in proprietary binary format
- support for FWA control plane functions only (SMF and GW-C)

2.3 Configuration

The MAG-c supports CLI commands to configure streaming of PCMD records. MAG-c supports PCMD record streaming to the provisioned real-time port when the record is created.

See PCMD record format and Generating and transmitting PCMD records for more information about PCMD records.

3 PCMD record generation

The MAG-c supports PCMD record configuration using CLI commands. A PCMD record is streamed to the provisioned real-time port when the record is created.

3.1 Configuring the destination port for PCMD records

The MAG-c collects and streams session PCMD records. Use the following command to configure the destination port for PCMD records:

```
configure mobile-gateway profile pcmd destination port
```

3.2 Session records

Session records overview

The most important entity reported in the PCMD session records is a procedure that describes the event (for example, attach, detach, PDU session create, modify bearer, and QoS flow modification). A procedure contains a set of messages that are reported together. A specific message starts a procedure and another message ends it. However, some exception procedures, such as session deletion because of MME failure, are initiated internally by the system without requiring an external trigger message. A procedure can also be relevant to bearers that are reported with it.

If a procedure starts while another procedure is still ongoing, the procedures are reported together as concurrent procedures. A procedure is concurrent if it is relevant to some bearers in the original procedure.

For example, when DL packets are received for an idle UE for a specific default bearer, a paging procedure is triggered and the DDN is sent to the MME. At the same time, the MME sends a Delete Session Request for this default bearer.

A session PCMD record is created when any of the supported 3GPP procedures are triggered and the call flow of the procedure ends (normally or abnormally).

Each session PCMD record contains fields for subscriber information (IMSI, SUPI, MSISDN, GPSI, IMEI, PEI), procedure ID, procedure result, procedure failure cause, and other data relevant to the procedure, such as bearer ID, QoS flow ID, APN, and slice.

Session record verbosity

The session PCMD can include either of the following records:

- The **standard** record contains only the mandatory and conditional fields.
- The **extended** record contains mandatory and conditional fields plus optional and conditional-optional fields.

Mandatory fields are always present. Optional fields are present only when an extended record is generated. Conditional (and conditional-optional) fields are filled in the PCMD record if the related information elements (IEs) are present in the signaling messages involved in the procedure. In some cases, a conditional parameter may be filled in the PCMD record even when the IE is not present in any signaling message. This happens when the MAG-c processing function knows the value, for example, through state information kept from previous processing.

The descriptions in the IE indicate the presence or availability of each PCMD IE; see PCMD record information elements for more information about IEs.

The procedure result and the configured verbosity type determine the type of PCMD records that are generated and streamed. Use the following CLI command to configure the verbosity type:

```
configure mobile-gateway profile pcmd session-report verbosity
```

The possible values for the **verbosity** are:

- **failure-only**
- **standard**
- **extended**

The following table lists the triggers for creating PCMD session records.

Table 1: Triggers for the creation of PCMD session records

User setting (CLI) verbosity command	Records		
	Extended session PCMD record for result FAILURE	Standard session PCMD record for result NORMAL	Extended session PCMD record for result NORMAL
failure-only	X	—	—
standard	X	X	—
extended	X	—	X

See Session PCMD record format for more information about the container formats that construct the standard and the extended session PCMD records.

See Generating and transmitting PCMD records for more information about generating and transmitting PCMD records.

3.3 PCMD heartbeat messages

The PCMD interface sends periodic heartbeat messages to notify the collector that the MAG-c reporting application is alive. This is especially useful in silent periods, for example, during the integration phase or when traffic is low.

The MAG-c active OAM-VM transmits the heartbeat messages toward the configured PCMD destination, based on the configuration in the PCMD profile. Use the following CLI command to modify the default setting for the heartbeat messages.

```
configure mobile-gateway profile pcmd heartbeat
```

See Generating and transmitting PCMD records for more information about configuring the PCMD profile.

3.4 Generating and transmitting PCMD records

An internal process collects PCMD data and generates the PCMD records. When a user configures a PCMD profile and assigns it to a PDN, the internal process starts generating (not transmitting) PCMD records. To transmit the generated PCMD records, the user must also configure the PCMD profile with a reachable destination IP address and assign it to a PDN that is operationally enabled.

About this task

PCMD records start generating as soon as you associate a PCMD profile with a PDN, regardless of whether you configure a reachable destination IP address.

Note: Generating PCMD records can have a performance impact on the system, regardless of whether the PCMD records are transmitted.

To transmit the generated PCMD records, the following is required:

- Configure the PCMD profile with a reachable destination IP address.
- Assign the PCMD profile to a PDN that is operationally enabled (**no shutdown** command).

Note:

- Reachability is calculated based on the local routing information and the link status. As a result, the MAG-c starts and stops PCMD record transmission and accordingly updates the PCMD operational state based on network configuration and interface status only.
- The PCMD transmission stops with any of the following events:
  - You execute the **shutdown** command at the PDN to shutdown the PDN.
  - You execute the **no pcmd** command at the PDN to disable the PCMD profile.
  - Connectivity to the configured destination IP address fails and the destination becomes unreachable.

In the following procedure, the PCMD profile configuration settings are defined as follows:

- The profile name is PCMD-records.
- The PCMD network destination is 192.0.2.2.
- The session report verbosity type is extended.

Procedure

Step 1. Configure a PCMD profile.

Note: If you are modifying the configuration of a PCMD profile that is already assigned to the PDN, remove the profile from the PDN configuration before making the changes.

The MAG-c does not support configuration of the PCMD profile while it is assigned to the PDN.

```
configure mobile-gateway profile pcmd
```

Example

```
configure mobile-gateway profile pcmd PCMD-records
```

Step 2. Configure the network destination for the PCMD profile records.

PCMD records generate without a configured network destination, however a reachable destination IP address is required to transmit the generated PCMD records.

```
configure mobile-gateway profile pcmd destination
```

Example

```
configure mobile-gateway profile pcmd PCMD-records destination 192.0.2.2
```

Step 3. Optional: Modify the default report type for the PCMD profile.

```
configure mobile-gateway profile pcmd session-report verbosity
```

Example

```
configure mobile-gateway profile pcmd PCMD-records session-report verbosity extended
```

Step 4. Optional: Modify the default periodic heartbeat transmission in the PCMD interface.

```
configure mobile-gateway profile pcmd heartbeat
```

Example

```
configure mobile-gateway profile pcmd PCMD-records heartbeat 15
```

Step 5. Assign the PCMD profile to the gateway instance.

```
configure mobile-gateway pdn pcmd profile
```

Example

```
configure mobile-gateway pdn 1 pcmd profile PCMD-records
```

Step 6. Ensure the PDN is in the operationally enabled state.

```
configure mobile-gateway pdn 1 no shutdown
```

Step 7. View the PCMD configuration.

```
show mobile-gateway profile pcmd
```

Example

```
show mobile-gateway profile pcmd PCMD-records
```

Expected outcome

```
A:MAG-c# show mobile-gateway profile pcmd "PCMD-records"
===============================================================================
PCMD profile
===============================================================================
Profile name        : PCMD-records
Description         : none
Destination address : 192.0.2.2
Destination port    : 29780
Destination router  : Base
Heartbeat           : 15
Session Report:
Verbosity           : extended
-------------------------------------------------------------------------------
Number of profiles  : 1
===============================================================================
```

Step 8. View the PCMD statistics.

```
show mobile-gateway pdn pcmd-stats
```

Expected outcome

```
A:MAG-c# show mobile-gateway pdn pcmd-stats
===============================================================================
PDN gateway PCMD statistics
===============================================================================
VNF/VM           : 1/3                  Gateway          : 1

PDN PCMD Profile name     : PCMD-records
PDN PCMD Profile duration : 0d 00:04:37
PDN PCMD oper. state      : up

Session records
---------------
Success records  : 0
Failure records  : 0
Success extended : 3
Success limited  : 0
Total records    : 3
Total bytes      : 588

--------------------------
Gateway lifetime statistics
--------------------------
Success records  : 3                    Failure records  : 0
-------------------------------------------------------------------------------
Number of cards  : 1
-------------------------------------------------------------------------------
NOTE: Gateway lifetime statistics represent all generated session records count
      since gateway creation regardless profile is assigned to gateway or not.
===============================================================================
```

4 PCMD record format

A PCMD record is logically divided into several parts known as containers. Containers are sorted and can be present multiple times. They can be of fixed or variable size and must be divisible by four. If the size is not divisible by four, padding 0s are appended.

If the system IP address inserted in the PCMD record is IPv6, the maximum session record size is:

- 1248 bytes for standard records
- 1532 bytes for extended records
- 32 bytes for heartbeat records

If the system IP address inserted in the PCMD record is IPv4, the sizes are decreased by 12 bytes. The PCMD record size equals the UDP payload length of the IP packet, if there is just one PCMD record present.

Every PCMD record begins with a header as defined in PCMD record header format. The version of the PCMD record conveyed in the PCMD header changes when either of the following occurs:

1. The structure or format of any container changes.
2. A new container type is introduced.

The PCMD version for this release is 6.

The following notation specifies the structure of each container. This notation is similar to the 3GPP specifications, with the left side of a byte holding the most significant bit. Four bytes are shown per table row. The leftmost byte is transmitted first.

bytes:	0	1	2	3
bits:	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0

When more than one byte is merged in a single information element, the bit numbering is contiguous and the left is the logically more significant. See Table 5: HeaderFlags in PCMD record report header2 for an example.

4.1 PCMD record header format

The PCMD record header is composed of the PCMD record common header, the PCMD record report header, and the SendingNodeIP container.

Table 2: PCMD record header format

PCMD record common header
PCMD record report header2
SendingNodeIP container

4.1.1 PCMD record common header

Table 3: PCMD record common header

Bytes	0	1	2	3
0	PCMDVersion=6	RecordType	RecordLength	

4.1.2 PCMD record report header2

Table 4: PCMD record report header2

Bytes	0	1	2	3
0	RecordOpeningTime			
4				
8	RecordSequenceNumber			
12	GwId	MscpGroupId	SendingNodeType	HeaderFlags
16	Reserved			
20	UEid			
24				

Table 5: HeaderFlags

7	6	5	4	3	2	1	0
Sending NodeIpV6	Reserved						

For descriptions of the PCMD record header container information elements, see Header information elements.

4.1.3 SendingNodeIP container

The length of the SendingNodeIP container depends on the IP address type:

- 4 bytes for IPv4
- 16 bytes for IPv6

Table 6: SendingNode IP container (IPv4)

Bytes	0	1	2	3
0	Sending node IPv4			

Table 7: SendingNode IP container (IPv6)

Bytes	0	1	2	3
0	Sending node IPv6			
4				
8				
12				

4.2 Session PCMD record format

The following tables describe the formats of the Session PCMD and Session Extended PCMD records.

Note:
The IMEI container is present when the ImeiFlag is set to 1.

The MSISDN container is present when the MsisdnFlag is set to 1.

The APN container is present when ApnFlag is set to 1.

The Procedure container is present only once, except if another procedure or procedures occur before the original procedure completes. See PCMD record generation for more information about the meaning of a concurrent procedure.

The Bearer, TEID, FTEID IP and Bearer Extended containers are present only when a bearer is involved in the procedure (bearer creation, modification, and deletion).

The Session Extended container and Bearer Extended container are present when the ExtendedFlag is set to 1.

One MessageAI container is present for every Message container.

One Charging container is present if BLC=0.

One Charging container is present for every Bearer container if BLC=1.

Table 8: Session PCMD record

Container	Multiplicity
PCMD Record Common Header	1
PCMD Record Report Header2	
Sending Node IP container	
Session Decoding container 2	
Session 3 container	
Procedure container	1-3
IMEI container	1

Container	Multiplicity
MSISDN container	
Peers container	
APN container	
Message container	0-40
—	
Message_n container	
MessageAI_1 container	0-40
—	
MessageAI_n container	
Bearer/QoS Flow container	0-11
TEID container	
FTEID IP container	
5G QoS container	
Charging container	1-11
—	
Charging_n container	
UE IP container	1
SNSSAI container	0-1

Table 9: Extended session PCMD record

Container	Multiplicity
PCMD Record Common Header	1
PCMD Record Report Header2	
Sending Node IP container	
Session Decoding container2	
Session 3 container	
Procedure container	1-3
IMEI container	1
MSISDN container	
Peers container	
APN container	

Container	Multiplicity
Session Extended container	
Message_1 container	0-40
—	
Message_n container	
MessageAI_1 container	0-40
—	
MessageAI_n container	
Bearer/QoS Flow container	0-11
TEID container	
FTEID IP container	
Bearer Extended container	
5G QoS container	
Charging_1 container	1-11
—	
Charging_n container	
UE IP container	1
SNSSAI container	0-1

4.2.1 Session PCMD Decoding container 2

Table 10: Session Decoding container 2

Bytes	0	1		2	3
0	MessageNum	ProcNum (4 bits)	PeerNum (4 bits)	Reserved	Session FlagsV2
4	SessionFlags2	Reserved			

Table 11: SessionFlagsV2

7	6	5	4	3	2	1	0
BrNum				ApnFlag	Extended Flag	ImeiFlag	MsisdnFlag

Table 12: SessionFlags2

7	6	5	4	3	2	1	0
SnssaiFlag	UliType Flag	Reserved					

4.2.2 Session3 container

Table 13: Session3 PCMD container

Bytes	0				1			2		3
0	Rat Type (4 bits)	DT (2 bits)	BLC (1 bit)	CI (1 bit)	PDN Type (3 bits)	Iwki (3 bits)	Reserved (3 bits)	UP Selection (6 bits)	SSCM (2 bits)	Pdu Session Id

Table 14: UPSelection

7	6	5	4	3	2	1	0
UPSAttributes				UPSelectionPeer			

Note: If UPSAttributes equals 0, the UPSelectionPeer field is not used. The UPSAttributes is always 0 in this release.

4.2.3 Procedure container

Table 15: Procedure container

Bytes	0	1	2	3
0	ProcedureID	ProcedureResult	ProcedureCause	
4	ProcedureDetailedCause		ProcedureDuration	

4.2.4 IMEI container

Table 16: IMEI container

Bytes	0	1	2	3
0	IMEI			
4				

4.2.5 MSISDN container

Table 17: MSISDN container

Bytes	0	1	2	3
0	MSISDN			
4				

4.2.6 Peer container

Table 18: Peer container

Bytes	0	1	2	3
0	Peer1TypeV2	Peer2TypeV2 or padding	Peer3TypeV2 or padding	Peer4TypeV2 or padding
...				
4 - 12	PeerXTypeV2	Peer(X+1)TypeV2 or padding	Peer(X+2)TypeV2 or padding	Peer(X+3)TypeV2 or padding
4 - 16	Peer1Id			
...	...			
... 252	PeerYId			

Note:

- X in [5..13]
- Y in [2..15] = PeerNum

The Peer container contains at least 1 peer and up to 15 peers maximum, as specified by PeerNum in the Session PCMD Decoding container 2.

Each peer is described by a PeerTypeV2 field and a PeerId field.

PeerTypeV2 field:

- Length is 1 byte.
- Padding may be added after the PeerTypeV2 fields to align with a 4-byte boundary.
- The total number of bytes depends on the total number of peers in the record:
  - 1 to 4 peers use 4 bytes
  - 5 to 8 peers use 8 bytes
  - 9 to 12 peers use 12 bytes
  - 13 to 15 peers use 16 bytes

The PeerId field length is 4 bytes (IPv4) or 16 bytes (IPv6 or UUID), as specified by the PeerIdType.

The maximum length of a Peer container is 256 bytes.

Table 19: PeerNTypeV2

7	6	5	4	3	2	1	0
PeerIdType		PeerType					

4.2.7 APN container

Table 20: APN container

Bytes	0	1	2	3
0	ApnLength	APN (0 – 2 bytes)		
...	APN (continued)			
96	(APN continued)		Padding to 4 bytes if needed	

Note: The APN container size is up to 100 bytes, depending on the APN length, and is always a multiple of 4 bytes.

4.2.8 Session Extended container

Table 21: Session Extended container

Bytes	0	1	2	3
0	UliLength	ULI		
...	ULI (continued)			
16	ULI (continued)		Padding to 4 bytes if needed	

Note:
The Session Extended container size is up to 20 bytes, depending on the ULI length, and is always a multiple of 4 bytes; for example, for 5G sessions it can be up to 17 bytes.

4.2.9 Message container

There is one Message container for every message that is transmitted or received in the reported procedure. The Message containers are appended in chronological order.

When concurrent procedures are reported, to preserve the chronology the messages of the concurrent procedure are interleaved with the messages of the reported procedure.

Table 22: Message container

Bits	31-22	21-17	16	15-0
0	MessageMarker_n	ReferencePoint_n	Direction_n	timestampMM_n

4.2.10 MessageAI container

There is one MessageAI (additional information) container for each Message container. Matching of the MessageAI container to the Message container is performed in the order that the Message containers appear.

Table 23: MessageAI container

Bytes	0	1	2	3
0	MessageCauseCode		Padding to 4 bytes at the last MessageAI container	

4.2.11 Bearer / QoS Flow container

Table 24: Bearer / QoS Flow container

Bits	31-28	27-24	23-16		15-8	7	6	5- 2	1	0
0	BearerID	LBI	BearerResult		BearerCause					
4	BearerDetailedCause				Bearer QCI	PVI	PCI	PL	Reserved	5GQos Flag
8	FTeidUIp V4BrIdRef (4 bit)	FTeidUIp V6 BrIdRef (4 bit)	5GTun Ipv4 (1 bit)	5GTun Ipv6 (1 bit)	Reserved					

4.2.12 TEID container

Table 25: TEID container

Bytes	0	1	2	3
0	TeidU			

4.2.13 FTEID IP container

The length of the FTEID IP container shown in the following tables depends on the IP address type:

- 4 bytes for IPv4

- 16 bytes for IPv6
- 20 bytes for IPv4 followed by IPv6

Table 26: FTEID IP container (IPv4)

Bytes	0	1	2	3
0	FTEID IPv4			

Table 27: FTEID IP container (IPv6)

Bytes	0	1	2	3
0	FTEID IPv6			
4				
8				
12				

Table 28: FTEID IP container (IPv4 and IPv6)

Bytes	0	1	2	3
0	FTEID IPv4 and IPv6			
4				
8				
12				
16				

4.2.14 Bearer Extended container

Table 29: Bearer Extended container

Bytes	0	1	2	3
0	Uplink APN-AMBR			
4	Downlink APN-AMBR			
8	Uplink MBR			
12	Downlink MBR			
16	Uplink GBR			
20	Downlink GBR			

4.2.15 5G QoS container

Table 30: 5G QoS container

Bytes	0		1		2			3
0	QFI (6bit)	RT (2 bit)	PDB (5 bit)	PEB (3 bit)	QNC (1 bit)	RQI (1 bit)	Reserved	
4	AW (12 bit)		MBV (12 bit)					Reserved

4.2.16 Charging container

There is one Charging container per procedure, when BLC=0. There is one Charging container for each Bearer container when BLC=1. The Charging container to Bearer container matching is performed in the order that the Bearer containers appear.

Table 31: Charging container

Bytes	0	1	2	3
0	GCID			

4.2.17 UE IP container

The length of the UE IP container shown in the following tables depends on the IP address type:

- 4 bytes for IPv4
- 16 bytes for IPv6
- 20 bytes for IPv4 followed by IPv6

Table 32: UE IP container (IPv4)

Bytes	0	1	2	3
0	UE IPv4			

Table 33: UE IP container (IPv6)

Bytes	0	1	2	3
0	UE IPv6			
4				
8				
12				

Table 34: UE IP container (IPv4 and IPv6)

Bytes	0	1	2	3
0	UE IPv4 and IPv6			
4				
8				
12				
16				

4.2.18 SNSSAI container

Table 35: SNSSAI container

Bytes	0	1	2	3
0	sst	sd		

4.3 PCMD Heartbeat format

The following table describes the PCMD Heartbeat format.

Table 36: PCMD Heartbeat format

PCMD record common header
PCMD Heartbeat container
SendingNodeIP container

4.3.1 PCMD Heartbeat container

Table 37: PCMD Heartbeat container

Bytes	0	1	2	3
0	HBSequenceNumber		GwId	HBFlags
4	Reserved			
8	HBTxTime			

Table 38: HBFlags

7	6	5	4	3	2	1	0
Sending NodeIpV6	Reserved						

5 PCMD record information elements

The MAG-c supports PCMD record IEs including header IEs, session IEs, and PCMD heartbeat message IEs.

5.1 Header information elements

The MAG-c supports Common Header, Report Header 2, and Sending Node IP container IEs.

5.1.1 Common Header IEs

Table 39: Common Header IEs

Information element	Description
PCMDVersion	Version of the PCMD feature Mandatory field [1]
RecordType	Type of record: • 3 - session2 • 4 - heartbeat Mandatory element
RecordLength	Total record length in bytes Mandatory element

5.1.2 Report Header2 IEs

Table 40: Report Header2 IEs

Information element	Description
RecordOpeningTime	Opening timestamp for the record generation First 4 bytes: seconds, indicating time since 1970-01-01 00:00:00 UTC Second 4 bytes: nanoseconds, precision of the procedure start time

[1] The current value of PCMDVersion is 6. The version changes whenever there is a modification in the Header structure or some non-compatible change in the structure of the containers.

Information element	Description
	Mandatory element
RecordSequenceNumber	Unique sequence identifier for the record type per card and per record type Each card generates the RecordSequenceNumber for each record type it transmits. If the maximum is reached, the number is set to 1. If an MSCP-group or MG-Group failover occurs, the number is set to 1. If a switchover occurs to a new active card or VM, the numbering restarts from 1. Mandatory element
GwId	Mobile gateway ID Range: 1 to 8 Mandatory element
MscpGroupId	MSCP group ID Range: 1 to 15 Mandatory element
SendingNodeType	Type of node that sends the PCMD record: • 9 – combined SGW-C + PGW-C • 14 – SMF Mandatory element
UEid	IMSI of the combined SGW-C + PGW-C session IMSI is encoded in TBCD format. The SUPI is used when the record is reported for a 5G PDU session. The field is set to zero when the IMSI or SUPI is not available; for example, emergency attach with just the IMEI. Mandatory element
SendingNodeIpV6	Sending node IP address type: • 1 – The SendingNodeIP contains an IPv6 address. • 0 – The SendingNodeIP contains an IPv4 address, stored in the first 4 bytes.

5.1.3 Sending Node IP container IEs

Table 41: Sending Node IP IEs

Information element	Description
SendingNodeIP	The IP address of the sending node is the IP address of the system interface of the base router. If the system interface is configured with both an IPv4 and an IPv6 address, the SendingNodeIP in the PCMD Header contains the IP address that matches the IP version on the transport layer. Mandatory element

5.2 Session PCMD record information elements

The MAG-c supports session PCMD record IEs.

5.2.1 Session Decoding container IEs

Table 42: Session Decoding container IEs

Information element	Description
MessageNum	Number of message containers Range: 0 to 40 Mandatory element
ProcNum	Number of procedure containers Range: 1 to 3 Mandatory element
PeerNum	Number of peers containers Range: 0 to 15 Mandatory element

Table 43: SessionFlags2 IEs

Information element	Description
SnssaiFlag	Presence of the SNSSAI container
UliTypeFlag	Type of ULI in the Session Extended container

Information element	Description
	See the ULI IE description in Table 52: Session extended container IEs.

Table 44: SessionFlagsV2 IEs

Information element	Description
BrNum	Number of bearer containers, or the number of QoS Flows containers for 5G Sessions Range is 0 to 11
ApnFlag	Presence of the APN or DNN container Mandatory element
ExtendedFlag	Extended report type flag The report type is extended when set to 1 Mandatory element
ImeiFlag	Presence of the IMEI or PEI for 5G Session container Mandatory element
MsisdnFlag	Presence of the MSISDN or GPSI for 5G Session container Mandatory element

5.2.2 Session3 container IEs

Table 45: Session3 container IEs

Information element	Description
RatType	Radio access technology: • 0 – reserved • 6 – EUTRAN (WB-E-UTRAN) • 14 – NR Mandatory element
DT	Direct tunnel indication: • 0 – undefined (when UE is idle) • 1 – S1-U
BLC	Bearer level charging or sessions flag: • 0 – Session level charging is used

Information element	Description
	• 1 – Bearer level charging is used GCID is reported for every bearer For 5G sessions, only PDU session-level charging is supported Mandatory element
CI	Charging indication: • 0 – no charging is done on the session • 1 – charging is done on the session The charging indication takes into account online and offline charging as configured or imposed by the PCF
PDNType	PDN type: • 0 – UE IP container is not present, for example in UE level procedures (see UE-level procedures) • 1 – IPv4 • 2 – IPv6 • 3 – Dual stack
IwkI	Interworking indication, from the AMF for a 5G-attached UE or from the MME for a 4G-attached UE: • 0 – reserved • 1 – sessions with no interworking • 2 – sessions with N26 interworking • 3 – sessions without N26 interworking
UPSelection	Consists of UPSelectionAttributes and UPSelection Peer; see the following table
SSC-Mode	SSC-Mode 1, 2, or 3 are reported Value 0 indicates undefined Mandatory element
PduSessionId	PDU session ID for the UE (0-15) **Note:** 0 for 4G sessions

Table 46: User Plane Selection IEs

Information element	Description
UPSelectionAttributes	0 – UPSelection not relevant UPSelectionAttributes is 0 in the current version. Mandatory element
UPSelectionPeer	Present when UPSelectionAttributes is not 0. Conditional element

5.2.3 Procedure container IEs

Table 47: Procedure container IEs

Information element	Description
ProcedureID	ID of the procedure See ProcedureIDs for possible values and meanings. Mandatory element
ProcedureResult	ProcedureResult associated with the current procedure: • 1 – Success • 2 – Failure Mandatory element
ProcedureCause	ProcedureCause associated with the Procedure Result for the current procedure. See Causes for possible values and meanings. When no value is reported, this is set to 0. This code is identical to the GTPv2, HTTP2, or PFCP external causes associated with the detailed cause (internal status events). Conditional element
ProcedureDetailedCause	ProcedureDetailedCause associated with the ProcedureCause for the current procedure. See Detailed causes for possible values and meanings. When no value is reported, this is set to 0. This code is identical to internal status events. Conditional element

Information element	Description
ProcedureDuration	Elapsed time since the start of the procedure, in hundredths of seconds. Mandatory element

5.2.4 IMEI container IEs

Table 48: IMEI container IEs

Information element	Description
IMEI	IMEI or PEI (14 decimal digits plus a check digit) or IMEI/SV (16 digits) for the UE The structure of the IMEI/SV is specified in 3GPP TS 23.003 and includes information about the origin, model, and serial number of the device. Non-zero if it is available Encoded in telephony binary-coded decimal (TBCD) Mandatory element

5.2.5 MSISDN container IEs

Table 49: MSISDN container IEs

Information element	Description
MSISDN	MSISDN or GPSI identifying the subscription Non-zero if available Encoded in TBCD Mandatory element

5.2.6 Peers container IEs

Table 50: PeerNTypeV2 container IEs

Information element	Description
PeerNId	ID of the nth peer It is IPv4, IPv6, or UUID according to the peer IdType value for the specific peer.

Information element	Description
PeerIdType	• 10 – PeerNId is IPv6 • 00 – PeerNId is IPv4 • 01 – PeerNId is UUID
PeerType	Indicates whether the PeerIP container is present, and if present, the type of peer node: • 2 – MME • 16 – combined SGW-U + PGW-U • 20 – UPF • 21 – Nsmf_PDUSession consumer • 23 – Namf_Communication service • 25 – Nudm_SubscriberDataManagement service • 26 – Nudm_UEContextManagement service • 27 – Npcf_SMPolicyControl service • 28 – Nchf_ConvergedCharging service Mandatory element

5.2.7 APN container IEs

Table 51: APN container IEs

Information element	Description
ApnLength	Length of the APN in bytes Mandatory element
APN	Access Point Name Conditional element

Note: APN is not reported in the UE level procedures (see UE-level procedures).

5.2.8 Session extended container IEs

The ULI container presence is indicated by the ExtendedFlag.

Table 52: Session extended container IEs

Information element	Description
UliLength	Length of the ULI Optional element
ULI	If the UliTypeFlag is not set (0), the ULI format is as specified in 3GPP TS 29.274, section 8.21. Only the bytes from 5 onwards defined in the specification are present in this field (the first 4 bytes containing type, length, spare, and instance are not present in the PCMD ULI field). If the UliTypeFlag is set (1), the ULI format is as specified in 3GPP TS 29.061, section 16.4.7.2. Only the bytes from 3 onwards defined in the specification are present in this field (the first 2 bytes containing 3GPP type and length are not present in the PCMD ULI field). This format is used for 5G ULI. Only the following types are reported: • 137 NrLocation – 5GS TAI and NCGI • 130 EutraLocation – 5GS TAI and ECGI From 29.571 (5.4.4.3-5): • TAI = PLMN-ID + 5GS TAC • ECGI = PLMN-ID + eutraCellId • NCGI = PLMN-ID + nrCellId • TAC, eutraCellId, and nrCellId encoded as per section 5.4.2 of 3GPP TS 29.571 For the PLMN-ID part, the MCC and MNC are encoded according to 3GPP TS 29.274. Optional – Conditional element

Note: In 5G, the TAC part of TAI can be a 2- or 3-octet string, however in 2G, 3G, and 4G, it is always 2 octets.

5.2.9 Message container IEs

There are 0 to 40 message containers in the Session PCMD record.

Table 53: Message container IEs

Information element	Description
MessageMarker_n	Code defining a specific procedure message when any message is received or sent during the associated procedure. See Message marker IDs and SBI service operation messages for possible values and meanings. Conditional element
ReferencePoint_n	Code specifying the reference point where the message is received or sent. See Reference point and SBI services IDs for the possible values and meanings. Conditional element
Direction_n	Code specifying the direction of the message. See Direction_n IDs for the possible values and meanings. Conditional field
TimestampMM_n	Time elapsed since the procedure started, in hundredths of seconds. Conditional element

5.2.10 MessageAI container IEs

There are 0 to 40 MessageAI containers in the Session PCMD record.

Table 54: MessageAI container IEs

Information element	Description
MessageCauseCode	Message cause or reason code

5.2.11 Bearer and QoS Flow container IEs

There are 0 to 11 bearer containers in the session PCMD record.

Table 55: Bearer and QoS Flow container IEs

Information element	Description
BearerID	ID of the bearer

Information element	Description
	Conditional element
LBI	Set to 0 in the default bearer record For 5GC QoS flow reporting, the BearerId is not known if the N26 interface is not used in the network. Also, the EBI is not a unique identifier of a QoS flow, so multiple QoS flows may be reported with the same EBI. Conditional element
BearerResult	Bearer result value See Results for a list of possible values and their meanings. Conditional element
BearerCause	Bearer cause value See Causes for a list of possible values and their meanings. When no value is reported, it is set to 0. Identical to GTPv2 – external causes associated with detailed cause (internal status events) Conditional element
BearerDetailedCause	Bearer detailed cause value See Detailed causes for a list of possible values and their meanings. When no value is reported, it is set to 0. The code is identical to internal status events. Conditional element
BearerQCI	Bearer QoS class ID For a 5G QoS flow, it is the 5QI value of the QoS flow. Conditional element
PVI	Bearer pre-emption vulnerability indicator Conditional element
PCI	Bearer pre-emption capability indicator Conditional element
PL	Bearer priority level Conditional element

Information element	Description
FTeidUIpV4BrIdRef	Four-bit indicator: • 0x0 – indicates absence of an IPv4 address. • equal to BearerId – indicates that an IPv4 address is reported in an FTEID IP container, immediately following the TEID container. • X in range 0x5 to 0xF and not equal to the BearerId value – indicates that the IPv4 address of this bearer FTEID has been reported in the same session record with bearer X. Serves as a reference to the bearer X FTEID IP, that is, same IP address is used. Mandatory element
FTeidUIpV6BrIdRef	Four-bit indicator: • 0x0 – indicates absence of an IPv6 address. • equal to BearerId – indicates that an IPv6 address is reported in an FTEID IP container, immediately following the TEID container, or the FTEID IP container having the IPv4. • X in range 0x5 to 0xF and not equal to the BearerId value – indicates that the IPv6 address of this bearer FTEID has been reported in the same session record with bearer X. Serves as a reference to the bearer X FTEID IP, that is, same IP address is used. When an IPv6 address is explicitly reported, the FTEID IP address container is reported immediately following the IPv4 FTEID IP container (if this is present), or immediately following the TEID container if the IPv4 address is not present. If both FTeidUIpV4BrIdRef and FTeidUIpV6BrIdRef are set to 0x0, no FTEID IP address and no TEID containers are present. Mandatory element
QosFlag5G	• 0 – the reported container is for an EPS bearer • 1 – the reported container is for a 5G QoS flow When the flag is set to 1, a 5G QoS container is present.
Tun5GIpv4	When set, the IP address of the 5G UP tunnel is an IPv4 address.

Information element	Description
	If this flag or the Tun5GIpv6 flag is set, there is only one FTEID being reported and the FTeidUIpV4/V6BrIdRef IEs must be ignored.
Tun5GIpv6	When set, the IP address of the 5G UP tunnel is an IPv6 address. If this flag or the Tun5GIpv4 flag is set, the FTeidUIpV4/V6BrIdRef IEs is ignored. When an IPv6 address is explicitly reported, the FTEID IP address container is reported immediately following the IPv4 FTEID IP container (if this is present) or right after the TEID container, if the IPv4 address is not present. If both Tun5GIpv4 and Tun5GIPv6 and QoSFlag5G are 0, no FTEID IP address and no TEID containers are present for this QoS flow. FTEID is reported only for the first QoS flow in a PCMD record.

5.2.12 TEID container IEs

Table 56: TEID container IEs

Information element	Description
TeidU	TEID value of the S1-U for the combined SGW + PGW session. For 5G sessions, the TEID is the TEID of the UP tunnel on the N3 UPF side. A single TEID is reported for all the QoS flows. If there are multiple UPFs for some QoS flows, the N3 tunnel is reported for all. The TEID is reported only for the first QoS flow in a PCMD record.

5.2.13 FTEID IP container IEs

Table 57: FTEID IP container IEs

Information element	Description
FTeidUIp	IPv4 or IPv6 address

Information element	Description
	The TEID for 5G sessions is the TEID of the UP tunnel on the N3 UPF side. A single TEID is reported for all the QoS flows. If there are multiple UPFs for some QoS flows, the N3 tunnel is reported for all the UPFs.

5.2.14 Bearer extended container IEs

Table 58: Bearer extended container IEs

Information element	Description
Uplink APN-AMBR	Uplink aggregate maximum bit rate in kb/s Conditional-optional element
Downlink APN-AMBR	Downlink aggregate maximum bit rate in kb/s Conditional-optional element
Uplink MBR	Uplink maximum bit rate in kb/s Conditional-optional element
Downlink MBR	Downlink maximum bit rate in kb/s Conditional-optional element
Uplink GBR	Uplink guaranteed bit rate in kb/s Conditional-optional element
Downlink GBR	Downlink guaranteed bit rate in kb/s Conditional-optional element

5.2.15 5GC QoS container IEs

Table 59: 5G QoS container IEs

Information element	Description
QFI	QFI value of the QoS flow (1 to 63) (6 bits) Mandatory element
RT	Resource type (2 bits): • 1 – GBR • 2 – Non-GBR • 3 – Delay critical GBR

Information element	Description
	Mandatory field
PDB	Packet delay budget (5 bits): • 0 – Undefined • 1 – 5 ms • 2 – 10 ms • 3 – 30 ms • 4 – 50 ms • 5 – 60 ms • 6 – 75 ms • 7 – 100 ms • 9 – 150 ms • 11 – 200 ms • 13 – 300 ms
PER	Packet error rate (3 bits): • 0 – Undefined • 1 – 10^{-6} • 2 – 10^{-5} • 3 – 10^{-4} • 4 – 10^{-3} • 5 – 10^{-2}
QNC	QoS control status: • 0 – disabled • 1 – enabled
RQI	Reflective QoS status: • 0 – disabled • 1 – enabled
AW	Averaging window (1 to 4095 ms) (12 bits)
MBV	Maximum burst volume (1 to 4095 Bytes) (12 bits)

5.2.16 Charging container IEs

There are 1 to 11 Charging containers in the session PCMD record.

Table 60: Charging container IEs

Information element	Description
GCID	Session GCID when BLC is 0 Bearer GCID when BLC is 1, that is, bearer-level charging is used. In this case there are multiple GCID bearers, one per bearer container. Mandatory element

5.2.17 UE IP container IEs

Table 61: UE IP container IEs

Information element	Description
UeIPs	IP addresses allocated to the UE The container is present when the PdnType is not 0. Length is from 4 to 20 bytes, depending on the Pdn Type in the report header: • PdnType = 1 (IPv4) – UeIPs contain the IPv4 allocated to the UE, length is 4 bytes. • PdnType = 2 (IPv6) – UeIPs contain the IPv6 allocated to the UE, length is 16 bytes. • PdnType = 3 (Dual Stack) – The first 4 bytes of the UeIPs contain the IPv4 allocated to the UE, and the next 16 bytes contain the IPv6; length is 20 bytes. Optional element

Note: Because the PdnType is set to 0 for UE-level procedures, the UE IP is not reported; see UE-level procedures for more information.

5.2.18 SNSSAI container IEs

Table 62: SNSSAI container IEs

Information element	Description
sst	Slice service type Range: 0 to 215
sd	6 byte-string, allowed characters "0" to "9" and "A"to "F"; for example, 0xD143A5 3 bytes, mandatory

5.3 PCMD Heartbeat message IEs

The MAG-c supports Heartbeat container IEs for PCMD.

Table 63: Heartbeat container IE

Information element	Description
HBSequenceNumber	Unique sequence identifier for the Heartbeat If the maximum value of 65535 is reached, the number is set to 1. Number is reset to 1 on failovers and each time the PCMD record transmission is enabled. Mandatory element
GwId	Mobile gateway ID Range: 1 to 8 Mandatory element
HBTxTime	Timestamp when the heartbeat message was transmitted Seconds since 1970-01-01 00:00:00 UTC Mandatory element
SendingNodeIpV6	• 1 – SendingNodeIP contains an IPv6 address • 0 – SendingNodeIP contains an IPv4 address stored in the first 4 bytes Mandatory element

6 Information elements value tables

The MAG-c PCMD supports IEs for procedure IDs, results, success and failure causes, message marker IDs, SBI service IDs and operation messages, and reference points.

6.1 ProcedureIDs

The MAG-c PCMD supports procedure IDs with related causes and responses, for supported MAG-c gateway types.

The following table describes the procedure ID, name, start and end actions, and supported gateway types.

Table 64: ProcedureIDs

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)	Supported gateway type
1	MME-initiated Create Default Bearer	> Combined SGW-C + PGW-C receives Create Session Request from MME	> Procedure completes successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, PCF, UDM, CHF)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C
9	MME-initiated Modify Bearer	> Combined SGW-C + PGW-C receives Modify Bearer Request from MME	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, and so on)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C
16	MME-initiated Modify Default Bearer	> Combined SGW-C + PGW-C receives Modify Bearer command from MME	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, PCF)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)	Supported gateway type
20	MME-initiated Delete Session	> Combined SGW-C + PGW-C receives Delete Session Request from MME	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, PCF, CHF, UDM)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C
26	SGW-initiated Downlink Data Notification to MME	> Combined SGW-C + PGW-C sends Downlink Data Notification to MME	> MME responds with successful cause	> A failure is encountered in MME	Combined SGW-C + PGW-C
32	MME-initiated release of S1U	> Combined SGW-C + PGW-C receives Release Access Bearer Request from MME	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U)	>A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C
80	Delete UE Administrative	> Combined SGW-C + PGW-C deletes all sessions for specific UE and may inform its peers if applicable Triggered by delete from CLI, reattach or collision	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, PCF, UDM, CHF)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C
81	Delete Session Administrative	> Combined SGW-C + PGW-C deletes session with one or several bearers but the UE persists if it has more sessions on the gateway.	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, PCF, UDM, CHF)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)	Supported gateway type
		May inform peers if applicable. Triggered mainly by collision, unsuccessful call-flow or per-bearer delete from CLI			
85	Sx Session Report	> Combined SGW-C + PGW-C receives a PFCP Session Report Req from UPF	> Combined SGW-C + PGW-C acknowledges the PFCP Session Report Resp with a success cause and initiates the PFCP Session Modification to update or clean up the bearer	> A failure is encountered in Combined SGW-C + PGW-C	Combined SGW-C + PGW-C
86	PCF Initiated Modify Default Bearer	> Combined SGW-C + PGW-C receives Npcf_SMPolicy Control_update	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, PCF)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C
87	PCF Initiated Delete Default Bearer	> Combined SGW-C + PGW-C receives Npcf_SMPolicy Control_update terminate	> Procedure is completed successfully in all involved peers (MME, combined SGW-C + PGW-C, combined SGW-U + PGW-U, PCF, UDM, CHF)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C
88	Delete Session because of MME Path failure	> Combined SGW-C + PGW-C detects MME Path failure	> Procedure is completed successfully, all involved peers (combined SGW-C + PGW-C, combined SGW-U	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)	Supported gateway type
			+ PGW-U, PCF, UDM, CHF)		
89	Delete Session because of UPF Path failure	> Combined SGW-C + PGW-C detects UPF Path failure	> Procedure is completed successfully in all involved peers (combined SGW-C + PGW-C, PCF, UDM, CHF)	> A failure is encountered in any of the involved peers	Combined SGW-C + PGW-C

The following table describes the 5G PCMD procedure IDs, names, start, and ending of a procedure.

Table 65: 5G PCMD procedures

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)
101	PDU Session Create	> SMF receives Nsmf_PDUSession_CreateSMContext service request from AMF	Procedure is completed successfully, in all involved peers (UE, RAN, AMF, SMF, UPF, PCF, UDM, CHF)	A failure is encountered in any of the involved peers
102	UE-initiated PDU Session Release	> SMF receives Nsmf_PDUSession_UpdateSMContext service request from AMF, containing the N1 container for PDU Session Release Request	Session and subscriptions are deleted successfully in all involved peers (UE, RAN, AMF, SMF, UPF, PCF, UDM, CHF)	A failure is encountered in any of the involved peers
103	AMF-initiated PDU Session Release without N1N2 signaling to the RAN	> SMF receives Nsmf_PDUSession_ReleaseSMContext Post request from AMF	Session and subscriptions are deleted successfully in all involved peers (AMF, SMF, UPF, PCF, UDM, CHF)	A failure is encountered in any of the involved peers
104	AMF-initiated PDU Session Release with RAN signaling	> SMF receives Nsmf_PDUSession_UpdateSMContext Post request from AMF. The release IE is included indicating	Session and subscriptions are deleted successfully in all involved peers (RAN, AMF, SMF, UPF, PCF, UDM, CHF)	A failure is encountered in any of the involved peers

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)
		that AMF wants to release the session.		
105	PCF-initiated PDU Session Release	> SMF receives Npcf_SMPolicy Control_Update Notify Post request from PCF. The payload identifies the released session.	Session and subscriptions are deleted successfully in all involved peers (UE, RAN, AMF, SMF, UPF, PCF, UDM, CHF)	A failure is encountered in any of the involved peers
106	SMF-initiated PDU Session Release	> SMF initiates PDU session release	Session and subscriptions are deleted successfully in all involved peers (UE, RAN, AMF, SMF, UPF, PCF, UDM, CHF)	A failure is encountered in any of the involved peers
107	UDM-initiated PDU Session Release	> SMF receives Nudm_SDM_ Notification Request from UDM, indicating the subscription data of the session has been removed	Session and subscriptions are deleted successfully in all involved peers (UE, RAN, AMF, SMF, UPF, PCF, UDM, CHF)	A failure is encountered in any of the involved peers
109	UE-triggered Service Request without AMF Change	> SMF Receives Nsmf_PDUSession_ UpdateSMContext Post request from AMF. The the value of up ConnectionState is set to 'ACTIVATING' to indicate that request is about activating the UP.	Procedure is completed successfully, in all involved peers (UE, RAN, AMF, SMF, UPF, PCF)	A failure is encountered in any of the involved peers
110	UE-triggered Service Request with AMF Change	> SMF receives Nsmf_PDUSession_ UpdateSMContext Post request from AMF. Value of up ConnectionState is set to 'ACTIVATING' to indicate that	Procedure is completed successfully, in all involved peers (UE, RAN, New AMF, SMF, UPF, PCF)	A failure is encountered in any of the involved peers

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)
		request is about activating the user plane. New AMF-ID is received.		
111	5GC Network-initiated Service Request	> SMF receives Data Notification from UPF. The session report message may contain also a Usage Report.	Procedure is completed successfully, in all involved peers (RAN, AMF, SMF, UPF, PCF, CHF)	A failure is encountered in any of the involved peers
112	NR RAN Release	> SMF receives Nsmf_PDUSession_UpdateSMContext Post request from AMF. The value of upConnection State is set to 'DEACTIVATED'	Procedure is completed successfully, in all involved peers (RAN, AMF, SMF, UPF)	A failure is encountered in any of the involved peers
114	SMF-initiated PDU Session Modification	> SMF initiates PDU session modification	Procedure is completed successfully, in all involved peers (UE, RAN, AMF, SMF, UPF, PCF, CHF)	A failure is encountered in any of the involved peers
115	PCF-initiated Session Modification	> SMF receives Npcf_SMPolicy Control Update Notify from PCF	Procedure is completed successfully, in all involved peers (UE, RAN, AMF, SMF, UPF, UDM, PCF, CHF)	A failure is encountered in any of the involved peers
116	UDM-initiated PDU Session Modification	> SMF receives Nudm_SDM Notification from UDM	Procedure is completed successfully, in all involved peers (UE, RAN, AMF, SMF, UPF, UDM, PCF, CHF)	A failure is encountered in any of the involved peers

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)
119	Xn based handover	> SMF receives Nsmf_PDUSession_UpdateSMContext Request from AMF for the PDU session, with Path Switch Request Transfer in the N2 container	Procedure is completed successfully, in all involved peers (RAN, AMF, SMF, UPF, PCF)	A failure is encountered in any of the involved peers
123	N2-based handover with indirect forwarding with AMF change	> SMF receives Nsmf_PDUSession_UpdateSMContext request from a new AMF. AMF ID of the new AMF is included in the message. The hoState is set to PREPARING. N2 container contains Handover Required Transfer IE, without Direct Forwarding Path Availability IE.	Procedure is completed successfully, in all involved peers (RAN, AMF, SMF, UPF, PCF)	A failure is encountered in any of the involved peers
124	AMF Change in IDLE state	> SMF receives an Nsmf_PDUSession_Update SM Context request from the AMF with a new AMF ID	Procedure is completed successfully, in all involved peers (new AMF, SMF, PCF)	A failure is encountered in any of the involved peers
127	SMF received Error Indication Report	> SMF receives Error indication report from UPF	Procedure is completed successfully, in all involved peers (RAN, AMF, SMF, UPF)	A failure is encountered in any of the involved peers
128	SMF received User Plane Inactivity Report	> SMF receives User plane Inactivity report from UPF. Session report message may contain also a Usage Report.	Procedure is completed successfully, in all involved peers (RAN, AMF, SMF, UPF, CHF, PCF)	A failure is encountered in any of the involved peers

ProcedureId	Name	Start of procedure	End of procedure (success)	End of procedure (failure)
129	SMF received Data Usage Report (as only report in the session report message)	> SMF receives Usage Data Report from UPF as the only report type in the session report message	Procedure is completed successfully in all involved peers (SMF, UPF, CHF, PCF)	A failure is encountered in any of the involved peers

6.1.1 UE-level procedures

Procedures that are related to a specific session of a UE include the session- and bearer-level characteristics, such as APN, UE IP, PDN type, and so on. There are also UE-level procedures that are relevant to all the sessions of a UE. In the UE-level procedures, some IEs are not reported, such as APNs, UE IP, and so on.

The following procedures are UE-level procedures that are relevant to all the sessions of a UE:

- MME-initiated release of S1U
- Downlink data notification to the MME
- Delete UE administrative

6.2 Results

The MAG-c supports success and failure results IEs for PCMD.

Table 66: Results

Result	Name
1	Normal
2	Failure

6.3 Causes

The MAG-c supports success and failure causes IEs for PCMD.

6.3.1 Success causes

The following table lists the success causes.

Table 67: Success causes

Cause	Name	Description	Protocol	Protocol value
112	GTP_CAUSE_ SUCCESS	Request accepted	GTPv2	16
113	GTP_CAUSE_ PARTIAL_ SUCCESS	Request accepted partially	GTPv2	17
114	GTP_CAUSE_ NEW_PDN_ NWPREFS	New PDN type because of network preference	GTPv2	18
115	GTP_CAUSE_ NEW_PDN_ SINGLE_ ADDRESS_ BEARER	New PDN type because of single address bearer only	GTPv2	19
150	SBI_200_OK		HTTP/2	200
151	SBI_201_ CREATED		HTTP/2	201
152	SBI_202_ ACCEPTED		HTTP/2	202
154	SBI_204_NO_ CONTENT		HTTP/2	204
430	PFCP_REQ_ ACCEPTED	Request accepted (success)	PFCP	1

6.3.2 Failure causes

The following table lists the failure causes.

Table 68: Failure causes

Cause	Name	Description	Protocol	Protocol value
238	GTP_CAUSE_ RESERVED	Reserved	GTPv2	0
239	GTP_CAUSE_ PAGING	Paging	GTPv2	1
240	GTP_CAUSE_ LOCAL_DETACH	Local Detach	GTPv2	2

Cause	Name	Description	Protocol	Protocol value
241	GTP_CAUSE_ COMPLETE_ DETACH	Complete Detach	GTPv2	3
242	GTP_ CAUSE_RAT_ 3GPP2NON3GPP	RAT changed from 3GPP to non-3GPP	GTPv2	4
243	GTP_ CAUSE_ISR_ DEACTIVATION	ISR deactivation	GTPv2	5
244	GTP_CAUSE_ ERR_IND_FROM_ RNCENB	Error Indication received from RNC/eNodeB/S4-SGSN	GTPv2	6
245	GTP_CAUSE_ IMSI_DETACH	IMSI Detach Only	GTPv2	7
246	GTP_CAUSE_ REACTIVATION_ REQUESTED	Reactivation Requested	GTPv2	8
247	GTP_CAUSE_ PDN_RECONN_ DISALLOWED	PDN reconnection to this APN disallowed	GTPv2	9
248	GTP_CAUSE_ ACCESS_ NON3GPP23GPP	Access changed from non-3GPP to 3GPP	GTPv2	10
249	GTP_CAUSE_ PDN_INACTIVE_ TIMEOUT	PDN connection inactivity timer expires	GTPv2	11
250	GTP_CAUSE_ CONTEXT_NOT_ FOUND	Context Not Found	GTPv2	64
251	GTP_CAUSE_ INVALID_MSG_ FMT	Invalid Message Format	GTPv2	65
252	GTP_CAUSE_ VERSION_NOT_ SUPPORTED	Version not supported by next peer	GTPv2	66
253	GTP_CAUSE_ INVALID_LENGTH	Invalid length	GTPv2	67
254	GTP_CAUSE_ SERVICE_NOT_ SUPPORTED	Service not supported	GTPv2	68

Cause	Name	Description	Protocol	Protocol value
255	GTP_CAUSE_ MANDAT_IE_ INCORRECT	Mandatory IE incorrect	GTPv2	69
256	GTP_CAUSE_ MANDAT_IE_ MISSING	Mandatory IE missing	GTPv2	70
257	GTP_CAUSE_ OPT_IE_ INCORRECT	Optional IE incorrect	GTPv2	71
258	GTP_CAUSE_ SYSTEM_ FAILURE	System failure	GTPv2	72
259	GTP_CAUSE_NO_ RESOURCES	No resources available	GTPv2	73
260	GTP_CAUSE_ SEMANTIC_ERR_ TFT	Semantic error in the TFT operation	GTPv2	74
261	GTP_CAUSE_ SYNTAX_ERR_ TFT	Syntactic error in the TFT operation	GTPv2	75
262	GTP_CAUSE_ SEMANTIC_ERR_ PKTFILTER	Semantic errors in packet filters	GTPv2	76
263	GTP_CAUSE_ SYNTAX_ERR_ PKTFILTER	Syntactic errors in packet filters	GTPv2	77
264	GTP_CAUSE_ MISSING_APN	Missing or unknown APN	GTPv2	78
266	GTP_CAUSE_ GREKEY_NOT_ FOUND	GRE key not found	GTPv2	80
267	GTP_CAUSE_ RELOCATION_ FAILURE	Relocation failure	GTPv2	81
268	GTP_CAUSE_ DENIED_RAT	Denied in RAT	GTPv2	82
269	GTP_CAUSE_ PREF_PDNTYPE_ NOT_SUPPORT	Preferred PDN type not supported	GTPv2	83

Cause	Name	Description	Protocol	Protocol value
270	GTP_CAUSE_ ALL_DYNAMIC_ ADDR_OCCUPIED	All dynamic addresses are occupied	GTPv2	84
271	GTP_CAUSE_UE_ CXT_ACTIVATED_ WITHOUT_TFT	UE context without TFT already activated	GTPv2	85
272	GTP_CAUSE_ PROTO_NOT_ SUPPORTED	Protocol type not supported	GTPv2	86
273	GTP_CAUSE_ UE_NOT_ RESPONDING	UE not responding	GTPv2	87
274	GTP_CAUSE_UE_ REFUSES	UE refuses	GTPv2	88
275	GTP_CAUSE_ SERVICE_DENIED	Service denied	GTPv2	89
276	GTP_CAUSE_ UNABLE_TO_ PAGE_UE	Unable to page UE	GTPv2	90
277	GTP_CAUSE_NO_ MEM	No memory available	GTPv2	91
278	GTP_CAUSE_ USER_AUTH_ FAILED	User authentication failed	GTPv2	92
279	GTP_CAUSE_ APN_ACCESS_ DENIED	APN access denied - no subscription	GTPv2	93
280	GTP_CAUSE_ REQUEST_ REJECTED	Request rejected (reason not specified)	GTPv2	94
281	GTP_CAUSE_ PTMSI_ MISMATCH	P-TMSI Signature mismatch	GTPv2	95
282	GTP_CAUSE_ IMSI_NOT_ KNOWN	IMSI/IMEI not known	GTPv2	96
283	GTP_CAUSE_ SEMANTIC_ERR_ TAD	Semantic error in the TAD operation	GTPv2	97

Cause	Name	Description	Protocol	Protocol value
284	GTP_CAUSE_ SYNTACTIC_ ERR_TAD	Syntactic error in the TAD operation	GTPv2	98
285	GTP_CAUSE_ RESERVED_ MSG_VAL	Used to indicate specific IE value validation failure cases.	GTPv2	99
286	GTP_CAUSE_ REM_PEER_NO_ RESPONSE	Remote peer not responding, used for all types of peers without differentiation	GTPv2	100
289	GTP_CAUSE_ COLLISION_ WITH_NW_REQS	Collision with network-initiated request	GTPv2	101
290	GTP_CAUSE_ UNABLE_TO_ PAGE_DUE_TO_ SUSPENSION	Unable to page UE because of Suspension	GTPv2	102
291	GTP_CAUSE_ CONDITIONAL_ IE_MISSING	Conditional IE missing	GTPv2	103
292	GTP_CAUSE_ APN_ RESTRICTION_ INCOMPATIBLE	APN Restriction type Incompatible with currently active PDN connection		104
293	GTP_CAUSE_ INVALID_ OVERALL_LEN_ TRIG_PIGGY	Invalid overall length of the triggered response message and a piggybacked initial message	GTPv2	105
294	GTP_CAUSE_ DATA_ FOWARDING_ NOT_ SUPPORTED	Data forwarding not supported	GTPv2	106
295	GTP_CAUSE_ INVALID_REPLY_ REMOTE_PEER	Invalid reply from remote peer	GTPv2	107

Cause	Name	Description	Protocol	Protocol value
296	GTP_CAUSE_ FALLBACK_TO_ GTPV1	Fallback to GTPv1	GTPv2	108
297	GTP_CAUSE_ INVALID_PEER	Invalid peer	GTPv2	109
298	GTP_CAUSE_ HANDOVER_IN_ PROGRESS	Temporarily rejected because of a handover procedure in progress	GTPv2	110
299	GTP_CAUSE_ MOD_BEYONG_ S1U_BEARERS	Modifications not limited to S1-U bearers	GTPv2	111
300	GTP_CAUSE_UE_ REATTACHED	UE already re-attached	GTPv2	115
301	GTP_CAUSE_ MPDN_PER_APN_ NOT_ALLOWED	Multiple PDN connections for a specific APN not allowed	GTPv2	116
302	GTP_CAUSE_ SGW_ RECOVERY_IDLE	SGW/combined SGW/PGW indicates to the MME that Geo-redundancy fail-over just occurred. This is a proprietary definition.	GTPv2	254
303	GTP_CAUSE_ PGW_NOT_ RESPONDING	For PGW Restart Notification (PRN) message to indicate the PGW down case.	GTPv2	12
409	GTP_CAUSE_ MME_REFUSE_ VPLMN_PCY	The MME or the SGSN refuses because of VPLMN Policy	GTPv2	119
410	GTP_CAUSE_UE_ UNREACH_PWR_ SAV	The UE is temporarily not reachable because of power saving	GTPv2	123

Cause	Name	Description	Protocol	Protocol value
411	GTP_CAUSE_UE_NO_AUTH_BY_OCS_AAA	The UE is not authorized by the Online Charging Server or the external AAA server	GTPv2	125
412	GTP_CAUSE_REQ_REJECT_UE_CAPABILITY	The request was rejected because of UE Capability	GTPv2	127
422	GTP_CAUSE_LATE_OVERLAP_REQ	Late Overlapping Request; see DIAMETER cause 420	GTPv2	121
423	GTP_CAUSE_TIMED_OUT_REQ	Timed Out Request; see DIAMETER cause 421	GTPv2	122
424	E_PCMD_CAUSE_GTP1_NETWORK_FAILURE	Sent by SGSN in the Delete PDP Context Request to indicate a network problem	GTPv1	8
431	PFCP_CAUSE_REQ_REJECTED	Request Rejected (no specified reason)	PFCP	64
432	PFCP_CAUSE_CONTEXT_NOT_FOUND	Session Context not found	PFCP	65
433	PFCP_CAUSE_MANDATORY_IE_MISSING	Mandatory IE Missing	PFCP	66
434	PFCP_CAUSE_CONDITIONAL_IE_MISSING	Conditional IE Missing	PFCP	67
435	PFCP_CAUSE_INVALID_LENGTH	Invalid message length	PFCP	68
436	PFCP_CAUSE_MANDATORY_IE_INCORRECT	Mandatory IE Incorrect	PFCP	69
501	SBI_307_TMP_REDIRECT	—	HTTP	307

Cause	Name	Description	Protocol	Protocol value
502	SBI_308_PERM_ REDIRECT	—	HTTP	308
503	SBI_400_BAD_ REQUEST_ INVALID_API	—	HTTP	400
504	SBI_400_BAD_ REQUEST_ INVALID_ MESSAGE_ FORMAT	—	HTTP/2	400
505	SBI_400_BAD_ REQUEST_ INVALID_QUERY_ PARAM	—	HTTP/2	400
506	SBI_400_BAD_ REQUEST_ MANDATORY_IE_ INCORRECT	—	HTTP/2	400
507	SBI_400_BAD_ REQUEST_ MANDATORY_IE_ MISSING	—	HTTP/2	400
508	SBI_400_BAD_ REQUEST_ MANDATORY_ QUERY_PARAM_ INCORRECT	—	HTTP/2	400
509	SBI_400_BAD_ REQUEST_ MANDATORY_ QUERY_PARAM_ MISSING	—	HTTP/2	400
510	SBI_400_BAD_ REQUEST_ OPTIONAL_IE_ INCORRECT	—	HTTP/2	400
511	SBI_400_BAD_ REQUEST_ OPTIONAL_ QUERY_PARAM_ INCORRECT	—	HTTP/2	400
512	SBI_400_BAD_ REQUEST_	—	HTTP/2	400

Cause	Name	Description	Protocol	Protocol value
	UNSPECIFIED_ MSG_FAILURE			
513	SBI_403_ FORBIDDEN_ DEFAULT_ EPS_BEARER_ INACTIVE	—	HTTP/2	403
514	SBI_403_ FORBIDDEN_ DNN_DENIED	—	HTTP/2	403
515	SBI_403_ FORBIDDEN_ DNN_NOT_ SUPPORTED	—	HTTP/2	403
516	SBI_403_ FORBIDDEN_EBI_ EXHAUSTED	—	HTTP/2	403
517	SBI_403_ FORBIDDEN_ EBI_REJECTED_ LOCAL_POLICY	—	HTTP/2	403
518	SBI_403_ FORBIDDEN_EBI_ REJECTED_NO_ N26	—	HTTP/2	403
519	SBI_403_ FORBIDDEN_ HO_TAU_IN_ PROGRESS	—	HTTP/2	403
520	SBI_403_ FORBIDDEN_ HOME_ROUTED_ ROAMING_ REQUIRED	—	HTTP/2	403
521	SBI_403_ FORBIDDEN_ INTEGRITY_ PROTECTED_ MDR_NOT_ ACCEPTABLE	—	HTTP/2	403
522	SBI_403_ FORBIDDEN_	—	HTTP/2	403

Cause	Name	Description	Protocol	Protocol value
	MODIFICATION_ NOT_ALLOWED			
523	SBI_403_ FORBIDDEN_N1_ SM_ERROR	—	HTTP/2	403
524	SBI_403_ FORBIDDEN_N2_ SM_ERROR	—	HTTP/2	403
525	SBI_403_ FORBIDDEN_ NO_EPS_5GS_ CONTINUITY	—	HTTP/2	403
526	SBI_403_ FORBIDDEN_ OUT_OF_LADN_ SERVICE_AREA	—	HTTP/2	403
527	SBI_403_ FORBIDDEN_ PDU_SESSION_ ANCHOR_ CHANGE	—	HTTP/2	403
528	SBI_403_ FORBIDDEN_ PDUTYPE_ DENIED	—	HTTP/2	403
529	SBI_403_ FORBIDDEN_ PDUTYPE_NOT_ SUPPORTED	—	HTTP/2	403
530	SBI_403_ FORBIDDEN_ PRIORITIZED_ SERVICES_ONLY	—	HTTP/2	403
531	SBI_403_ FORBIDDEN_ REJECTED_BY_ UE	—	HTTP/2	403
532	SBI_403_ FORBIDDEN_ REJECTED_DUE_ VPLMN_POLICY	—	HTTP/2	403

Cause	Name	Description	Protocol	Protocol value
533	SBI_403_ FORBIDDEN_ SNSSAI_DENIED	—	HTTP/2	403
534	SBI_403_ FORBIDDEN_ SSC_DENIED	—	HTTP/2	403
535	SBI_403_ FORBIDDEN_ SSC_NOT_ SUPPORTED	—	HTTP/2	403
536	SBI_403_ FORBIDDEN_ SUBSCRIPTION_ DENIED	—	HTTP/2	403
537	SBI_403_ FORBIDDEN_ TARGET_MME_ CAPABILITY	—	HTTP/2	403
538	SBI_403_ FORBIDDEN_ UE_NOT_ RESPONDING	—	HTTP/2	403
539	SBI_403_ FORBIDDEN_ UNABLE_TO_ PAGE_UE	—	HTTP/2	403
540	SBI_404_ NOT_FOUND_ CONTEXT_NOT_ FOUND	—	HTTP/2	404
541	SBI_404_ NOT_FOUND_ RESOURCE_URI_ STRUCTURE_ NOT_FOUND	—	HTTP/2	404
542	SBI_404_ NOT_FOUND_ SUBSCRIPTION_ NOT_FOUND	—	HTTP/2	404
543	SBI_411_ LENGTH_ REQUIRED_	—	HTTP/2	411

Cause	Name	Description	Protocol	Protocol value
	INCORRECT_ LENGTH			
544	SBI_429_ TOO_MANY_ REQUESTS_NF_ CONGESTION_ RISK	—	HTTP/2	429
545	SBI_500_ INTERNAL_ SERVER_ ERROR_ INSUFFICIENT_ RESOURCES	—	HTTP/2	500
546	SBI_500_ INTERNAL_ SERVER_ ERROR_ INSUFFICIENT_ RESOURCES_ SLICE	—	HTTP/2	500
547	SBI_500_ INTERNAL_ SERVER_ ERROR_ INSUFFICIENT_ RESOURCES_ SLICE_DNN	—	HTTP/2	500
548	SBI_500_ INTERNAL_ SERVER_ ERROR_ SYSTEM_ FAILURE	—	HTTP/2	500
549	SBI_500_ INTERNAL_ SERVER_ ERROR_ UNSPECIFIED_ NF_FAILURE	—	HTTP/2	500
550	SBI_503_ SERVICE_ UNAVAILABLE_ DNN_ CONGESTION	—	HTTP/2	503

Cause	Name	Description	Protocol	Protocol value
551	SBI_503_ SERVICE_ UNAVAILABLE_ NF_CONGESTION	—	HTTP/2	503
552	SBI_503_ SERVICE_ UNAVAILABLE_ S_NSSAI_ CONGESTION	—	HTTP/2	503
553	SBI_504_ GATEWAY_ TIMEOUT_ NETWORK_ FAILURE	—	HTTP/2	504
554	SBI_504_ GATEWAY_ TIMEOUT_ PEER_NOT_ RESPONDING	—	HTTP/2	504
555	SBI_400_BAD_ REQUEST_ CHARGING_ FAILED	—	HTTP/2	400
556	SBI_403_ FORBIDDEN_ CHARGING_NOT_ APPLICABLE	—	HTTP/2	403
557	SBI_403_ FORBIDDEN_ END_USER_ REQUEST_ DENIED	—	HTTP/2	403
558	SBI_403_ FORBIDDEN_ QUOTA_LIMIT_ REACHED	—	HTTP/2	403
559	SBI_403_ FORBIDDEN_ END_USER_ REQUEST_ REJECTED	—	HTTP/2	403

Cause	Name	Description	Protocol	Protocol value
560	SBI_404_NOT_FOUND_USER_UNKNOWN	—	HTTP/2	404
561	N10_UNAUTHORIZED_ERROR	Error when building HTTP/2 Authorization Header	HTTP/2	—
562	N10_EXTERNAL_ERROR	Various error cases when decoding N10 peer message	HTTP/2	—
563	N10_INTERNAL_ERROR	Various error cases when sending HTTP/2 N10 peer message	HTTP/2	—
564	N7_INTERNAL_ERROR	Various error cases when sending HTTP/2 N7 peer message	HTTP/2	—
565	SBI_400_BAD_REQUEST	—	HTTP/2	400
566	SBI_403_FORBIDDEN	—	HTTP/2	403
567	SBI_404_NOT_FOUND	—	HTTP/2	404
568	SBI_411_LENGTH_REQUIRED	—	HTTP/2	411
569	SBI_429_TOO_MANY_REQUESTS	—	HTTP/2	429
570	SBI_500_INTERNAL_SERVER_ERROR	—	HTTP/2	500
571	SBI_503_SERVICE_UNAVAILABLE	—	HTTP/2	503
572	SBI_504_GATEWAY_TIMEOUT	—	HTTP/2	504

Cause	Name	Description	Protocol	Protocol value
573	SBI_403_UE_IN_NON_ALLOWED_AREA	—	HTTP/2	573

6.4 Detailed causes

Table 69: Detailed causes

Detailed cause ID	Description	Related event	Related cause
1008	Address Pool Missing/cfg	LTE_ADDR_POOL_NOT_PRESENT	GTP1_CAUSE_NO_RESOURCES
1009	Unsupported Auth Type	LTE_UNSUPP_AUTH_TYPE	GTP1_CAUSE_AUTH_FAILURE
1010	Invalid Authentication Key	LTE_INV_AUTH_KEY	GTP1_CAUSE_AUTH_FAILURE
1011	Invalid Authentication Type	LTE_INV_AUTH_TYPE	GTP1_CAUSE_AUTH_FAILURE
1012	Authentication Failed	LTE_AUTH_FAIL	GTP1_CAUSE_AUTH_FAILURE
1013	Failed	LTE_FAILED	GTP1_CAUSE_USER_AUTH_FAILURE
1014	UE Reattach	LTE_UE_REATTACH	GTP_CAUSE_SUCCESS
1015	User authentication failure	LTE_USER_AUTH_FAIL	GTP1_CAUSE_USER_AUTH_FAILURE
1016	Diameter (PCRF) disabled	LTE_DIAM_PCRF_DISABLED	GTP1_CAUSE_USER_AUTH_FAILURE
1017	ROL session establishment failure	LTE_ROL_SESS_FAILED	GTP1_CAUSE_USER_AUTH_FAILURE
1018	Addr Alloc Failed	LTE_ADDR_ALLOC_FAIL	GTP1_CAUSE_PDP_ADDR_NOT_AVAI
1019	Address Pool Exhausted	LTE_ADDR_POOL_EXHAUSTED	GTP1_CAUSE_PDP_ADDR_NOT_AVAI
1020	Address Pool Empty	LTE_ADDR_POOL_EMPTY	GTP1_CAUSE_PDP_ADDR_NOT_AVAI
1021	APN access denied	LTE_APN_ACCESS_DENIED	GTP1_CAUSE_APN_ACC_DENIED

Detailed cause ID	Description	Related event	Related cause
1022	APN Selection Mode Mismatch	LTE_APN_ SELECTION_MODE_ MISMATCH	GTP1_CAUSE_APN_ ACC_DENIED
1023	Session Termination because of Timeout	LTE_SESSION_ TIMEOUT	GTP_CAUSE_PDN_ INACTIVE_TIMEOUT
1024	Delete Session Idle Timeout	LTE_IDLE_TIMEOUT	GTP_CAUSE_PDN_ INACTIVE_TIMEOUT
1025	UE Context Not Found	LTE_UE_CTXT_NOT_ FOUND	GTP_CAUSE_ CONTEXT_NOT_ FOUND
1026	PDN Context Not Found	LTE_PDN_CTXT_NOT_ FOUND	GTP_CAUSE_ CONTEXT_NOT_ FOUND
1027	Bearer Context Not Found	LTE_BEARER_CTXT_ NOT_FOUND	GTP_CAUSE_ CONTEXT_NOT_ FOUND
1028	BCE PBU Prefixes Set Mismatch	LTE_BCE_PBU_PFX_ SET_MISMATCH	GTP_CAUSE_ CONTEXT_NOT_ FOUND
1029	Unexpected IE	LTE_IE_UNEXPECTED	GTP_CAUSE_INVALID_ MSG_FMT
1030	Proxy registration not enabled for the mobile node	LTE_PROXY_REG_ NOT_ENABLED	GTP_CAUSE_ SERVICE_NOT_ SUPPORTED
1031	Not local mobility anchor for the mobile node	LTE_NOT_LMA_FOR_ THIS_MN	GTP_CAUSE_ SERVICE_NOT_ SUPPORTED
1032	The mobile access gateway is not authorized to send proxy binding updates	LTE_MAG_NO_AUTH_ FOR_PROXY_REG	GTP_CAUSE_ SERVICE_NOT_ SUPPORTED
1033	Service Not Supported	LTE_SERVICE_NOT_ SUPPORTED	GTP_CAUSE_ SERVICE_NOT_ SUPPORTED
1034	Timestamp Mismatch	LTE_TIMESTAMP_ MISMATCH	GTP_CAUSE_ MANDAT_IE_ INCORRECT
1035	Older Timestamp	LTE_TIMESTAMP_IN_ PAST	GTP_CAUSE_ MANDAT_IE_ INCORRECT

Detailed cause ID	Description	Related event	Related cause
1036	Invalid Mand/Cond IE	LTE_INV_REQ_IE	GTP_CAUSE_ MANDAT_IE_ INCORRECT
1037	Missing Home Net Pfx Option	LTE_MISSING_HOME_ NET_PFX_OPT	GTP_CAUSE_ MANDAT_IE_MISSING
1038	Missing UE ID Option	LTE_MISSING_MN_ IDENTIFIER_OPT	GTP_CAUSE_ MANDAT_IE_MISSING
1039	Missing Handoff Ind Option	LTE_MISSING_ HANDOFF_ INDICATOR_OPT	GTP_CAUSE_ MANDAT_IE_MISSING
1040	Missing Access Tech Type Option	LTE_MISSING_ ACCESS_TECH_ TYPE_OPT	GTP_CAUSE_ MANDAT_IE_MISSING
1041	Missing IE	LTE_MISSING_IE	GTP_CAUSE_ MANDAT_IE_MISSING
1042	Addr Pool Invalid Mscp	LTE_ADDR_POOL_ INVALID_MSCP	GTP_CAUSE_ALL_ DYNAMIC_ADDR_ OCCUPIED
1043	One of the Gateways is active or the MSCP group is active	LTE_BUSY	GTP_CAUSE_UE_ NOT_RESPONDING
1044	Relinking Attributes failed - discarded	LTE_DISCARD	GTP_CAUSE_UE_ REFUSES
1045	Unauthorized for Home Net Pfx	LTE_NO_AUTH_FOR_ HOME_NET_PFX	GTP_CAUSE_USER_ AUTH_FAILED
1047	MME No Resp	LTE_MME_NO_RESP	GTP_CAUSE_REM_ PEER_NO_RESPONSE
1048	PGW No Resp	LTE_PGW_NO_RESP	GTP_CAUSE_REM_ PEER_NO_RESPONSE
1049	SGW No Resp	LTE_SGW_NO_RESP	GTP_CAUSE_REM_ PEER_NO_RESPONSE
1050	Disallowed RAT Type	LTE_DISALLOWED_ RAT	GTP_CAUSE_DENIED_ RAT
1051	Peer is considered to be down	LTE_PEER_DOWN	GTP_CAUSE_ SUCCESS
1052	Multiple failed rules	RFC_MULTIPLE_ FAILED_RULES	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT

Detailed cause ID	Description	Related event	Related cause
1053	Unknown Rule Name	RFC_UNK_RULE_ NAME	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1054	Rating group Error	RFC_RATING_GRP_ ERR	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1055	Service ID error	RFC_SERVICE_ID_ ERR	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1056	Gateway Malfunction	RFC_GW_MALFUNC	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1057	Resource Limitation	RFC_RESOURCE_ LIMIT	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1058	Max number of Bearers reached	RFC_MAX_NR_ BEARER_REACHED	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1059	Unknown Bearer ID	RFC_UNK_BEARER_ID	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1060	Missing Bearer ID	RFC_MISS_BEARER_ ID	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1061	Missing Flow Description	RFC_MISS_FLOW_ DESCRIPTION	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1062	Resource allocation Failure	RFC_RSRC_ALLOC_ FAILURE	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1063	Unsuccessful QoS validation	RFC_UNSUCC_QOS_ VALIDATION	DIAMETER_PCC_ BEARER_EVENT/

Detailed cause ID	Description	Related event	Related cause
			DIAMETER_PCC_ RULE_ EVENT
1064	Incorrect flow information	RFC_INCORRECT_ FLOW_INFO	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1065	PS to CS handover	RFC_PS2CS_ HANDOVER	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1066	TDF application identifier error	RFC_TDF_APPL_ID_ ERR	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1067	No IP-CAN bearer without traffic mapping information	RFC_NO_BEARER_ BOUND	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1068	Filter restrictions	RFC_FILTER_ RESTRICTIONS	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1069	AN gateway failed	RFC_ANGW_FAILED	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1070	Missing redirect server address	RFC_MISS_REDIR_ SERVR_ADDR	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1071	End user service denied	RFC_CM_END_USER_ SERVICE_DENIED	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1072	Credit control not applicable	RFC_CM_CREDIT_ CONTROL_NOT_ APPLICABLE	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1073	Authorization rejected	RFC_CM_ AUTHORIZATION_ REJECTED	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT

Detailed cause ID	Description	Related event	Related cause
1074	User unknown	RFC_CM_USER_ UNKNOWN	DIAMETER_PCC_ BEARER_EVENT/ DIAMETER_PCC_ RULE_ EVENT
1075	Rating failed	RFC_CM_RATING_ FAILED	—
1076	Diameter Internal Error	DIAMETER_ INTERNAL_ERROR	—
1077	Diameter Fsm Error	DIAMETER_FSM_ ERROR	—
1078	Diameter PCRF OOS	DIAMETER_PCRF_ OOS	—
1079	Diameter PCRF Disabled	DIAMETER_PCRF_ DISABLED	—
1080	Diameter Mem Error	DIAMETER_MEM_ ERROR	—
1081	Diameter Tx Tmr Expiry	DIAMETER_TX_TMR_ EXPIRY	—
1082	Diameter Gen Encode Error	DIAMETER_GEN_ ENCODE_ERROR	—
1083	Diameter Gen Decode Error	DIAMETER_GEN_ DECODE_ERROR	—
1084	Diameter AMS Error	DIAMETER_AMS_ ERROR	—
1085	Diameter Session Gone	DIAMETER_SESSION_ GONE	—
1086	Diameter Timer Error	DIAMETER_TIMER_ ERROR	—
1087	LTE APN is shut	LTE_APN_IS_SHUT	GTP_CAUSE_APN_ ACCESS_DENIED
1088	LTE is missing PCO IE	LTE_MISSING_PCO_IE	GTP_CAUSE_ MANDAT_IE_MISSING
1089	GTP request is rejected because dual connectivity is disabled	LTE_DUAL_ CONNECTIVITY_NOT_ SUPPORTED	GTP_CAUSE_ SERVICE_NOT_ SUPPORTED
1090	Session is rejected because of Diameter Overload Indication Conveyance (DOIC)	DIAMETER_DOIC_ DROP	GTP_CAUSE_NO_ RESOURCES

Detailed cause ID	Description	Related event	Related cause
1094	Context not found	LTE_NOT_FOUND	HTTP_STATUS_404_CONTEXT_NOT_FOUND
1095	Local Area DN Session Release	LTE_LADN_PDU_SESS_REL	—
1096	Failure Sending Message	LTE_MSG_SEND_FAIL	—
1097	N2 Encoding Failure	LTE_N2_ENCODE_FAIL	—
1098	Encoding Failure	LTE_ENCODE_FAIL	—
1099	AMF Configuration Error	LTE_AMF_CFG_NF_FAIL	—
1100	PDU Session Rejected Only Allow IPv4	LTE_PDU_ONLY_ALLOW_IPV4	HTTP_STATUS_403_PDUTYPE_DENIED
1101	PDU Session Rejected Only Allow IPv6	LTE_PDU_ONLY_ALLOW_IPV6	HTTP_STATUS_403_PDUTYPE_DENIED
1102	SSC mode is not supported	LTE_UNSUPPORTED_SSCMODE	HTTP_STATUS_403_SSC_NOT_SUPPORTED
1103	Insufficient resource in slice	LTE_INSUFFICIENT_RES_SLICE	HTTP_STATUS_500_INSUFFIC_RESOURCES_SLICE
1104	PDU session type unknown	LTE_UNKNOWN_PDU_SESSTYPE	HTTP_STATUS_403_PDUTYPE_DENIED
1105	N2 PDU Setup Failure	LTE_N2_ESTB_FAIL	HTTP_STATUS_200_OK
1106	N1_T3591 and N1_T3592 timeout	LTE_N1_TIMER_TIMEOUT	—
1107	N2 Decoding Failure	LTE_N2_DECODING_FAILED	HTTP_STATUS_500_UNSPECIFIED_NF_FAILURE / HTTP_STATUS_403_N2_SM_ERROR
1108	AMF reported 5G AN not responding	LTE_AN_NOT_RESPONDING	—
1110	UPF no response	LTE_PEER_REQ_TIMEOUT	—

6.5 Message marker IDs and SBI service operation messages

Table 70: MessageMarker_n IDs

Message marker ID	Message interface, name, direction / service operation	Node	Protocol	Interface / SBI service
0	No_Message	N/A	N/A	N/A
1	Create_Session_Request	Combined SGW-C + PGW-C	GTPv2	S11
2	Create_Session_Response	Combined SGW-C + PGW-C	GTPv2	S11
3	Delete_Session_Request	Combined SGW-C + PGW-C	GTPv2	S11
4	Delete_Session_Response	Combined SGW-C + PGW-C	GTPv2	S11
5	Modify_Bearer_Request	Combined SGW-C + PGW-C	GTPv2	S11
6	Modify_Bearer_Response	Combined SGW-C + PGW-C	GTPv2	S11
7	Resume_Notification	Combined SGW-C + PGW-C	GTPv2	S11
8	Resume_Acknowledge	Combined SGW-C + PGW-C	GTPv2	S11
9	Modify_Bearer_Command	SGW, PGW, combined SGW-C + PGW-C	GTPv2	S11
10	Modify_Bearer_Failure_ Indication	Combined SGW-C + PGW-C	GTPv2	S11
11	Delete_Bearer_Command	Combined SGW-C + PGW-C	GTPv2	S11
12	Delete_Bearer_Failure_ Indication	Combined SGW-C + PGW-C	GTPv2	S11
13	Bearer_Resource_Command	Combined SGW-C + PGW-C	GTPv2	S11
14	Bearer_Resource_Failure_ Indication	Combined SGW-C + PGW-C	GTPv2	S11
15	Downlink_Data_Notification_ Failure_Indication	Combined SGW-C + PGW-C	GTPv2	S11

Message marker ID	Message interface, name, direction / service operation	Node	Protocol	Interface / SBI service
16	Create_Bearer_Request	Combined SGW-C + PGW-C	GTPv2	S11
17	Create_Bearer_Response	Combined SGW-C + PGW-C	GTPv2	S11
18	Update_Bearer_Request	Combined SGW-C + PGW-C	GTPv2	S11
19	Update_Bearer_Response	Combined SGW-C + PGW-C	GTPv2	S11
20	Delete_Bearer_Request	Combined SGW-C + PGW-C	GTPv2	S11
21	Delete_Bearer_Response	Combined SGW-C + PGW-C	GTPv2	S11
22	Suspend_Notification	Combined SGW-C + PGW-C	GTPv2	S11
23	Suspend_Acknowledge	Combined SGW-C + PGW-C	GTPv2	S11
24	Create_Indirect_Data_ Forwarding_Tunnel_Request	Combined SGW-C + PGW-C	GTPv2	S11
25	Create_Indirect_Data_ Forwarding_Tunnel_ Response	Combined SGW-C + PGW-C	GTPv2	S11
26	Delete_Indirect_Data_ Forwarding_Tunnel_Request	Combined SGW-C + PGW-C	GTPv2	S11
27	Delete_Indirect_Data_ Forwarding_Tunnel_ Response	Combined SGW-C + PGW-C	GTPv2	S11
28	Release_Access_Bearers_ Request	Combined SGW-C + PGW-C	GTPv2	S11
29	Release_Access_Bearers_ Response	Combined SGW-C + PGW-C	GTPv2	S11
30	Downlink_Data_Notification	Combined SGW-C + PGW-C	GTPv2	S11
31	Downlink_Data_Notification_ Acknowledge	Combined SGW-C + PGW-C	GTPv2	S11
32	PGW_Restart_Notification	Combined SGW-C + PGW-C	GTPv2	S11

Message marker ID	Message interface, name, direction / service operation	Node	Protocol	Interface / SBI service
33	PGW_Restart_Notification_ Acknowledge	Combined SGW-C + PGW-C	GTPv2	S11
82	Modify_Access_Bearer_ Request	Combined SGW-C + PGW-C	GTPv2	S11
83	Modify_Access_Bearer_ Response	Combined SGW-C + PGW-C	GTPv2	S11
83	Modify_Access_Bearer_ Response	Combined SGW-C + PGW-C	GTPv2	S11
84	PFCP Session Establishment Request	Combined SGW-C + PGW-C	PFCP	Sx, N4
85	PFCP Session Establishment Response	Combined SGW-C + PGW-C	PFCP	Sx, N4
86	PFCP Session Modification Request	Combined SGW-C + PGW-C	PFCP	Sx, N4
87	PFCP Session Modification Response	Combined SGW-C + PGW-C	PFCP	Sx, N4
88	PFCP Session Deletion Request	Combined SGW-C + PGW-C	PFCP	Sx, N4
89	PFCP Session Deletion Response	Combined SGW-C + PGW-C	PFCP	Sx, N4
90	PFCP Session Report Request	Combined SGW-C + PGW-C	PFCP	Sx, N4
91	PFCP Session Report Response	Combined SGW-C + PGW-C	PFCP	Sx, N4
101	Create SM Context Request	SMF	HTTP/2	Nsmf_ PDUSession
102	Create SM Context Response	SMF	HTTP/2	Nsmf_ PDUSession
103	Update SM Context Request	SMF	HTTP/2	Nsmf_ PDUSession
104	Update SM Context Response	SMF	HTTP/2	Nsmf_ PDUSession
105	Release SM Context Request	SMF	HTTP/2	Nsmf_ PDUSession
106	Release SM Context Response	SMF	HTTP/2	Nsmf_ PDUSession

Message marker ID	Message interface, name, direction / service operation	Node	Protocol	Interface / SBI service
107	SM Context Notify Request	SMF	HTTP/2	Nsmf_ PDUSession
108	SM Context Notify Response	SMF	HTTP/2	Nsmf_ PDUSession
109	N1N2MessageTransfer Request	SMF	HTTP/2	Namf_ Communication
110	N1N2MessageTransfer Response	SMF	HTTP/2	Namf_ Communication
111	N1N2Message Transfer Failure Notification Request	SMF	HTTP/2	Namf_ Communication
112	N1N2Message Transfer Failure Notification Response	SMF	HTTP/2	Namf_ Communication
115	Subscriber Data Management Get Request	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management
116	Subscriber Data Management Get Response	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management
117	Subscriber Data Management Subscribe Request	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management
118	Subscriber Data Management Subscribe Response	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management
119	Subscriber Data Management Unsubscribe Request	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management
120	Subscriber Data Management Unsubscribe Response	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management
121	Subscriber Data Change Notification Request	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management
122	Subscriber Data Change Notification Response	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ SubscriberData Management

Message marker ID	Message interface, name, direction / service operation	Node	Protocol	Interface / SBI service
123	UE Context Management Register Request	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ UEContext Management
124	UE Context Management Register Response	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ UEContext Management
125	UE Context Management Deregister Request	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ UEContext Management
126	UE Context Management Deregister Response	SMF, combined SGW-C + PGW-C	HTTP/2	Nudm_ UEContext Management
127	SM Policy Control Get Request	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
128	SM Policy Control Get Response	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
129	SM Policy Control Delete Request	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
130	SM Policy Control Delete Response	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
131	SM Policy Control Update Notify Request	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
132	SM Policy Control Update Notify Response	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
133	SM Policy Control Update Request	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
134	SM Policy Control Update Response	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
135	Charging Data Request [Initial]	SMF, combined SGW-C + PGW-C	HTTP/2	Nchf_Converged Charging
136	Charging Data Response [Initial]	SMF, combined SGW-C + PGW-C	HTTP/2	Nchf_Converged Charging
137	Charging Data Request [Update]	SMF, combined SGW-C + PGW-C	HTTP/2	Nchf_Converged Charging
138	Charging Data Response [Update]	SMF, combined SGW-C + PGW-C	HTTP/2	Nchf_Converged Charging

Message marker ID	Message interface, name, direction / service operation	Node	Protocol	Interface / SBI service
139	Charging Data Request [Terminate]	SMF, combined SGW-C + PGW-C	HTTP/2	Nchf_Converged Charging
140	Charging Data Response [Terminate]	SMF, combined SGW-C + PGW-C	HTTP/2	Nchf_Converged Charging
141	SM Policy Control Delete Notify Request	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
142	SM Policy Control Delete Notify Response	SMF, combined SGW-C + PGW-C	HTTP/2	Npcf_SMPolicy Control
143	EBI Request	SMF	HTTP/2	Namf_ Communication
144	EBI Response	SMF	HTTP/2	Namf_ Communication

6.6 Reference point and SBI services IDs

Table 71: Reference point and SBI services IDs

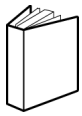
Reference point ID / service ID	Reference point / SBI service name	Involved Nodes	Protocol
0	Unknown	N/A	N/A
1	S11	Combined SGW-C + PGW-C, MME	GTPv2
15	Combined Sxa/Sxb	Combined SGW-C + PGW-C, UPF	PFCP
16	N4	SMF, UPF	PFCP
17	Nsmf_PDUSession	SMF, AMF	HTTP/2
19	Namf_Communication	SMF, AMF	HTTP/2
22	Nudm_SubscriberData Management	SMF, Combined SGW-C + PGW-C, UDM	HTTP/2
23	Nudm_UEContextManagement	SMF, Combined SGW-C + PGW-C, UDM	HTTP/2
24	Npcf_SMPolicyControl	SMF, Combined SGW-C + PGW-C, PCF	HTTP/2
25	Nchf_ConvergedCharging	SMF, Combined SGW-C + PGW-C, CHF	HTTP/2

6.7 Direction_n IDs

Table 72: Direction_n IDs

Direction ID	Direction
0	Ingress
1	Egress

Customer document and product support



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