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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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Contents

Foreword

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

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

Version x.y.z

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  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

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

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

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

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

can indicates that something is possible

cannot indicates that something is impossible

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

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

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

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

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

In addition:

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

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

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

1 Scope

The present document specifies the stage 3 protocol and data model for the Namf Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the AMF.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

2 References

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[6] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

[7] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[8] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[9] IETF RFC 2387: "The MIME Multipart/Related Content-type".

[10] IETF RFC 2045: "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies".

[11] 3GPP TS 24.501: "Non-Access-Stratum (NAS) Protocol for 5G System (5GS); Stage 3".

[12] 3GPP TS 38.413: "NG Radio Access Network (NG-RAN); NG Application Protocol (NGAP)".

[13] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".

[14] IETF RFC 6902: "JavaScript Object Notation (JSON) Patch".

[15] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General Aspects".

[16] 3GPP TS 29.502: "5G System, Session Management Services; Stage 3".

[17] 3GPP TS 38.455: "NR Positioning Protocol A (NRPPa)".

[18] 3GPP TS 29.531: "Network Slice Selection Services; Stage 3".

[19] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

[20] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[21] Void.

[22] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".

[23] OpenAPI Initiative, "OpenAPI 3.0.0 Specification", https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md.

[24] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[25] 3GPP TS 29.572: "5G System, Location Management Services; Stage 3".

[26] Void.

[27] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[28] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[29] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".

[30] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".

[31] Void.

[32] 3GPP TS 29.507: "5G System; Access and Mobility Policy Control Service; Stage 3".

[33] 3GPP TS 23.527: "5G System; Restoration Procedures".

[34] 3GPP TS 29.525: "5G System; UE Policy Control Service; Stage 3".

[35] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[36] IETF RFC 7807: "Problem Details for HTTP APIs".

[37] 3GPP TR 21.900: "Technical Specification Group working methods".

[38] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[39] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC); Stage 2".

[40] IETF RFC 6901: "JavaScript Object Notation (JSON) Pointer".

[41] 3GPP TS 29.274: "3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[42] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

[43] 3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification; Formats and coding".

[44] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[45] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[46] 3GPP TS 29.515: "5G System; Gateway Mobile Location Services Stage 3".

[47] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

[48] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[49] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

example: text used to clarify abstract rules by applying them literally.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC	5G Core Network
5GS	5G System
5G-AN	5G Access Network
5G-GUTI	5G Globally Unique Temporary Identifier
5QI	5G QoS Identifier
AMF	Access and Mobility Management Function
DAPS	Dual Active Protocol Stacks
EBI	EPS Bearer Identity
GAD	Universal Geographical Area Description
GPSI	Generic Public Subscription Identifier
GUAMI	Globally Unique AMF Identifier
JSON	JavaScript Object Notation
LADN	Local Area Data Network
LDR	Location Deferred Request
LMF	Location Management Function
MA	Multi-Access
MM	Mobility Management
N3IWF	Non-3GPP InterWorking Function
NEF	Network Exposure Function
NR	New Radio
NRF	Network Repository Function
NRPPa	NR Positioning Protocol A
NSI ID	Network Slice Instance Identifier
NSSAI	Network Slice Selection Assistance Information
NSSAA	Network Slice-Specific Authentication and Authorization
NWDAF	Network Data Analytics Function
PCF	Policy Control Function
PEI	Permanent Equipment Identifier
RAT	Radio Access Type
RFSP	RAT/Frequency Selection Priority
SARI	Service Area Restriction Information
SBI	Service Based Interface
SM	Session Management
SMF	Session Management Function
SMSF	Short Message Service Function
S-NSSAI	Single Network Slice Selection Assistance Information
SUCI	Subscription Concealed Identifier
SUPI	Subscription Permanent Identifier
TA	Tracking Area
TAI	Tracking Area Identity
TNAP	Trusted Non-3GPP Access Point
TWAP	Trusted WLAN Access Point
UDM	Unified Data Management
UDSF	Unstructured Data Storage Function

4 Overview

4.1 Introduction

Within the 5GC, the AMF offers services to the SMF, other AMF, PCF, SMSF, LMF, GMLC, CBCF, PWS-IWF , NWDAF and NEF via the Namf service based interface (see 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.288 [38]).

Figure 4.1-1 provides the reference model (in service based interface representation and in reference point representation), with focus on the AMF and the scope of the present specification.

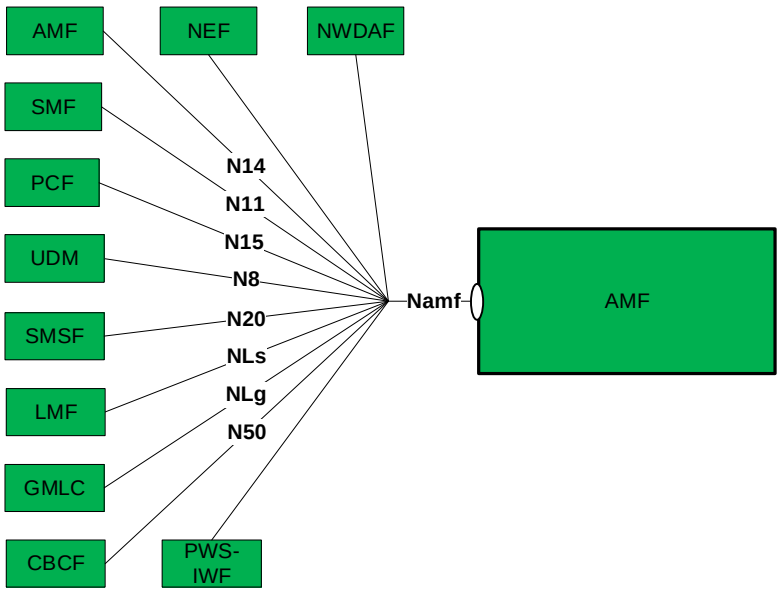

Figure 4.1-1: Reference model – AMF

The functionalities supported by the AMF are listed in clause 6.2.1 of 3GPP TS 23.501 [2].

5 Services offered by the AMF

5.1 Introduction

The table 5.1-1 shows the AMF Services and AMF Service Operations:

Table 5.1-1 List of AMF Services

Service Name	Service Operations	Operation Semantics	Example Consumer(s)
Namf_Communication	UEContextTransfer	Request/Response	Peer AMF
	RegistrationStatusUpdate	Request/Response	Peer AMF
	CreateUEContext	Request/Response	Peer AMF
	ReleaseUEContext	Request/Response	Peer AMF
	N1MessageNotify	Subscribe/Notify	Peer AMF, LMF, PCF
	N2InfoNotify		LMF, AMF
	N1N2MessageSubscribe		PCF
	N1N2MessageUnSubscribe		PCF
	N1N2MessageTransfer	Request/Response	Peer AMF, SMF, SMSF, LMF, PCF
	N1N2TransferFailureNotification	Subscribe/Notify	SMF, SMSF, LMF
	NonUeN2MessageTransfer	Request/Response	Peer AMF, LMF, CBCF, PWS-IWF
	NonUeN2InfoSubscribe	Subscribe/Notify	CBCF, PWS-IWF
	NonUeN2InfoUnSubscribe		CBCF, PWS-IWF
	NonUeN2InfoNotify		LMF, CBCF, PWS-IWF
	EBIAssignment	Request/Response	SMF
	AMFStatusChangeSubscribe	Subscribe / Notify	SMF, PCF, NEF, SMSF, UDM
	AMFStatusChangeUnSubscribe	Subscribe / Notify	SMF, PCF, NEF, SMSF, UDM
	AMFStatusChangeNotify	Subscribe / Notify	SMF, PCF, NEF, SMSF, UDM
Namf_EventExposure	Subscribe (see NOTE)	Subscribe/Notify	NEF, SMF, UDM, NWDAF
	Unsubscribe (see NOTE)	Subscribe/Notify	NEF, SMF, UDM, NWDAF
	Notify	Subscribe/Notify	NEF, SMF, UDM, NWDAF
Namf_MT	EnableUEReachability	Request/Response	SMSF
	ProvideDomainSelectionInfo	Request/Response	UDM
Namf_Location	ProvidePositioningInfo	Request/Response	GMLC
	EventNotify	Subscribe / Notify	GMLC
	ProvideLocationInfo	Request/Response	UDM
	CancelLocation	Request/Response	GMLC
NOTE: A subscription applies for one UE, group of UE(s) or any UE.			

Table 5.1-2 summarizes the corresponding APIs defined for this specification.

Table 5.1-2: API Descriptions

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
Namf_Communication	6.1	AMF Communication Service	TS29518_Namf_Communication.yaml	namf-comm	A.2
Namf_EventExposure	6.2	AMF Event Exposure Service	TS29518_Namf_EventExposure.yaml	namf-evts	A.3
Namf_MT	6.3	AMF Mobile Terminated Service	TS29518_Namf_MT.yaml	namf-mt	A.4
Namf_Location	6.4	AMF Location Service	TS29518_Namf_Location.yaml	namf-loc	A.5

5.2 Namf_Communication Service

5.2.1 Service Description

This service enables an NF to communicate with the UE through N1 NAS messages or with the AN (both UE and non UE specific). The service operations defined below allow the NF to communicate with the UE and the AN. The following are the key functionalities of this NF service.

- Provide service operations for transporting N1 messages to the UE;
- Allow NFs to subscribe and unsubscribe for notifications of specific N1 messages from the UE;
- Allow NFs to subscribe and unsubscribe for notifications about specific information from AN;
- Provide service operations for initiating N2 messages towards the AN;
- Security Context Management; and
- UE information management and transfer (including its security context).

5.2.2 Service Operations

5.2.2.1 Introduction

The Namf_Communication service supports following service operations:

- UEContextTransfer
- RegistrationStatusUpdate
- N1N2MessageTransfer (UE Specific)
- N1N2TransferFailureNotification (UE Specific)
- N1N2MessageSubscribe (UE Specific)
- N1N2MessageUnsubscribe (UE Specific)
- N1MessageNotify (UE Specific)
- N2InfoNotify (UE Specific)
- NonUeN2MessageTransfer
- NonUeN2InfoSubscribe
- NonUeN2INfoUnsubscribe
- N2InfoNotify
- EBIAssignment
- CreateUEContext
- ReleaseUEContext
- AMFStatusChangeSubscribe
- AMFStatusChangeUnsubscribe
- AMFStatusChangeNotify

5.2.2.2 UE Context Operations

5.2.2.2.1 UEContextTransfer

5.2.2.2.1.1 General

The UEContextTransfer service operation is used during the following procedure:

- General Registration procedure (see 3GPP TS 23.502 [3], clause 4.2.2.2.2)

The UEContextTransfer service operation is invoked by a NF Service Consumer, e.g. a target AMF, towards the AMF (acting as source AMF), when the target AMF receives a Registration Request with the UE's 5G-GUTI included and the serving AMF has changed since last registration, to retrieve the UE Context, e.g. the UE's SUPI and MM Context, in the source AMF.

The NF Service Consumer (e.g. the target AMF) shall retrieve the UE Context by invoking the "transfer" custom method on the URI of an "Individual ueContext" resource identified by UE's 5G-GUTI, see clause 6.1.3.2.4. See also Figure 5.2.2.2.1.1-1.

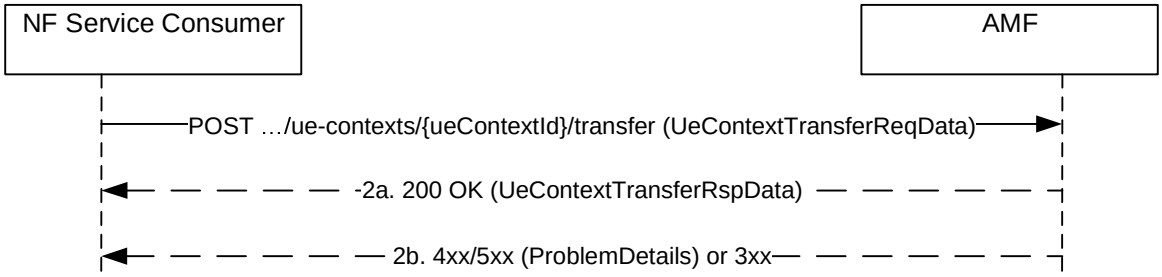

Figure 5.2.2.2.1.1-1 UE Context Transfer

1. The NF Service Consumer, e.g. target AMF, shall send a HTTP POST request to invoke "transfer" custom method on an "Individual ueContext" resource URI. The payload of the request shall be an object of "UeContextTranferReqData" data type.

   If UE Context Transfer is triggered by UE initial registration or mobility registration, the NF Service Consumer, e.g. target AMF, shall set the reason attribute to "INIT_REG" or "MOBI_REG" and include the integrity protected registration request message which triggers the UE context transfer in the payload.

2a. On success:

- if the reason attribute is "INIT_REG" and integrity check is successful, the (source) AMF shall respond with the status code "200 OK". The payload of the response shall be an object of "UeContextTransferRspData" data type, containing:

  case a) the representation of the requested UE Context without PDU Session Contexts; or

  case b) the representation of the requested UE Context only containing the "supi" attribute, if the UE is registered in a different access type in the (source) AMF and the source AMF determines based on the PLMN ID of the (target) AMF that there is no possibility for relocating the N2 interface to the (target) AMF.

- If the reason attribute is "MOBI_REG" and integrity check is successful, the (source) AMF shall respond with the status code "200 OK". The payload of the response shall be an object of "UeContextTransferRspData" data type, containing the representation of the complete UE Context including available PDU Session Contexts.

The UE context shall contain trace control and configuration parameters, if signalling based trace has been activated (see 3GPP TS 32.422 [30]).

The NF Service Consumer, e.g. target AMF, starts tracing according to the received trace control and configuration parameters, if trace data is received in the UE context indicating that signalling based trace has

been activated. Once the NF Service Consumer receives subscription data, trace requirements received from the UDM supersedes the trace requirements received from the AMF.

The UE context shall contain event subscriptions information in the following cases:

a) Any NF Service Consumer has subscribed for UE specific event; and/or

b) Any NF Service Consumer has subscribed for UE group specific events to which the UE belongs. In this case the event subscriptions provided in the UE context shall contain the event details applicable to this specific UE in the group (e.g maxReports in options IE).

The NF Service Consumer, e.g. target AMF, shall:

- in case a) create event subscriptions for the UE specific events;

- in case b) create event subscriptions for the group Id if there are no existing event subscriptions for that group Id, subscription change notification URI (subsChangeNotifyUri) and the subscription change notification correlation Id (subsChangeNotifyCorrelationId). If there is already an existing event subscription for the group Id, and for the given subscription change notification URI (subsChangeNotifyUri) and subscription change notification correlation Id (subsChangeNotifyCorrelationId), then an event subscription shall not be created at the NF Service Consumer. The individual UE specific event details (e.g maxReports in options IE) within that group shall be taken into account.

- for both the cases, for each created event subscription, allocate a new subscription Id, if necessary (see clause 6.5.2 of 3GPP TS 29.500 [4]), and if allocated, send the new subscription Id to the notification endpoint for informing the subscription Id creation, along with the notification correlation Id for the subscription Id change.

NOTE: Subscription Id can be reused if the mobility is between AMFs of same AMF Set.

If the UE context being transferred from the source AMF is the last UE context that belongs to a UE group Id related subscription, then the source AMF shall not delete the UE group Id related subscription until the expiry of that event subscription (see clause 5.3.2.2.2).

The source AMF shall not transfer those PDU sessions which are not supported by the target AMF, e.g. the MA-PDU sessions shall not be transferred if the target AMF does not support ATSSS.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.2.4.4.2-2 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.2.4.4.2-2.

5.2.2.2.1.2 Retrieve UE Context after successful UE authentication

When a successful UE authentication has been performed after a previous integrity check failure, the NF service consumer (e.g. the target AMF) shall retrieve the UE context by invoking "transfer" service operation on the URI of the "Individual ueContext" resource identified by UE's SUPI. The same requirements in clause 5.2.2.2.1.1 shall be applied with following modifications:

1. Same as step 1 of figure 5.2.2.2.1.1-1, with following differences:

   - The {ueContextId} in the URI shall be composed using UE's SUPI, and

   - The "reason" attribute in request body shall be set to "MOBI_REG_UE_VALIDATED", and

   - The request body shall not include registration request message from UE.

2. Same as step 2a of figure 5.2.2.2.1.1-1, with following differences:

   - The (source) AMF shall skip integrity check and shall respond with the status code "200 OK "with the UE Context excluding SeafData and including available PDU Session Contexts

5.2.2.2.2 RegistrationStatusUpdate

5.2.2.2.2.1 General

The RegistrationStatusUpdate service operation is used during the following procedure:

- General Registration procedure (see 3GPP TS 23.502 [3], clause 4.2.2.2.2)
- Registration with AMF re-allocation procedure (see 3GPP TS 23.502 [3], clause 4.2.2.2.3)

The RegistrationStatusUpdate service operation is invoked by a NF Service Consumer, e.g. the target AMF, towards the NF Service Producer, i.e. the source AMF, to update the status of UE registration at the target AMF, thereby indicating the result of previous UE Context transfer for a given UE (see clause 5.2.2.2.1.1).

The target AMF shall update the NF Service Producer (i.e. source AMF) the status of the UE registration at the target AMF due to a previous UE Context transfer. The NF Service Consumer (e.g. target AMF) shall use the HTTP method POST to invoke the "transfer-update" custom operation on the URI of an "Individual ueContext" resource, see clause 6.1.3.2.4. See also Figure 5.2.2.2.2.1-1.

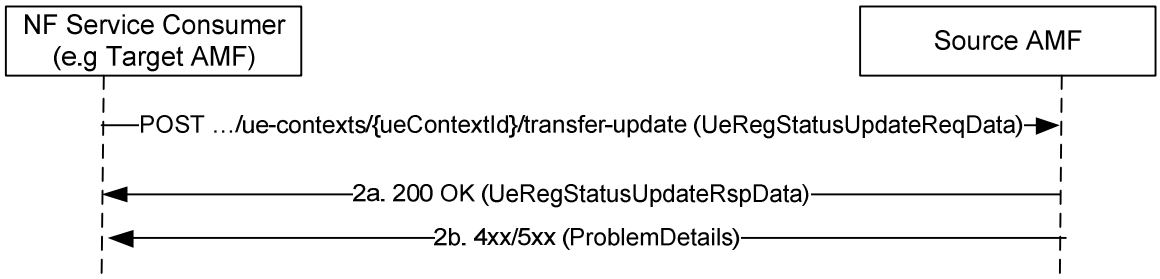

Figure 5.2.2.2.2.1-1 Registration Status Update

1. The NF service consumer (e.g. target AMF), shall send a POST request to invoke the "transfer-update" custom operation on the URI of an "Individual ueContext" resource, to update the source AMF of the status of the UE registration at the target AMF. The UE's 5G-GUTI is included as the UE identity.

   If any network slice(s) become no longer available and there are PDU Session(s) associated with them, the target AMF shall include these PDU session(s) in the toReleaseSessionList attribute in the payload.

   If the target AMF selects a new PCF for AM Policy and/or UE policy other than the one which was included in the UeContext by the old AMF, the target AMF shall set pcfReselectedInd to true.

   NOTE: AMF selects the same PCF instance for AM policy and for UE policy, as described in clause 6.3.7.1, 3GPP TS 23.501 [2].

   The NF service consumer shall include the smfChangeInfoList attribute including the UE's PDU Session ID(s) for which the I-SMF or V-SMF has been changed or removed, if any, with for each such PDU session, the related smfChangeIndication attribute set to "CHANGED" or "REMOVED", if the I-SMF is changed or removed respectively, or set to "CHANGED" if the V-SMF is changed.

   Once the update is received, the source AMF shall:

   - remove the individual ueContext resource and release any PDU session(s) in the toReleaseSessionList attribute, if the transferStatus attribute included in the POST request body is set to "TRANSFERRED". The source AMF may choose to start a timer to supervise the release of the UE context resource and may keep the individual ueContext resource until the timer expires. If the pcfReselectedInd is set to true, the source AMF shall terminate the AM Policy Association and/or the UE Policy Association that the source AMF has to the old PCF.

   - shall keep the UE Context as if the context transfer procedure had not happened if the transferStatus attribute included in the POST request body is set to "NOT_TRANSFERRED".

2a. On Success: The source AMF shall respond with the status code "200 OK" if the request is accepted. If the smfChangeInfoList attribute was received in the request, the source AMF shall release the SM context at the I-SMF or V-SMF only, for all the PDU sessions listed in the smfChangeInfoList attribute with the smfChangeIndication attribute set to "CHANGED" or "REMOVED".

If some PDU sessions are not supported by the target AMF and thus not transferred to the target AMF, the source AMF shall release these PDU sessions after this step.

2b. On failure, one of the HTTP status code listed in Table 6.1.3.2.4.5.2-2 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.2.4.5.2-2, where applicable.

5.2.2.2.3 CreateUEContext

5.2.2.2.3.1 General

The CreateUEContext service operation is used during the following procedure:

- Inter NG-RAN node N2 based handover (see 3GPP TS 23.502 [3], clause 4.9.1.3, and clause 4.23.7)
- EPS to 5GS handover procedure using N26 interface (see 3GPP TS 23.502 [3], clause 4.11.1.2.2)
- 5G-SRVCC procedure from NG-RAN to UTRAN (see 3GPP TS 23.216 [39], clause 6.5)

The CreateUEContext service operation is invoked by a NF Service Consumer, e.g. a source AMF, towards the AMF (acting as target AMF), when the source AMF can't serve the UE and selects the target AMF during the handover procedure, to create the UE Context in the target AMF.

The NF Service Consumer (e.g. the source AMF) shall create the UE Context by using the HTTP PUT method with the URI of the "Individual UeContext" resource (See clause 6.1.3.2.3.1). See also Figure 5.2.2.2.3.1-1.

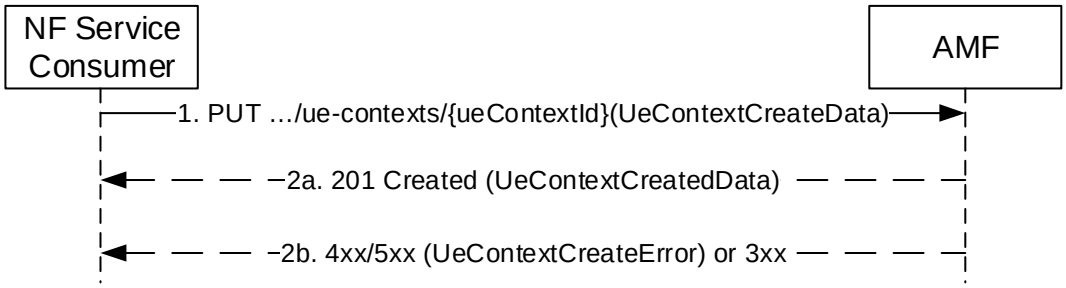

Figure 5.2.2.2.3.1-1 Create UE Context

1. The NF Service Consumer, e.g. source AMF, shall send a PUT request, to create the ueContext in the target AMF. The payload body of the PUT request shall contain a UeContextCreateData structure, including a N2 Information Notification callback URI.

   The UE context shall contain trace control and configuration parameters, if signalling based trace has been activated (see 3GPP TS 32.422 [30]).

   For EPS to 5GS Mobility procedure, the NF Service Consumer, i.e. initial AMF, shall carry the S-NSSAI for serving PLMN, and MME Control Plane Address and TEID in the request. In Home Routed roaming case, the S-NSSAI for serving PLMN is derived by the initial AMF based on the S-NSSAI for home PLMN retrieved from SMF+PGW-C, as specified in 3GPP TS 23.502 [3].

   For 5G-SRVCC procedure from NG-RAN to UTRAN, the NF Service Consumer (i.e. AMF) carries the Mobile Station Classmark 2, STN-SR, C-MSISDN and Supported Codec List in the request, as specified in 3GPP TS 23.502 [3].

2a. On success, the target AMF shall respond with the status code "201 Created" if the request is accepted, together with a HTTP Location header to provide the location of a newly created resource. The payload body of the PUT response shall contain the representation of the created UE Context. If the target AMF selects a new PCF for AM Policy other than the one which was included in the UeContext by the old AMF, the target AMF shall set pcfReselectionInd to true. If the pcfReselectionInd is set to true, the source AMF shall terminate the AM Policy Association to the old PCF.

The target AMF starts tracing according to the received trace control and configuration parameters, if trace data is received in the UE context indicating that signalling based trace has been activated. Once the AMF receives subscription data, trace requirements received from the UDM supersedes the trace requirements received from the NF Service Consumer.

The UE context shall contain event subscriptions information in the following cases:

a) Any NF Service Consumer has subscribed for UE specific event; and/or

b) Any NF Service Consumer has subscribed for UE group specific events to which the UE belongs. In this case the event subscriptions provided in the UE context shall contain the event details applicable to this specific UE in the group (e.g maxReports in options IE).

The target AMF shall:

- in case a) create event subscriptions for the UE specific events;

- in case b) create event subscriptions for the group Id if there are no existing event subscriptions for that group Id, subscription change notification URI (subsChangeNotifyUri) and the subscription change notification correlation Id (subsChangeNotifyCorrelationId). If there is already an existing event subscription for the group Id and for the given subscription change notification URI (subsChangeNotifyUri) and subscription Id change notification correlation Id (subsChangeNotifyCorrelationId), then an event subscription shall not be created at the target AMF. The individual UE specific event details (e.g maxReports in options IE) within that group shall be taken into account.

- for both the cases, for each created event subscription, allocate a new subscription Id, if necessary (see clause 6.5.2 of 3GPP TS 29.500 [4]), and if allocated send the new subscription Id to the notification endpoint for informing the subscription Id creation, along with the notification correlation Id for the subscription Id change.

NOTE: Subscription Id can be reused if the mobility is between AMFs of same AMF Set.

If the UE context being transferred from the NF service consumer (e.g. source AMF) is the last UE context that belongs to a UE group Id related subscription, then the NF service consumer (e.g. source AMF) shall not delete the UE group Id related subscription until the expiry of that event subscription (see clause 5.3.2.2.2).

The source AMF, shall:

- release those PDU sessions not supported by the target AMF and thus not transferred to the target AMF.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.2.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a UeContextCreateError structure, including:

- a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.2.3.1-3;

- NgAPCause, if available;

- N2 information carrying the Target to Source Failure Transparent Container, if this information has been received from the target NG-RAN and if the source AMF supports the NPN feature.

5.2.2.2.4 ReleaseUEContext

5.2.2.2.4.1 General

The ReleaseUEContext service operation is used during the following procedure:

- Inter NG-RAN node N2 based handover, Cancel procedure (see 3GPP TS 23.502 [3], clause 4.9.1.4)

The ReleaseUEContext service operation is invoked by a NF Service Consumer, e.g. a source AMF, towards the AMF (acting as target AMF), when the source AMF receives the Handover Cancel from the 5G-AN during the handover procedure, to release the UE Context in the target AMF.

The NF Service Consumer (e.g. the source AMF) shall release the UE Context by using the HTTP "release" custom operation with the URI of the "Individual UeContext" resource (See clause 6.1.3.2.4.2). See also Figure 5.2.2.2.4.1-1.

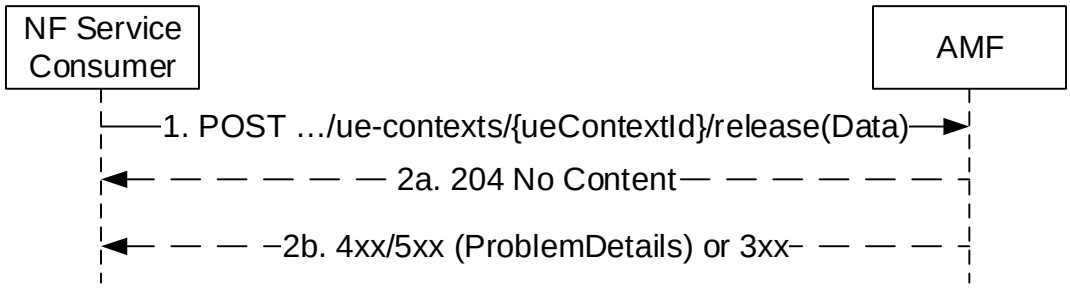

Figure 5.2.2.2.4.1-1 Release UE Context

1. The NF Service Consumer, e.g. source AMF, shall send a POST request, to release the ueContext in the target AMF. The payload body of the POST request shall contain any data that needs to be passed to the target AMF.

2a. On success, the target AMF shall return "204 No Content" with an empty payload body in the POST response.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.2.4.2.2-2 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.2.4.2.2-2.

5.2.2.3 UE Specific N1N2 Message Operations

5.2.2.3.1 N1N2MessageTransfer

5.2.2.3.1.1 General

The N1N2MessageTransfer service operation is used by a NF Service Consumer to transfer N1 and/or N2 information to the UE and/or 5G-AN through the AMF in the following procedures:

- Network triggered Service Request (see clause 4.2.3.3 of 3GPP TS 23.502 [3])
- PDU Session establishment (see clause 4.3.2 of 3GPP TS 23.502 [3])
- PDU Session modification (see clause 4.3.3 of 3GPP TS 23.502 [3])
- PDU Session release (see clause 4.3.4 of TS 3GPP 23.502 [3])
- Session continuity, service continuity and UP path management (see clause 4.3.5 of 3GPP TS 23.502 [3])
- Inter NG-RAN node N2 based handover (see clause 4.9.1.3 of 3GPP TS 23.502 [3])
- SMS over NAS procedures (see clause 4.13.3 of 3GPP TS 23.502 [3]
- UE assisted and UE based positioning procedure (see clause 6.11.1 of 3GPP TS 23.273 [42])
- Network assisted positioning procedure (see clause 6.11.2 of 3GPP TS 23.273 [42])
- LCS Event Report, LCS Cancel Location and LCS Periodic-Triggered Invoke procedures (see clause 6.3 of 3GPP TS 23.273 [42])
- UE configuration update procedure for transparent UE policy delivery (see clause 4.2.4.3 of 3GPP TS 23.502 [3])
- UPF anchored Mobile Terminated Data Transport in Control Plane CIoT 5GS Optimisation (see clause 4.24.2 of 3GPP TS 23.502 [3])
- NEF Anchored Mobile Terminated Data Transport (see clause 4.25.5 of 3GPP TS 23.502 [3])
- System interworking procedures with EPC (see clause 4.3 in 3GPP TS 23.501 [2] and clause 4.11 in 3GPP TS 23.502 [3])
- SMF triggered N3 data transfer establishment procedure (see clause 4.2.10.2 of 3GPP TS 23.502 [3])
- 5G-RG requested PDU Session Establishment via W-5GAN (see clause 7.3.1 of 3GPP TS 23.316 [48])

- 5G-RG or Network requested PDU Session Modification via W-5GAN (see clause 7.3.2 of 3GPP TS 23.316 [48])
- 5G-RG or Network requested PDU Session Release via W-5GAN (see clause 7.3.3 of 3GPP TS 23.316 [48])
- FN-RG related PDU Session Establishment via W-5GAN (see clause 7.3.4 of 3GPP TS 23.316 [48])
- CN-initiated selective deactivation of UP connection of an existing PDU Session associated with W-5GAN Access (see clause 7.3.5 of 3GPP TS 23.316 [48])
- FN-RG or Network Requested PDU Session Modification via W-5GAN (see clause 7.3.6 of 3GPP TS 23.316 [48])
- FN-RG or Network Requested PDU Session Release via W-5GAN (see clause 7.3.7 of 3GPP TS 23.316 [48])
- Non-5G capable device behind 5G-CRG and FN-CRG requested PDU Session Establishment via W-5GAN (see clause 4.10a of 3GPP TS 23.316 [48])
- Non-5G capable device behind 5G-CRG and FN-CRG or Network Requested PDU Session Modification via W-5GAN (see clause 4.10a of 3GPP TS 23.316 [48])
- Non-5G capable device behind 5G-CRG and FN-CRG or Network Requested PDU Session Release via W-5GAN (see clause 4.10a of 3GPP TS 23.316 [48])
- Handover procedures between 3GPP access / 5GC and W-5GAN access (see clause 7.6.3 of 3GPP TS 23.316 [48])
- Handover from 3GPP access / EPS to W-5GAN / 5GC (see clause 7.6.4.1 of 3GPP TS 23.316 [48])

NOTE: Though in 3GPP TS 23.502 [3] the procedure is called "UE configuration update procedure for transparent UE policy delivery", as per 3GPP TS 24.501 [11] clause 5.4.5.3.1, the network initiated NAS transport procedure is used.

The NF Service Consumer shall invoke the service operation by using HTTP method POST, to request the AMF to transfer N1 and/or N2 information for a UE and/or 5G-AN, with the URI of "N1 N2 Messages Collection" resource (see clause 6.1.3.5.3.1).

The NF Service Consumer may include the following information in the HTTP Request message body:

- SUPI
- PDU Session ID or LCS Correlation ID depending on the N1/N2 message class to be transferred
- N2 SM Information (PDU Session ID, QoS profile, CN N3 Tunnel Info, S-NSSAI)
- N1 Message Container, including a N1 SM, LPP message, LCS message, SMS, UPDP message
- N2 Information Container, including N2 SM, NRPPa message, PWS or RAN related information
- Mobile Terminated Data (i.e. CIoT user data container)
- Allocation and Retention Priority (ARP)
- Paging Policy Indication
- 5QI
- Notification URL (used for receiving Paging Failure Indication)
- Last Message Indication
- NF Instance Identifier and optionally Service Instance Identifier of the NF Service Consumer (e.g. an LMF or SMF)
- N1 SM Skipping Indication

- Area of Validity for N2 SM Information

- A MA PDU Session Accepted indication, if a MA-PDU session is established;

- Extended Buffering Support Indication, if SMF determines that Extended Buffering applies during Network triggered Service Request Procedure (see clause 4.2.3.3 of 3GPP TS 23.502 [3]), UPF anchored Mobile Terminated Data Transport in Control Plane CIoT 5GS Optimisation procedure (see clause 4.24.2 of 3GPP TS 23.502 [3]) or NEF Anchored Mobile Terminated Data Transport (see clause 4.25.5 of 3GPP TS 23.502 [3]);

- Target Access type towards which the SMF requests to send N2 information and optionally N1 information, for a Multi-Access (MA) PDU session, or through which the LMF requests to transfer an LPP message to the UE.

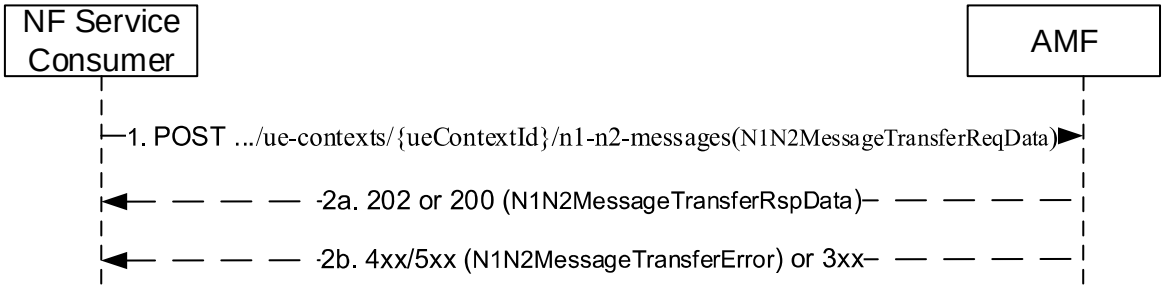

Figure 5.2.2.3.1.1-1 N1N2MessageTransfer for UE related signalling

1. The NF Service Consumer shall send a POST request to transfer N1 and N2 information. The NF Service Consumer may include a N1N2MessageTransfer Notification URI to AMF in the request message.

2a. On success, i.e. if the request is accepted and the AMF is able to transfer the N1/N2 message to the UE and/or the AN, the AMF shall respond with a "200 OK" status code. The AMF shall set the cause IE in the N1N2MessageTransferRspData as "N1_N2_TRANSFER_INITIATED" in this case.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.5.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a N1N2MessageTransferError structure, including:

   - a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.5.3.1-3;

5.2.2.3.1.2 Detailed behaviour of the AMF

When an NF service consumer is requesting to send N1 and/or N2 information and the UE is in CM-IDLE state for the access type for which the N1 and/or N2 information is related (called "associated access type" hereafter in this clause), the requirements specified in clause 5.2.2.3.1.1 shall apply with the following modifications:

NOTE: N1 and/or N2 Session Management information is related to the access type of the targeted PDU session for a single access PDU session, or to the Target Access received in the request for a MA PDU session; LCS related N1 (LPP or LCS) and/or N2 (NRPPa) information is related to 3GPP access in Rel-15.

4xx and 5xx response cases shall also apply to UEs in CM-CONNECTED state, when applicable.

2xx Response Cases:

Case A: When UE is CM-IDLE in 3GPP access and the associated access type is 3GPP access:

a) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF should respond with the status code "200 OK", if "skipInd" attribute is set to "true" in the request body, with a response body that carries the cause "N1_MSG_NOT_TRANSFERRED".

b) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "202 Accepted", if the asynchronous type communication is invoked and hence the UE is not paged, update the UE context and store N1 and/or N2 information and initiate communication with the UE and/or 5G-AN when the UE becomes reachable. In this case the AMF shall provide the URI of the resource in the AMF in the "Location" header of the

response, which contains information regarding the stored N1/N2 message. The AMF shall also provide a response body containing the cause, "WAITING_FOR_ASYNCHRONOUS_TRANSFER" that represents the current status of the N1/N2 message transfer;

c) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "202 Accepted", if paging is issued when the UE is in CM-IDLE and reachable for 3GPP access, with a response body that carries a cause "ATTEMPTING_TO_REACH_UE" as specified in clause 4.2.3.3 and 5.2.2.2.7 of 3GPP TS 23.502 [3].

Case B: When UE is CM-IDLE in Non-3GPP access but CM-CONNECTED in 3GPP access and the associated access type is Non-3GPP access:

a) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "200 OK" with cause "N1_N2_TRANSFER_INITIATED" and initiate N1 NAS SM message transfer via 3GPP access, if the NF service consumer (i.e. SMF) requests to send only N1 NAS SM message without any associated N2 SM information, and the current access type related to the PDU session is Non-3GPP access and the UE is CM-CONNECTED in 3GPP access.

b) Same as step 2a of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "202 Accepted", if NAS Notification procedure is issued when the UE is in CM-CONNECTED in 3GPP access, with a response body that carries a cause "ATTEMPTING_TO_REACH_UE" as specified in step 4c of clause 4.2.3.3 and 5.2.2.2.7 of 3GPP TS 23.502 [3].

Case C: When UE is CM-IDLE in both Non-3GPP access and 3GPP access and the associated access type is Non-3GPP access:

All the bullets specified in Case A are applicable.

The NF Service Consumer shall not send any further signalling for the UE if it receives a POST response body with a cause "ATTEMPTING_TO_REACH_UE" unless it has higher priority signalling. In such a case the response shall include the "Location" header containing the URI of the resource created in the AMF, which holds the status of the N1/N2 message transfer, e.g. ".../n1-n2-messages/{n1N2MessageId}". The AMF shall:

- store the N1 and/or N2 information related to 3GPP access and, when the UE responds with a Service Request, shall initiate communication with the UE and/or 5G-AN using the stored N1 and/or N2 information;

- store the N1 NAS SM information related to Non-3GPP access if no N2 information was received and the AMF initiated paging towards the UE. Later when the UE responds with a Service Request,the AMF shall initiate communication with the UE using the stored N1 information via 3GPP access;

- inform the SMF which invoked the service operation, that the access type of the PDU Session can be changed from Non-3GPP access to 3GPP access as specified in clause 5.2.2.3.2.1 of 3GPP TS 29.502 [16], when the UE responds with a "List Of Allowed PDU Sessions" and the indicated non-3GPP PDU session of the N2 (and N1 if received) information is included in the list; or

- notify the NF which invoked the service operation, as specified in clause 5.2.2.3.2, if the Notification URI is provided, when the AMF determines that the paging or NAS Notification has failed or when the UE responds with a "List Of Allowed PDU Sessions" and the indicated Non-3GPP PDU session of the N2 (and N1 if received) information is not included in the list.

4xx Response Cases:

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with status code "409 Conflict" in the following cases:

  - if the UE is in 3GPP access and there is already an ongoing paging procedure with higher or same priority, the AMF shall set the application error as "HIGHER_PRIORITY_REQUEST_ONGOING" in the "cause" attribute of the ProblemDetails structure of the POST response body. The AMF may provide a retry timer value to the NF Service Consumer in order for the NF Service Consumer to retry the request after the expiry of the timer. When the retry timer is provided, the NF Service Consumer shall not initiate the downlink messaging until the timer expires. The AMF may also provide the ARP value of the QoS flow that has triggered the currently ongoing highest priority paging, so that the NF Service Consumer (e.g. SMF) knows that if any subsequent trigger initiating downlink messaging for a QoS flow with the same or lower priority happens.

- if there is an ongoing registration procedure (see clause 4.2.3.3 of 3GPP TS 23.502 [3]) the AMF shall set the application error as "TEMPORARY_REJECT_REGISTRATION_ONGOING" in the "cause" attribute of the ProblemDetails structure in the POST response body;

- if this is a request to transfer a N2 PDU Session Resource Modify Request or a N2 PDU Session Resource Release Command to a 5G-AN and if the UE is in CM-IDLE state at the AMF for the Access Network Type associated to the PDU session (see clauses 4.3.3 and 4.3.4 of 3GPP TS 23.502 [3] and clause 5.3.2.1 of 3GPP TS 23.527 [33]), the AMF shall set the application error "UE_IN_CM_IDLE_STATE" in the "cause" attribute of the ProblemDetails structure in the POST response body.

- if there is an ongoing Xn or N2 handover procedure (see clause 4.9.1.2.1 and 4.9.1.3.1 of 3GPP TS 23.502 [3]) the AMF shall set the application error as "TEMPORARY_REJECT_HANDOVER_ONGOING" in the "cause" attribute of the ProblemDetails structure in the POST response body, if the AMF rejects the request due to the on-going handover.

- if the RAT Type is NB-IoT, and the UE already has 2 PDU Sessions with active user plane resources, the AMF shall set the application error as "MAX_ACTIVE_SESSIONS_EXCEEDED" in POST response body.

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "403 Forbidden", if the UE is in a Non-Allowed Area and the service request is not for regulatory prioritized service. The AMF shall set the application error as "UE_IN_NON_ALLOWED_AREA" in POST response body.

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "403 Forbidden ", if the NF service consumer (e.g. an LMF) is requesting to send N1 LPP message to the UE and the UE has indicated that it does not support LPP in N1 mode during registration procedure (see clause 5.5.1.2.2 and 5.5.1.3.2 of 3GPP TS 24.501 [11]). The AMF shall set the application error to "UE_WITHOUT_N1_LPP_SUPPORT" in POST response body.

5xx Response Cases:

- Same as step 2b of Figure 5.2.2.3.1.1-1, the AMF shall respond with the status code "504 Gateway Timeout", if the UE is currently unreachable (e.g., due to the UE in MICO mode, the UE using extended idle mode DRX or the UE is only registered over Non-3GPP access and its state is CM-IDLE). The AMF shall set the application error as "UE_NOT_REACHABLE" in POST response body. If Extended Buffering Support Indication is received in the request, the AMF shall include the Estimated Maximum Waiting time in the response body when the message is rejected due to the UE in MICO mode or the UE using extended idle mode DRX.

5.2.2.3.2 N1N2Transfer Failure Notification

The AMF uses this notification to inform the NF service consumer that initiated an earlier Namf_Communication_N1N2MessageTransfer, that the AMF failed to deliver the N1 message to the UE as the UE failed to respond to paging. The HTTP POST method shall be used on the notification callback URI provided by the NF service consumer as specified in clause 5.2.2.3.1.2.

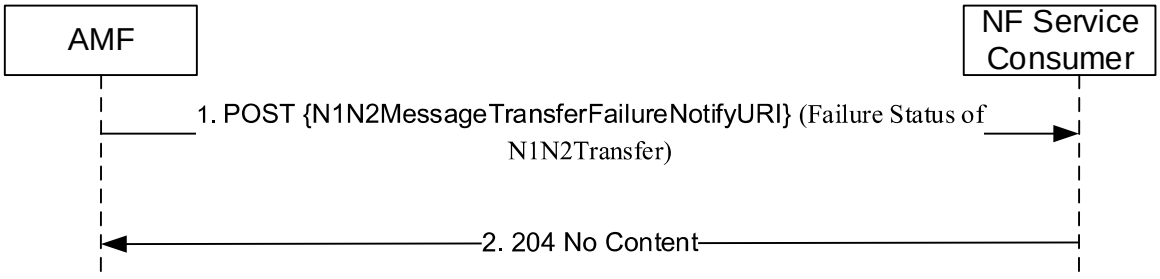

Figure 5.2.2.3.2-1 N1N2Transfer Failure Notification for UE related signalling

1. When the AMF determines that the paging or NAS Notification has failed, or that the indicated non-3GPP PDU session is not allowed to move to 3GPP access, or that the delivery of the N1 message fails e.g. in case the UE is in RRC Inactive and NG-RAN paging was not successful or in case an Xn or N2 handover is being triggered at the NG-RAN, and if the NF service consumer had provided a notification URI (see clause 5.2.2.3.1.2), the AMF shall send a POST request to the NF Service Consumer on that Notification URI. The AMF shall include the

N1N2MessageTransfer request resource URI returned earlier in the N1N2MessageTransfer response if any (see clause 5.2.2.3.1.2), otherwise a dummy URI (see clause 6.1.6.2.30), in the POST request body. The AMF shall also include a N1/N2 message transfer cause information in the POST request body and set the value as specified in clause 6.1.5.6.3.1.

The NF Service Consumer shall delete any stored representation of the N1N2MessageTransfer request resource URI upon receiving this notification.

2. The NF Service Consumer shall send a response with "204 No Content" status code.

5.2.2.3.3 N1N2MessageSubscribe

5.2.2.3.3.1 General

The N1N2MessageSubscribe service operation is used by a NF Service Consumer (e.g. PCF) to subscribe to the AMF for notifying N1 messages of a specific type (e.g. LPP) or N2 information of a specific type. For the N1 message class is UPDP, a PCF shall subscribe for the N1 message notification with the AMF, after the AM policy association establishment procedure between the AMF and the PCF (see clause 4.16.1 of 3GPP TS 23.502 [3]).

NOTE: Step 0 of clause 4.2.4.3 of 3GPP TS 23.502 [3] specifies that the PCF can split the UPDP transfer towards UE into multiple units. one UE specific callback URI is registered with the AMF by the PCF for the AMF to notify all UPDP message responses from the UE to the same callback URI. As a result, an explicit subscription per UE policy association is defined in stage 3 for this purpose.

An NF Service Consumer (e.g. PCF) may subscribe to notifications of specific N1 message type (e.g. LPP or UPDP) or N2 information type. In this case the NF Service Consumer shall subscribe by using the HTTP POST method with the URI of the "N1N2 Subscriptions Collection for Individual UE Contexts" resource (See clause 6.1.3.6.3.1). See also Figure 5.2.2.3.3.1-1.

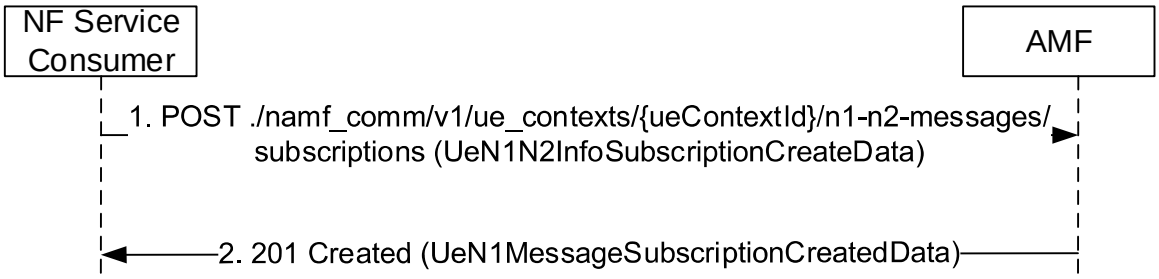

Figure 5.2.2.3.3.1-1 N1N2 Message Subscribe

1. The NF Service Consumer shall send a POST request to create a subscription resource in the AMF for a UE specific N1/N2 message notification. The payload body of the POST request shall contain:

   - N1 and/or N2 Message Type, identifying the type of N1 and/or N2 message to be notified
   - A callback URI for the notification

2. If the request is accepted, the AMF shall include a HTTP Location header to provide the location of a newly created resource (subscription) together with the status code 201 indicating the requested resource is created in the response message.

5.2.2.3.4 N1N2MessageUnSubscribe

5.2.2.3.4.1 General

The N1N2MessageUnSubscribe service operation is used by a NF Service Consumer (e.g. PCF) to unsubscribe to the AMF to stop notifying N1 messages of a specific type (e.g. LPP or UPDP).

The NF Service Consumer shall use the HTTP method DELETE with the URI of the "N1N2 Individual Subscription" resource (See clause 6.1.3.7.3.1), to request the deletion of the subscription for the N1 / N2 message towards the AMF. See also Figure 5.2.2.3.4.1-1.

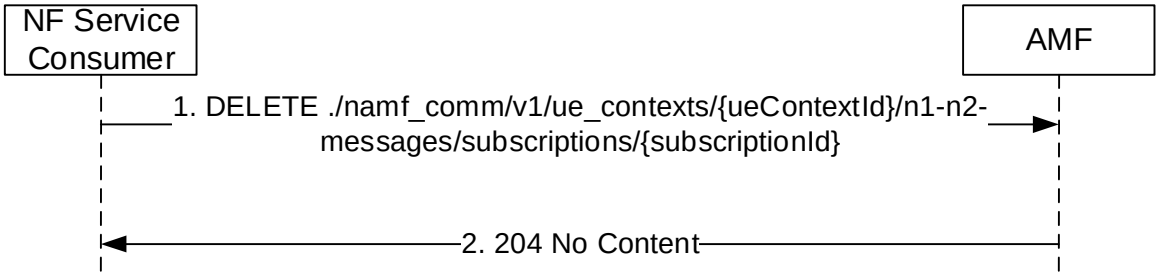

Figure 5.2.2.3.4.1-1 N1N2 Message UnSubscribe

1. The NF Service Consumer shall send a DELETE request to delete an existing subscription resource in the AMF.
2. If the request is accepted, the AMF shall reply with the status code 204 indicating the resource identified by subscription ID is successfully deleted, in the response message.

5.2.2.3.5 N1MessageNotify

5.2.2.3.5.1 General

The N1MessageNotify service operation is used by an AMF notifying the N1 message received from the UE to a destination CN NF, and it is used in the following procedures:

- Registration with AMF re-allocation (see clause 4.2.2.2.3 of 3GPP TS 23.502 [3])
- UE assisted and UE based positioning procedure (see clause 6.11.1 of 3GPP TS 23.273 [42])
- LCS Event Report, LCS Cancel Location and LCS Periodic-Triggered Invoke procedures (see clause 6.3 and clause 6.7 of 3GPP TS 23.273 [42])
- UE configuration update procedure for transparent UE policy delivery (See clause 4.2.4.3 in 3GPP TS 23.502 [3])

NOTE: Though in 3GPP TS 23.502 [3] the procedure is called "UE configuration update procedure for transparent UE policy delivery", as per 3GPP TS 24.501 [11] clause 5.4.5.2.1, the UE initiated NAS transport procedure is used.

The AMF shall use HTTP POST method to the N1 Notification URI provided by the NF Service Consumer via N1N2MessageSubscribe service operation (See clause 5.2.2.3.3). See also figure 5.2.2.3.5.1-1.

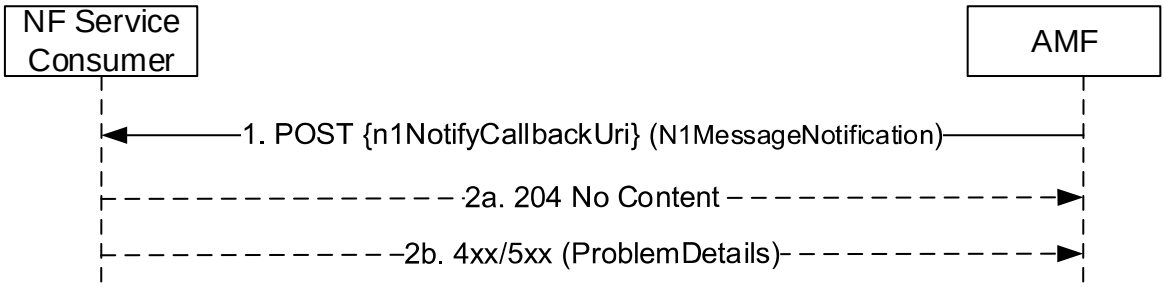

Figure 5.2.2.3.5.1-1 N1 Message Notify

1. The AMF shall send a HTTP POST request to the N1 Notification URI, and the payload body of the POST request shall contain an N1MessageNotificatoin data structure with the subscribed N1 message.

2a. On success, "204 No Content" shall be returned and the payload body of the POST response shall be empty.

2b. On failure, one of the HTTP status code listed in Table 6.1.5.6.4.1-2 shall be returned. The message body shall contain a ProblemDetails object with "cause" set to one of the corresponding application errors listed in Table 6.1.5.6.4.1-2.

5.2.2.3.5.2 Using N1MessageNotify in the Registration with AMF Re-allocation Procedure

In the Registration with AMF re-allocation procedure, the N1MessageNotify service operation is invoked by a NF Service Producer, i.e. an Initial AMF, towards a NF Service Consumer, e.g. the target AMF, which is selected to serve the UE, by the initial AMF.

The requirements specified in clause 5.2.2.3.5.1 shall apply with the following modifications:

1. The initial AMF discovers the NF Service Consumer (e.g. the target AMF) from the NRF, and fetch N1 Notification URI from the default notification subscription registered with "N1_MESSAGE" notification type and "5GMM" N1 message class (See Table 6.2.6.2.3-1 and Table 6.2.6.2.4-1 of 3GPP TS 29.510 [29].

NOTE: The alternate AMF is expected to have registered a callback URI with the NRF.

2. Same as step 1 of Figure 5.2.2.3.5.1-1, the request payload shall include the following information in the HTTP POST Request message body:

   - RAN NGAP ID and initial AMF name (the information enabling (R)AN to identify the N2 terminating point);
   - RAN identity, e.g. RAN Node Id, RAN N2 IPv4/v6 address;
   - Information from RAN, e.g. User Location, RRC Establishment Cause and UE Context Request;
   - the N1 message;
   - the UE's SUPI and MM Context;
   - the Allowed NSSAI together with the corresponding NSI IDs (if network slicing is used and the initial AMF has obtained).

5.2.2.3.5.3 Using N1MessageNotify in the UE Assisted and UE Based Positioning Procedure

In the UE assisted and UE based positioning procedure, the N1MessageNotify service operation is invoked by the AMF, towards the LMF, to notify the N1 UE positioning messages received from the UE.

The requirements specified in clause 5.2.2.3.5.1 shall apply with the following modifications:

1. If the corresponding N1 notification URI is not available, the AMF shall retrieve the NF profile of the NF Service Consumer (e.g. the LMF) from the NRF using the NF Instance Identifier received during corresponding N1N2MessageTransfer service operation (see clause 5.2.2.3.1), and further identify the corresponding service instance if Service Instance Identifier was also received, and fetch N1 Notification URI from the default notification subscription registered with "N1_MESSAGE" notification type and "LPP" N1 message class (See Table 6.2.6.2.3-1 and Table 6.2.6.2.4-1 of 3GPP TS 29.510 [29]).

2. Same as step 1 of Figure 5.2.2.3.5.1-1, the request payload shall include the following information:

   - the N1 Uplink Positioning Message;
   - LCS correlation identifier.

5.2.2.3.5.4 Using N1MessageNotify in the UE Configuration Update for transparent UE Policy delivery

In the UE Configuration Update for transparent UE Policy delivery procedure, the N1MessageNotify service operation is invoked by the AMF, towards the PCF which subscribed to be notified with UPDP messages received from the UE.

The requirements specified in clause 5.2.2.3.5.1 shall apply with the following modifications:

1. Same as step 1 of Figure 5.2.2.3.5.1-1. The request payload shall include the following information:

- the UPDP message.

5.2.2.3.5.5 Using N1MessageNotify in the LCS Event Report, LCS Cancel Location and LCS Periodic-Triggered Invoke Procedures

In the LCS Event Report, LCS Cancel Location and LCS Periodic-Triggered Invoke procedure, the N1MessageNotify service operation is invoked by the AMF, towards the LMF, to notify the N1 UE LCS messages received from the UE.

The requirements specified in clause 5.2.2.3.5.1 shall apply with the following modifications:

1. If the corresponding N1 notification URI is not available, the AMF shall retrieve the NF profile of the NF Service Consumer (e.g. the LMF) from the NRF using the NF Instance Identifier received during corresponding N1N2MessageTransfer service operation (see clause 5.2.2.3.1), and further identify the corresponding service instance if Service Instance Identifier was also received, and fetch N1 Notification URI from the default notification subscription registered with "N1_MESSAGE" notification type and "LCS" N1 message class (See Table 6.2.6.2.3-1 and Table 6.2.6.2.4-1 of 3GPP TS 29.510 [29]).
2. Same as step 1 of Figure 5.2.2.3.5.1-1, the request payload shall include the following information:
   - the N1 Uplink LCS Message;
   - LCS correlation identifier;
   - indication of Control Plane CIoT 5GS Optimisation if Control Plane CIoT 5GS Optimisation is being used.

NOTE: For the EventReport message and UE initiated CancelDeferredLocation message, the AMF includes the deferred routing identifier received from UE in N1 UL NAS TRANSPORT message as LCS correlation identifier. The LCS correlation identifier can assist a serving LMF in identifying the periodic or triggered location session if the same LMF had assigned the deferred routing identifier or can indicate to the LMF that it is acting as a default LMF.

5.2.2.3.6 N2InfoNotify

5.2.2.3.6.1 General

The N2InfoNotify service operation is used during the following procedure:

- Inter NG-RAN node N2 based handover procedure (see 3GPP TS 23.502 [3], clauses 4.9.1.3.3, 4.9.1.3.3a and 4.23.7.3);
- Network assisted positioning procedure (see clause 6.11.2 of 3GPP TS 23.273 [42])
- AMF planned removal procedure with UDSF deployed (see clause 5.21.2.2.1 of 3GPP TS 23.501 [2]), to forward uplink N2 signalling to a different AMF.

The N2InfoNotify service operation is invoked by AMF, to notify a NF Service Consumer that subscribed N2 information has been received from access network.

The AMF shall use HTTP POST method to the N2Info Notification URI provided by the NF Service Consumer via N1N2MessageSubscribe service operation (See clause 5.2.2.3.3). See also figure 5.2.2.3.6.1-1.

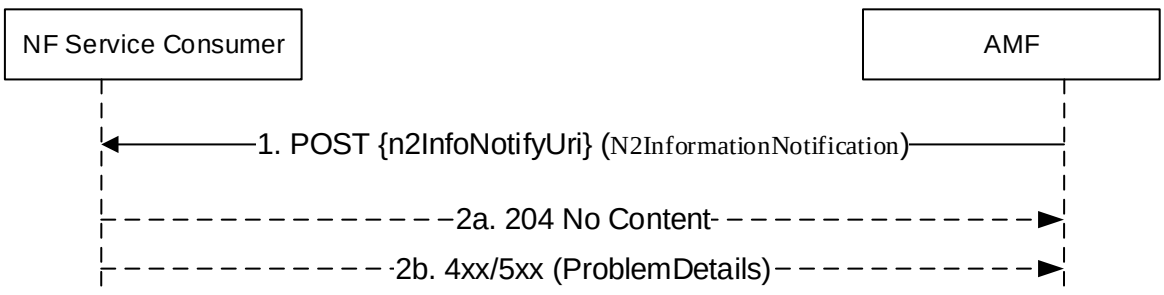

Figure 5.2.2.3.6.1-1 N2 Information Notify

1. The AMF shall send a HTTP POST request to the n2InfoNotifyUri, and the payload body of the POST request shall contain a N2InformationNotification data structure, containing the N2 information that was subscribed by the NF Service Consumer.

2a. On success, "204 No Content" shall be returned and the payload body of the POST response shall be empty.

2b. On failure, one of the HTTP status code listed in Table 6.1.5.5.3.1-2 shall be returned. The message body shall contain a ProblemDetails object with "cause" set to one of the corresponding application errors listed in Table 6.1.5.5.3.1-2.

5.2.2.3.6.2 Using N2InfoNotify during Inter NG-RAN node N2 based handover procedure

The N2InfoNotify service operation is invoked by a NF Service Producer, e.g. the target AMF, towards the NF Service Consumer, i.e. the source AMF, to notify that the handover procedure has been successful in the target side, for a given UE.

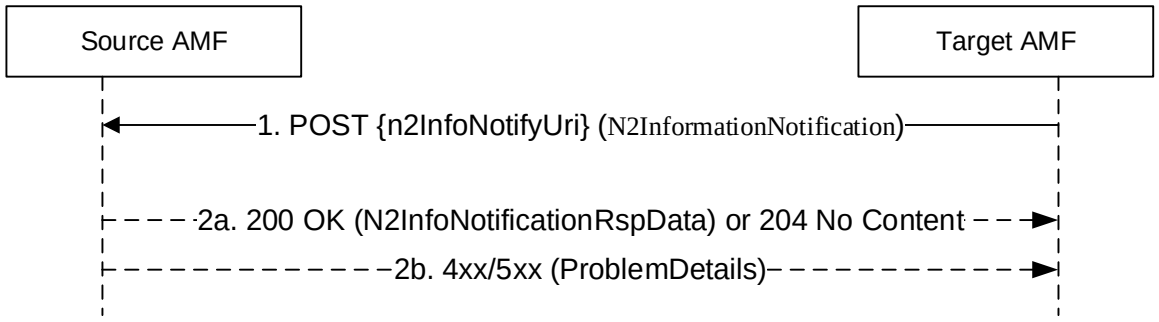

Figure 5.2.2.3.6.2-1 N2 Information Notify during N2 Handover execution

The requirements specified in clause 5.2.2.3.6.1 shall apply with the following modifications:

0. During an inter AMF handover procedure, the source AMF, acting as a NF Service Consumer, when invoking the CreateUEContext service operation (see clause 5.2.2.2.3), shall include a N2Info Notification URI to the target AMF in the HTTP request message.

1. Same as step 1 of Figure 5.2.2.3.6.1-1, the request payload shall contain the following information:

   - notification payload (see clause 6.1.5.5) without the "n2InfoContainer" attribute;
   - the "notifyReason" attribute set to "HANDOVER_COMPLETED";
   - the "smfChangeInfoList" attribute including the UE's PDU Session ID(s) for which the I-SMF or V-SMF has been changed or removed, if any, with for each such PDU session, the related "smfChangeIndication" attribute set to "CHANGED" or "REMOVED", if the I-SMF or the V-SMF is changed or removed respectively.
   - the "notifySourceNgRan" attribute set to "true" during an Inter NG-RAN node N2 based DAPS handover procedure, if the target AMF receives this indication in the Handover Notify from the target NG-RAN node (see clause 4.9.1.3.3a of 3GPP TS 23.502 [3]).

   If any network slice(s) become no longer available and there are PDU Session(s) associated with them, the target AMF shall include these PDU session(s) in the toReleaseSessionList attribute in the payload. The n2NotifySubscriptionId included in the notification payload shall be the UE context Id.

2. Same as Step 2a of Figure 5.2.2.3.6.1-1, with the following additions/modifications:

   - the source AMF shall release the PDU Session(s) listed in the toReleaseSessionList attribute in the payload;
   - if the smfChangeInfoList attribute was received in the request, the source AMF shall release the SM Context at the I-SMF or V-SMF only, for all the PDU sessions listed in the smfChangeInfoList attribute with the smfChangeIndication attribute set to "CHANGED" or "REMOVED";

- the source AMF shall remove the individual ueContext resource. The source AMF may choose to start a timer to supervise the release of the UE context resource and may keep the individual ueContext resource until the timer expires;

- if Secondary RAT usage data have been received from the source NG-RAN and buffered at the source AMF as specified in step 2a0 of clause 4.9.1.3.3 of 3GPP TS 23.502 [3], the source AMF shall send a 200 OK response with the Secondary RAT usage data included in the response payload.

- if the "notifySourceNgRan" attribute was set to "true" in the request, the source AMF shall send a HANDOVER SUCCESS to the source NG-RAN (see clause 4.9.1.3.3a of 3GPP TS 23.502 [3]).

NOTE: This notification is due to an implicit subscription and hence no explicit subscription Id is created. UE context Id is included as the notification subscription Id for the NF Service Consumer (e.g. Source AMF) to co-relate the notification to an earlier initiated UE context creation during a handover procedure.

5.2.2.3.6.3 Using N2InfoNotify during Location Services procedures

The N2InfoNotify service operation is invoked by a NF Service Producer, i.e. the AMF, towards the NF Service Consumer, e.g. the LMF, to notify the positioning parameters received from the 5G-AN in the NRPPa message.

The requirements specified in clause 5.2.2.3.6.1 shall apply with the following modifications:

1. If the corresponding N2 notification URI is not available, the AMF shall retrieve the NF profile of the NF Service Consumer (e.g. the LMF) from the NRF using the NF Instance Identifier received during corresponding N1N2MessageTransfer service operation (see clause 5.2.2.3.1), and further identify the corresponding service instance if Service Instance Identifier was also received, and fetch N2 Notification URI from the default subscription registered with "N2_INFORMATION" notification type and "NRPPa" N2 information class (See Table 6.2.6.2.3-1 and Table 6.2.6.2.4-1 of 3GPP TS 29.510 [29]).

2. Same as step 1 of Figure 5.2.2.3.6.1-1, the request payload shall contain N2 information of type NRPPa and LCS correlation identifier.

5.2.2.3.6.4 Using N2InfoNotify during AMF planned removal procedure with UDSF deployed procedure

In the AMF planned removal procedure with UDSF deployed (see clause 5.21.2.2.1 of 3GPP TS 23.501 [2]), the N2InfoNotify service operation is invoked by a NF Service Producer, i.e. an initial AMF, towards the NF Service Consumer, i.e. the target AMF, to forward uplink N2 signalling to the target AMF.

The requirements specified in clause 5.2.2.3.6.1 shall apply with the following modifications:

1. If the N2 notification URI is not available, the initial AMF shall discover the NF Service Consumer (i.e. the target AMF) from the NRF, and fetch the N2 Notification URI from the default notification subscription registered with "N2_INFORMATION" notification type and "RAN" N2 message class (See Table 6.2.6.2.3-1 and Table 6.2.6.2.4-1 of 3GPP TS 29.510 [29].

NOTE: The target AMF is expected to have registered a callback URI with the NRF.

2. Same as step 1 of Figure 5.2.2.3.6.1-1, the request payload shall contain the following information in the HTTP POST Request message body:

   - N2 information of type "RAN";

   - N2 message;

   - initial AMF name;

   - RAN identity, e.g. RAN Node Id, RAN N2 IPv4/v6 address.

5.2.2.4 Non-UE N2 Message Operations

5.2.2.4.1 NonUeN2MessageTransfer

5.2.2.4.1.1 General

The NonUeN2MessageTransfer service operation is used by a NF Service Consumer to transfer N2 information to the 5G-AN through the AMF in the following procedures:

- Obtaining non-UE associated network assistance data (See clause 4.13.5.6 in 3GPP TS 23.502 [3]);
- Warning Request Transfer procedures (See clause 9A in 3GPP TS 23.041 [20]);
- Configuration Transfer procedure (see clause 5.26 of 3GPP TS 23.501 [2])
- RIM Information Transfer procedures (see clause 8.x of 3GPP TS 38.413 [12]).

The NF Service Consumer shall invoke the service operation by sending POST to the URI of the "transfer" customer operation on the "Non UE N2Messages Collection" resource (See clause 6.1.3.8.4.2) on the AMF. See also figure 5.2.2.4.1.1-1.

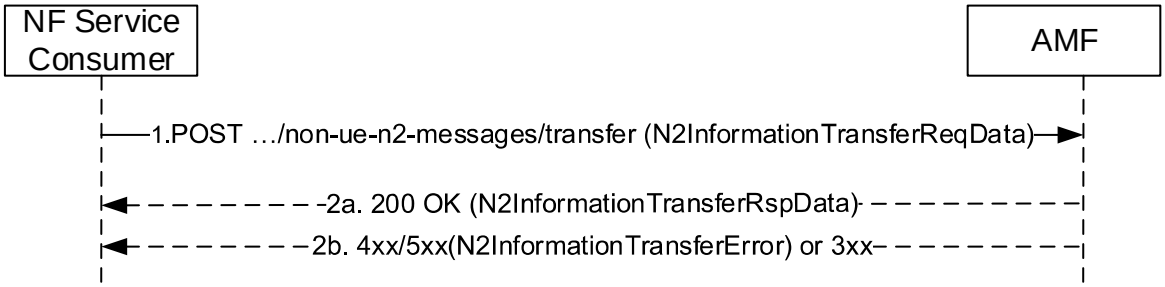

Figure 5.2.2.4.1.1-1 Non-UE N2 Message Transfer

1. The NF Service Consumer shall invoke the custom operation for non UE associated N2 message transfer by sending a HTTP POST request, and the request body shall carry the N2 information to be transferred.

2a. On success, AMF shall respond a "200 OK" status code with N2InformationTransferRspData data structure.

2b. On failure, one of the HTTP status code listed in Table 6.1.3.8.4.2.2-2shall be returned with the message body containing a N2InformationTransferError structure, including a ProblemDetails attribute with the "cause" attribute set to one of the application errors listed in Table 6.1.3.8.4.2.2-2.

5.2.2.4.1.2 Obtaining Non UE Associated Network Assistance Data Procedure

The NonUeN2MessageTransfer service operation shall be invoked by a NF Service Consumer, e.g. LMF to transfer non UE associated N2 information of N2 information class NRPPa to NG-RAN for obtaining the network assistance data.

The requirements specified in clause 5.2.2.4.1.1 shall apply with the following modifications:

1. Same as step 1 of Figure 5.2.2.4.1.1-1, the POST request body shall carry the N2 information to be transferred together with the NG RAN node identifier(s) to which the transfer needs to be initiated. The POST request body shall also include the NF Instance Identifier of the NF Service Consumer (e.g. LMF) in "nfId" attribute.

5.2.2.4.1.3 Warning Request Transfer Procedure

The NonUeN2MessageTransfer service operation shall be invoked by the NF Service Consumer, e.g. CBCF/PWS-IWF, to send non-UE specific messages of N2 information class PWS to the NG-RAN.

The requirements specified in clause 5.2.2.4.1.1 shall apply with the following modifications:

1. Same as step 1 of Figure 5.2.2.4.1.1-1, the request body shall include the N2 Message Container and:

   - the globalRanNodeList IE, or;

- the taiList IE and the ratSelector IE, or;

- the ratSelector IE.

The AMF shall forward the N2 Message Container to ng-eNBs or to gNBs indicated in the globalRanNodeList IE if present. If the globalRanNodeList IE if not present, the AMF shall forward the N2 Message Container to ng-eNBs or to gNBs, subject to the value of the *ratSelector* IE, that serve Tracking Areas as listed in the *taiList* IE if present. If the *taiList* IE and the *globalRanNodeList* IE are not present, the AMF shall forward the N2 Message Container to all attached ng-eNBs or all attached gNBs, subject to the value of the *ratSelector* IE.

NOTE: The *globalRanNodeList* IE can be present when transferring WRITE-REPLACE WARNING REQUEST. When present, the *globalRanNodeList* IE only contains RAN nodes of the same type, i.e. only ng-eNBs or only gNBs.

The request body may additionally include the *omcId* IE and/or the *sendRanResponse* IE.

2a. Same as step 2a of Figure 5.2.2.4.1.1-1, and the POST response body shall contain the mandatory elements from the Write-Replace-Warning Confirm response (see clause 9.2.17 in TS 23.041 [20]) or the mandatory elements and optionally the *unknown TAI List* IE from the Stop-Warning Confirm response (see clause 9.2.19 in TS 23.041 [20]).

2b. Same as step 2b of Figure 5.2.2.4.1.1-1, and the POST response body shall contain following additional information:

- PWS specific information, if any, e.g. PWS Cause information.

5.2.2.4.1.4 Configuration Transfer Procedure

The NonUeN2MessageTransfer service operation shall be invoked by the NF Service Consumer (i.e. source AMF) towards the NF Service Producer (i.e. target AMF) to transfer the RAN configuration information received from the source NG-RAN towards the target NG-RAN.

The requirements specified in clause 5.2.2.4.1.1 shall apply with the following modifications:

1. Same as step 1 of Figure 5.2.2.4.1.1-1. The POST request body shall contain the SON Configuration Transfer IE received from the source NG-RAN, the NG RAN node identifier of the destination of this configuration information, and the N2 information class "RAN".

   The target AMF shall forward the SON Configuration Transfer IE in a NGAP Downlink RAN Configuration Transfer message to the target NG-RAN.

5.2.2.4.1.5 RIM Information Transfer Procedures

The NonUeN2MessageTransfer service operation shall be invoked by the NF Service Consumer (i.e. source AMF) towards the NF Service Producer (i.e. target AMF) to transfer the RIM information received from the source NG-RAN towards the target NG-RAN.

The requirements specified in clause 5.2.2.4.1.1 shall apply with the following modifications:

1. Same as step 1 of Figure 5.2.2.4.1.1-1. The POST request body shall contain the RIM Information Transfer IE received from the source NG-RAN, the NG RAN node identifier of the destination of this configuration information, and the N2 information class "RAN".

   The target AMF shall forward the RIM Information Transfer IE in a NGAP Downlink RIM Information Transfer message to the target NG-RAN.

5.2.2.4.2 NonUeN2InfoSubscribe

5.2.2.4.2.1 General

The NonUeN2InfoSubscribe service operation is used by a NF Service Consumer (e.g. CBCF or PWS-IWF) to subscribe to the AMF for notifying non UE specific N2 information of a specific type (e.g. PWS Indications).

An NF Service Consumer (e.g. CBCF or PWS-IWF) may subscribe to notifications of specific N2 information type (e,g PWS Indications) that are not associated with any UE. In this case, the NF Service Consumer shall subscribe by using the HTTP POST method with the URI of the "Non UE N2Messages Subscriptions Collection" resource (See clause 6.1.3.9.3.1). See also Figure 5.2.2.4.2.1-1.

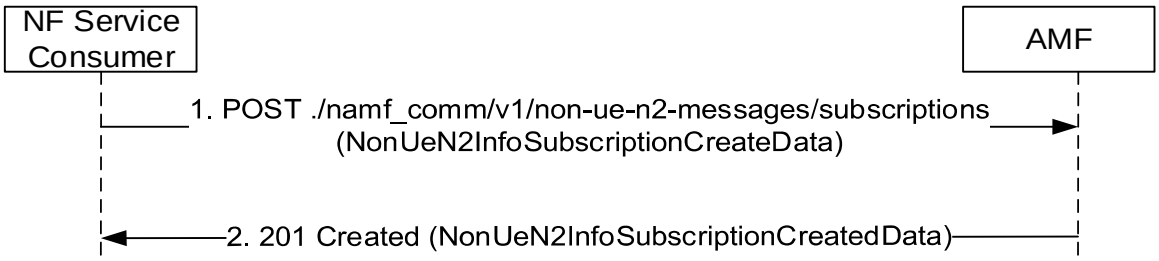

Figure 5.2.2.4.2.1-1 N2 Information Subscription for Non UE Information

1. The NF Service Consumer shall send a POST request to create a subscription resource in the AMF for a non UE specific N2 information notification. The payload body of the POST request shall contain:

   - N2 Information Type, identifying the type of N2 information to be notified
   - A callback URI for the notification

2. If the request is accepted, the AMF shall include a HTTP Location header to provide the location of a newly created resource (subscription) together with the status code 201 indicating the requested resource is created in the response message.

5.2.2.4.3 NonUeN2InfoUnSubscribe

5.2.2.4.3.1 General

The NonUeN2InfoUnSubscribe service operation is used by a NF Service Consumer (e.g. CBCF or PWS-IWF) to unsubscribe to the AMF to stop notifying N2 information of a specific type (e.g. PWS Indications).

The NF Service Consumer shall use the HTTP method DELETE with the URI of the "Non UE N2 Message Notification Individual Subscription" resource (See clause 6.1.3.10.3.1), to request the deletion of the subscription for non UE specific N2 information notification, towards the AMF. See also Figure 5.2.2.4.3.1-1.

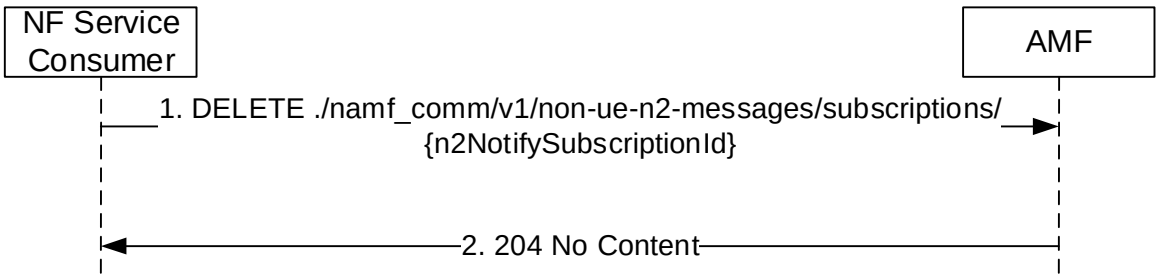

Figure 5.2.2.4.3.1-1 NonUeN2InfoUnSubscribe for Non UE Specific Information

1. The NF Service Consumer shall send a DELETE request to delete an existing subscription resource in the AMF.
2. If the request is accepted, the AMF shall reply with the status code 204 indicating the resource identified by subscription ID is successfully deleted, in the response message.

5.2.2.4.4 NonUeN2InfoNotify

5.2.2.4.4.1 General

The NonUeN2InfoNotify service operation is used during the following procedures:

- Obtaining non-UE associated network assistance data (See clause 4.13.5.6 in 3GPP TS 23.502 [3])
- Receiving PWS related events from the NG-RAN

The NonUeN2InfoNotify service operation is invoked by the AMF to notify a NF Service Consumer that subscribed Non-UE N2 information has been received from the 5G-AN.

The AMF shall use HTTP POST method to the N2Info Notification URI provided by the NF Service Consumer via NonUeN2InfoSubscribe service operation (See clause 5.2.2.4.2). See also Figure 5.2.2.4.4.1-1.

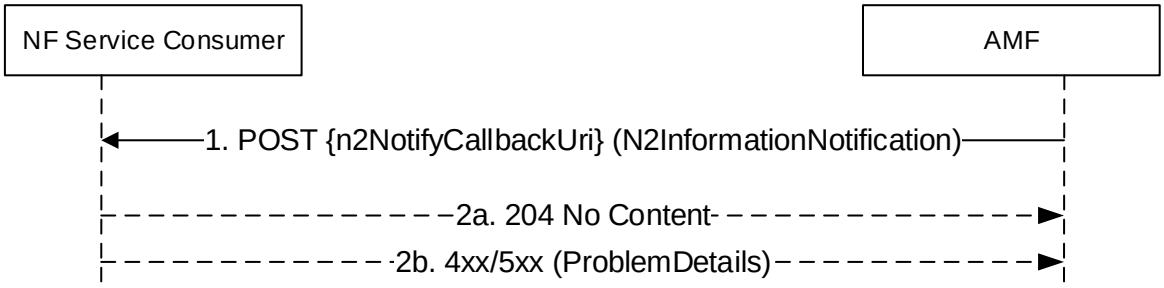

Figure 5.2.2.4.4.1-1 Non-UE N2 Information Notify

1. The AMF shall send a HTTP POST request to the N2Info Notification URI, and the payload body of the POST request shall contain a N2INformationNotification data structure, with the N2 information that was subscribed by the NF Service Consumer.

2a. On success, "204 No Content" shall be returned and the payload body of the POST response shall be empty.

2b. On failure, one of the HTTP status code listed in Table 6.1.5.3.3.1-2 shall be returned. The message body shall contain a ProblemDetails object with "cause" set to one of the corresponding application errors listed in Table 6.1.5.3.3.1-2.

5.2.2.4.4.2 Using NonUeN2InfoNotify during Location Services procedures

The NonUeN2InfoNotify service operation is invoked by a NF Service Producer, i.e. the AMF, towards the NF Service Consumer, e.g. the LMF, to notify the assistance data received from the 5G-AN.

The requirements specified in clause 5.2.2.4.4.1 shall apply with the following modifications:

1. If the corresponding N2 notification URI is not available, the AMF shall retrieve the NF profile of the NF Service Consumer (e.g. the LMF) from the NRF using the NF Instance Identifier received during "Obtaining Non UE Associated Network Assistance Data Procedure" (see clause 5.2.2.4.1.2), and further identify the corresponding service instance if Service Instance Identifier was also received, and fetch N2 Notification URI from the default subscription registered with "N2_INFORMATION" notification type and "NRPPa" information class (See Table 6.2.6.2.3-1 and Table 6.2.6.2.4-1 of 3GPP TS 29.510 [29]).
2. Same as step 1 of Figure 5.2.2.4.4.1-1, the payload shall contain network assistance data.

5.2.2.4.4.3 Use of NonUeN2InfoNotify for PWS related events

The NonUeN2InfoNotify service operation shall be used during the following PWS related events:

1) The AMF has received a Write-Replace-Warning-Confirm response or a PWS-Cancel-Confirm response from the NG-RAN over N2.

   Upon receiving the N2 Message Content the RAN Nodes return a response which may include the *Broadcast Completed Area List* IE or the *Broadcast Cancelled Area List* IE, depending on the *Message Type* IE. The AMF may aggregate the lists it receives from the RAN Nodes for the same request.

   If the *Send-Write-Replace-Warning Indication* IE was present in the Write-Replace-Warning Request message, then the AMF may forward the *Broadcast Completed Area List* IE(s) to the NF Service Consumer.

   If the *Send-Stop-Warning Indication* IE was present in the Stop-Warning-Request message, then the AMF may forward the *Broadcast Cancelled Area List* IE(s) to the NF Service Consumer. If the NG-RAN node(s) have

responded without the *Broadcast Cancelled Area List* IE then the AMF shall include the NG-RAN node ID(s) in "bcEmptyAreaList" attribute in the request body.

2) The AMF has received a Restart Indication or a Failure Indication from a NG-RAN Node. The AMF shall forward the Restart Indication or Failure Indication to the NF Service Consumer.

The requirements specified in clause 5.2.2.4.4.1 shall apply with the following modifications:

1. Same as step 1 of Figure 5.2.2.4.4.1-1, the request body shall include the PWS related N2 information.

5.2.2.5 AMF Status Change Operations

5.2.2.5.1 AMFStatusChangeSubscribe

5.2.2.5.1.1 General

This service operation is used by a NF Service Consumer to subscribe the status change of the AMF.

The AMFStatusChangeSubscribe service operation is used during the following procedure:

- AMF planned removal procedure (see 3GPP TS 23.501 [2], clause 5.21.2.2)

5.2.2.5.1.2 Creation of a subscription

This service operation creates a subscription so a NF Service Consumer can request to be notified when the status of the AMF is changed.

It is executed by creating a new individual resource under the collection resource "subscriptions". The operation shall be invoked by issuing a POST request on the URI of the "subscriptions collection" resource (See clause 6.1.3.6.3.1).

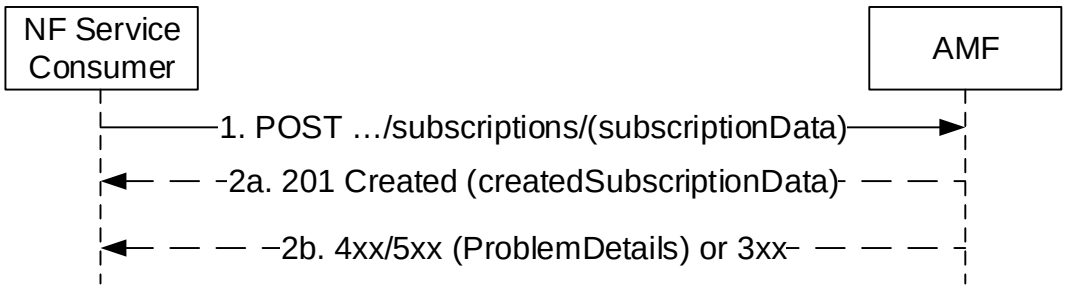

Figure 5.2.2.5.1.1-1 NF Service Consumer Subscription to Notifications

1. The NF Service Consumer shall send a POST request to the resource URI representing the "subscriptions" collection resource. The request body shall include the data indicating the GUAMI(s) supported by the AMF that the NF Service Consumer is interested in receiving the related status change notification. The request body also contains a callback URI, where the NF Service Consumer shall be prepared to receive the actual notification from the AMF (see AMFStatusChangeNotify operation in clause 5.2.2.5.3).

2a. On success, the AMF shall include a HTTP Location header to provide the location of a newly created resource (subscription) together with the status code 201 indicating the requested resource is created in the response message.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.6.3.1-3 shall be returned. For a 4xx/5xx response, the message body containing a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.6.3.1-3.

5.2.2.5.1.3 Modification of a subscription

This service operation updates the subscription data of an NF Service Consumer previously subscribed in the AMF by providing the updated subscription data to the AMF. The update operation shall apply to the whole subscription data (complete replacement of the existing subscription data by a new subscription data).

The NF Service Consumer shall issue an HTTP PUT request, towards the URI of the "individual subscription" resource (See clause 6.1.3.7.3.2), as shown in Figure 5.2.2.5.1.3-1:

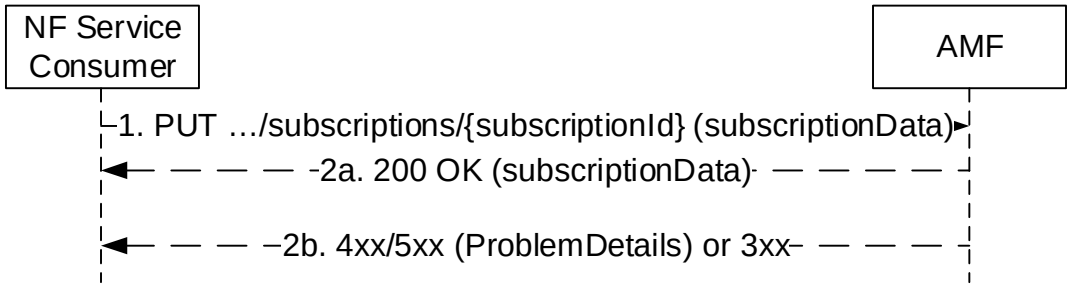

Figure 5.2.2.5.1.3-1 Subscription Data Complete Replacement

1. The NF Service Consumer shall send a PUT request to the resource URI representing the individual subscription. The request body shall include a representation of subscription data to replace the previous subscription data in the AMF.

2a. On success, "200 OK" shall be returned, the payload body of the PUT response shall contain the representation of the replaced resource.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.7.3.2-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.7.3.2-3.

5.2.2.5.2 AMFStatusChangeUnSubscribe

5.2.2.5.2.1 General

This service operation removes an existing subscription to notifications.

The AMFStatusChangeUnSubscribe service operation is used during the following procedure:

- AMF planned removal procedure (see 3GPP TS 23.501 [2], clause 5.21.2.2)

It is executed by deleting a given resource identified by a "subscriptionId". The operation is invoked by issuing a DELETE request on the URI of the specific " individual subscription" resource (See clause 6.1.3.7.3.1).

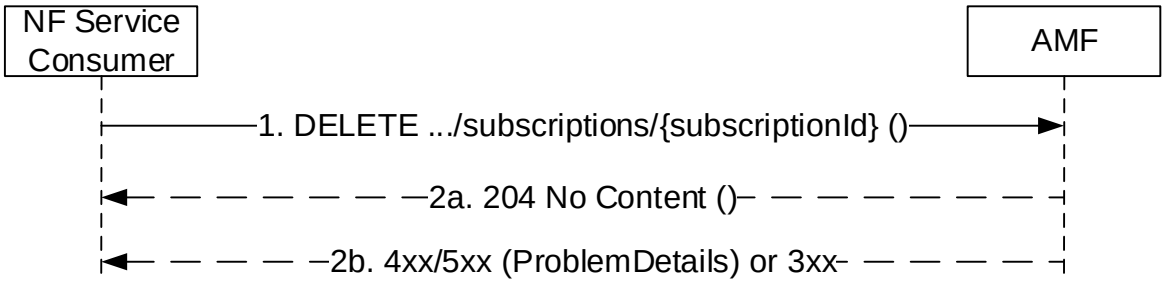

Figure 5.2.2.5.2.1-1: NF Service Consumer Unsubscription to Notifications

1. The NF Service Consumer shall send a DELETE request to the resource URI representing the individual subscription. The request body shall be empty.

2a. On success, "204 No Content" shall be returned. The response body shall be empty.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.7.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.7.3.1-3.

5.2.2.5.3 AMFStatusChangeNotify

5.2.2.5.3.1 General

This service operation notifies each NF Service Consumer that was previously subscribed to receiving notifications of the status change of the AMF (e.g. AMF unavailable). The notification is sent to a callback URI that each NF Service Consumer provided during the subscription (see AMFStatusChangeSubscribe operation in 5.2.2.5.1).

The AMFStatusChangeNotify service operation is used during the following procedure:

- AMF planned removal procedure (see 3GPP TS 23.501 [2], clause 5.21.2.2)

The operation is invoked by issuing a POST request to each callback URI of the different NF Service Consumer.

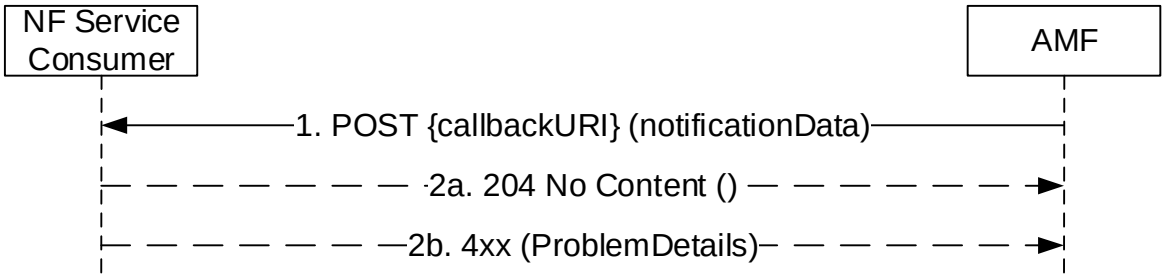

Figure 5.2.2.5.3.1-1: AMF Notifications

1. The AMF shall send a POST request to the callback URI. The request body shall include the GUAMI(s) and the related status change, GUAMI(s) is indicated by the NF Service Consumer during the subscription operation. For network deployment without UDSF case, the target AMF Name which is to serve the user of the indicated GUAMI(s) is also included.

2a. On success, "204 No content" shall be returned by the NF Service Consumer.

2b. On failure, one of the HTTP status code listed in Table 6.1.5.2.3.1-2 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.5.2.3.1-2.

5.2.2.6 EBIAssignment

5.2.2.6.1 General

The EBIAssignment service operation is used during the following procedures (see 3GPP TS 23.502 [3], clause 4.11.1.4):

- UE requested PDU Session Establishment including Request Types "Initial Request" and "Existing PDU Session" (Non-roaming and Roaming with Local Breakout (see 3GPP TS 23.502 [3], clause 4.3.2.2.1).

- UE requested PDU Session Establishment including Request Types "Initial Request" and "Existing PDU Session" (Home-routed Roaming (see 3GPP TS 23.502 [3], clause 4.3.2.2.2).

- UE or network requested PDU Session Modification (non-roaming and roaming with local breakout) (see 3GPP TS 23.502 [3], clause 4.3.3.2).

- UE or network requested PDU Session Modification (home-routed roaming) (see 3GPP TS 23.502 [3], clause 4.3.3.3).

- UE Triggered Service Request (see 3GPP TS 23.502 [3], clause 4.2.3.2) to move PDU Session(s) from untrusted non-3GPP access to 3GPP access.

- Network requested PDU Session Modification, when the SMF needs to release the assigned EBI from a QoS flow (see 3GPP TS 23.502 [3], clause 4.11.1.4.3).

The EBIAssignment service operation is invoked by a NF Service Consumer, e.g. a SMF, towards the NF Service Producer, i.e. the AMF, to request the AMF to allocate EPS bearer ID(s) towards EPS bearer(s) mapped from QoS flow(s) for an existing PDU Session for a given UE.

EBI allocation shall apply only to:

- QoS flows of Single Access PDU Session(s) via 3GPP access supporting EPS interworking with N26;
- Qos flows of Multi-Access PDU Session(s) supporting EPS interworking with N26, that are not only allowed over non-3GPP access.

EBI allocation shall not apply to:

- PDU Session(s) via 3GPP access supporting EPS interworking without N26, or;
- PDU Session(s) via non-3GPP access supporting EPS interworking;
- GBR QoS flow(s) that are only allowed over non-3GPP access in Multi-Access PDU Session(s) supporting EPS interworking.

The NF Service Consumer (e.g. the SMF) shall perform EBIAssignment service operation by invoking "assign-ebi" custom operation on the "individual ueContext" resource (See clause 6.1.3.2.4.3). See also Figure 5.2.2.6.1-1.

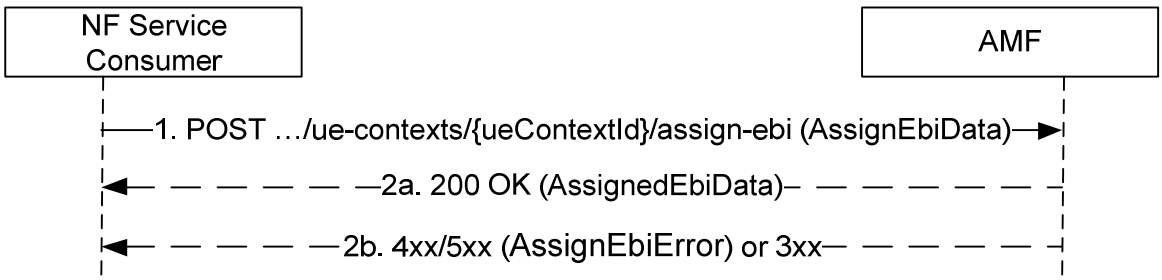

Figure 5.2.2.6.1-1 EBI Assignment

1. The NF Service Consumer, e.g. the SMF, shall invoke "assign-ebi" custom method on individual ueContext resource, which is identified by the UE's SUPI or PEI in the AMF. The NF Service consumer shall provide PDU Session ID, ARP list and S-NSSAI as input for the service operation.

2a. On success, the AMF shall assign EBI for each ARP in received ARP list, if enough EBI(s) are available. If there is not enough EBI(s) available, the AMF may revoke already assigned EBI(s) based on the ARP(s) and the S-NSSAI of the PDU session for which the request was received, EBIs information in the UE context and local policies. The AMF may only assign a subset of the requested EPS Bearer ID(s), e.g. when other PDU Sessions with higher ARP have occupied other available EPS Bearer IDs. If AMF has successfully assigned all or part of the requested EBI(s), the AMF shall respond with the status code 200 OK, together with the assigned EBI to ARP mapping(s), the list of ARPs for which the AMF failed to allocate an EBI (if any) and the list of EBI(s) released for this PDU session due to revocation based on ARP(s) and the S-NSSAI (if any).

   If the request contains "releasedEbiList", the AMF shall release the requested EBI(s). The AMF shall respond with the status code 200 OK and shall include the EBI(s) released in the "releasedEbiList" IE of the POST response body. The "releasedEbiList" in the request shall be handled before the EBI assignment in AMF.

   If the same EBI(s) are both in the "releasedEbiList"and "assignedEbiList", the NF sevice consumer considers that EBI(s) have been released and reassigned.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.2.4.3.2-2 shall be returned. For a 4xx/5xx response, the message body shall contain an AssignEbiError structure, including:

   - a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.2.4.3.2-2;
   - a failureDetails which describes the details of the failure including the list of ARPs for which the EBI assignment failed.

5.3 Namf_EventExposure Service

5.3.1 Service Description

The AMF may offer this service as a Service Producer to enable an NF to subscribe to event notifications on its own or on behalf of another NF and get notified about an event. The known Service Consumers are NEF, SMF, UDM and NWDAF. See also clause 5.34.7 of 3GPP TS 23.501 [2] and clauses 4.15.1, 4.15.3.2, 4.15.4.2 and 5.2.2.3.1 of 3GPP TS 23.502 [3] , clause 6.2.2 in 3GPP TS 23.288 [38].

The following events are provided by Namf_EventExposure Service:

Event: Location-Report

A NF subscribes to this event to receive the Last Known Location of a UE or a group of UEs or any UE, and Updated Location of any of these UEs when AMF becomes aware of a location change of any of these UEs with the granularity as requested.

This event implements the "Location Reporting" event in table 4.15.3.1-1 of 3GPP TS 23.502 [3].

UE Type: One UE, Group of UEs, any UE

Report Type: One-Time Report, Continuous Report (See NOTE 1), Periodic Report (See NOTE 1 and 2)

Input: UE-ID(s), "ANY_UE", optional filters: TAI, Cell-ID, N3IWF, UE-IP, UDP-PORT, TNAP ID, TWAP ID, Global Line Id

Notification; UE-ID, filtered updated location (TAI, Cell-ID for 3GPP access, most recent N3IWF node, UE local IP address and UDP source port number for non-3GPP access, TNAP ID, TWAP ID, Global Line Id).

NOTE 1: Support of Continuous Report or Periodic Report should be controlled by operator policy.

NOTE 2: For Periodic Report, UE Last Known Location is reported if the UE is in CM-IDLE state when the report is being generated.

Event: Presence-In-AOI-Report

A NF subscribe to this event to receive the current present state of a UE or a group of UEs or any UE in a specific Area of Interest (AOI), and notification when a specified UE enters or leaves the specified area. The area could be identified by a TA list, an area ID or specific interested area name like "LADN".

UE Type: One UE, Group of UEs, any UE

Report Type: One-Time Report, Continuously Report

Input: UE ID(s), "ANY_UE", Area identifier (a TA list, an area Id or "LADN"), S-NSSAI, NSI ID.

Notification: UE-ID(s), Area identifier, Presence Status (IN/OUT/UNKNOWN)

Event: Time-Zone-Report

A NF subscribes to this event to receive the current time zone of a UE or a group of UEs, and updated time zone of the UE or any UE in the group when AMF becomes aware of a time zone change of the UE.

UE Type: One UE, Group of UEs

Report Type: One-Time Report, Continuous Report

Input: UE ID(s)

Notification; UE-ID, most recent time-zone

Event: Access-Type-Report

A NF subscribes to this event to receive the current access type(s) of a UE or a group of UEs or any UE, and updated access type(s) of any of the UEs when AMF becomes aware of the access type change of any of

these UEs. The area could be identified by a TA list, an area ID or specific interested area name like "LADN".

UE Type: One UE, Group of UEs, any UE

Report Type: One-Time Report, Continuous Report

Input: UE ID(s), "ANY_UE", optionally filters: Area identifier (a TA list, an area Id or "LADN")

Notification; UE ID, most recent access-types (3GPP, Non-3GPP)

Event: Registration-State-Report

A NF subscribes to this event to receive the current registration state of a UE or a group of UEs or any UE, and report for updated registration state of any of these UEs when AMF becomes aware of a registration state change of any of these UEs. The area could be identified by a TA list, an area ID or specific interested area name like "LADN".

UE Type: One UE, Group of UEs, any UE

Report Type: One-Time Report, Continuous Report

Input: UE ID(s), "ANY_UE", optionally filters: Area identifier (a TA list, an area Id or "LADN")

Notification; UE ID, most recent registration state (REGISTERED/DEREGISTERED) with access type

Event: Connectivity-State-Report

A NF subscribes to this event to receive the current connection management state of a UE or a group of UEs, and report for updated connection management state of a UE or any UE in the group when AMF becomes aware of a connection management state change of the UE.

UE Type: One UE, Group of UEs

Report Type: One-Time Report, Continuous Report

Input: UE ID(s)

Notification; UE ID, most recent connection management state (IDLE/CONNECTED) with access type

Event: Reachability-Report

A NF subscribes to this event for "UE Reachability Status Change" to receive the current reachability state of a UE or a group of UEs in the AMF, and report for updated reachability state of a UE or any UE in the group when AMF becomes aware of a reachability state change of the UEs between REACHABLE, UNREACHABLE, REGULATORY_ONLY.

An NF subscribes to this event for "UE Reachable for DL Traffic" to receive reports of a UE or a group of UEs when the UE becomes reachable for sending downlink data. In this case, the event is detected when the UE transitions to CM-CONNECTED mode or when the UE will become reachable for paging, as specified in table 4.15.3.1-1, clauses 4.2.5 and 4.3.3 of 3GPP TS 23.502 [3].

UE Type: One UE, Group of UEs

Report Type: One-Time Report, Continuous Report

Input: UE ID(s), (optional) Reachability Filter

Notification; UE ID, AMF Id, most recent reachability state (REACHABLE/UNRACHABLE/REGULATORY_ONLY).

Event: Communication-Failure-Report

A NF subscribes to this event to receive the Communication failure report of a UE or group of UEs or any UE, when the AMF becomes aware of a RAN or NAS failure event.

This event implements the "Communication failure" event in table 4.15.3.1-1 of 3GPP TS 23.502 [3].

UE Type: One UE, Group of UEs, any UE

Report Type: One-Time Report, Continuous Report

Input: UE ID(s), "ANY_UE", optionally filters: Area identifier (a TA list, an area Id or "LADN")

Notification; UE ID, RAN/NAS release code.

Event: UEs-In-Area-Report

A NF subscribes to this event to receive the number of UEs in a specific area. A NF may ask AMF for the UEs within the area based on Last Known Location or it may request AMF to actively look for the UEs within the area based on Current Location.

This event implements the "Number of UEs present in a geographical area" event in table 4.15.3.1-1 of 3GPP TS 23.502 [3].

UE Type: any UE

Report Type: One-Time Report (See NOTE 3), Continuous Report (See NOTE 4), Periodic Report (See NOTE 4) Input: Area identified in a TA List

Notification: Number of UEs in the area

NOTE 3: For an Immediate Report, UE Last Known Location is used to count the UEs within the area.

NOTE 4: Support of Continuous Report or Periodic Report should be controlled by operator.

Event: Loss-of-Connectivity

An NF subscribes to this event to receive the event report of a UE or group of UEs when AMF detects that a target UE is no longer reachable for either signalling or user plane communication. Such condition is identified when Mobile Reachable timer expires in the AMF (see 3GPP TS 23.501 [2]), when the UE detaches and when AMF deregisters from UDM for an active UE. If the UE is already not reachable for either signalling or user plane communication when the event is subscribed, the AMF reports the event directly.

This event implements the "Loss of Connectivity" event in table 4.15.3.1-1 of 3GPP TS 23.502 [3].

UE Type: One UE, Group of UEs.

Report Type: One-Time Report, Continuous Report

Input: UE ID(s)

Notification; UE ID.

Event: 5GS-User-State-Report

A NF subscribes to this event to receive the 5GS User State of a UE.

UE Type: One UE

Report Type: One-Time Report

Input: UE ID(s)

Notification; UE ID, 5GS User State

Event: Availability-after-DDN-failure

A NF subscribes to this event to be notified about the Availability of a UE after a DDN failure.

UE Type: One UE, Group of UEs

Report Type: One-Time Report, Continuous Report

Input: UE ID(s)

Notification: UE ID(s)

Event: Type-Allocation-Code-Report

A NF subscribes to this event to receive the TAC of a UE or a group of UEs or any UE.

UE Type: One UE, Group of UEs, any UE

Report Type: One-Time Report, Continuous Report

Input: UE ID(s),"ANY_UE", optionally filters: TAI, Area identifier (a TA list, an area Id or "LADN")

Notification: UE ID(s), TAC(s)

Event: Frequent-Mobility-Registration-Report

A NF subscribes to this event to receive the number of mobility registration during a period for a UE or a group of UEs or any UE.

UE Type: One UE, Group of UEs, any UE

Report Type: One-Time Report, Continuous Report

Input: UE ID(s), expiry time, "ANY_UE", optionally filters: Area identifier (a TA list, an area Id or "LADN")

Notification: UE ID(s), Frequent Registration

5.3.2 Service Operations

5.3.2.1 Introduction

For the Namf_EventExposure service the following service operations are defined:

- Subscribe;
- Unsubscribe;
- Notify.

5.3.2.2 Subscribe

5.3.2.2.1 General

The Service Operation is used by a NF Service Consumer (e.g. NEF) to subscribe to an event(s) for one UE, group of UE(s) or any UE.

5.3.2.2.2 Creation of a subscription

The Subscribe service operation is invoked by a NF Service Consumer, e.g. NEF, towards the AMF, when it needs to create a subscription to monitor at least one event relevant to the AMF. The NF Service Consumer may subscribe to multiple events in a subscription. A subscription may be associated with one UE, a group of UEs or any UE.

The NF Service Consumer shall request to create a new subscription by using HTTP method POST with URI of the subscriptions collection, see clause 6.2.3.2.

The NF Service Consumer shall include the following information in the HTTP message body:

- NF ID, indicates the identity of the network function instance initiating the subscription;
- Subscription Target, indicates the target(s) to be monitored, as one of the following types:
  - A specific UE, identified with a SUPI, a PEI or a GPSI;

- A group of UEs, identified with a group identity;
- Any UE, identified by the "anyUE" flag.

- Notification URI, indicates the address to deliver the event notifications generated by the subscription;
- Notification Correlation ID, indicates the correlation identity to be carried in the event notifications generated by the subscription;
- List of events to be subscribed;
- Event Types per event, as specified in clause 5.3.1.
- Reference Id per event, indicates the value of the Reference Id associated with the event to be monitored. If provided, the Reference Id shall be included in the reports triggered by the event.

The NF Service Consumer may include the following information in the HTTP message body:

- Immediate Report Flag per event, indicates an immediate report to be generated with current event status;
- Event Trigger, indicates how the events shall be reported (One-time Reporting or Continuously Reporting).
- Maximum Number of Reports, defines the maximum number of reports after which the event subscription ceases to exist;
- Expiry, defines maximum duration after which the event subscription ceases to exist;
- Sampling ratio, defines the random subset of UEs among target UEs, and AMF only report the event(s) related to the selected subset of UEs;
- Periodic Report Flag per event, indicates the report to be generated periodically;
- Repetition Period, defines the period for periodic reporting;
- Event Filter per applicable event, defines further options on how the event shall be reported.

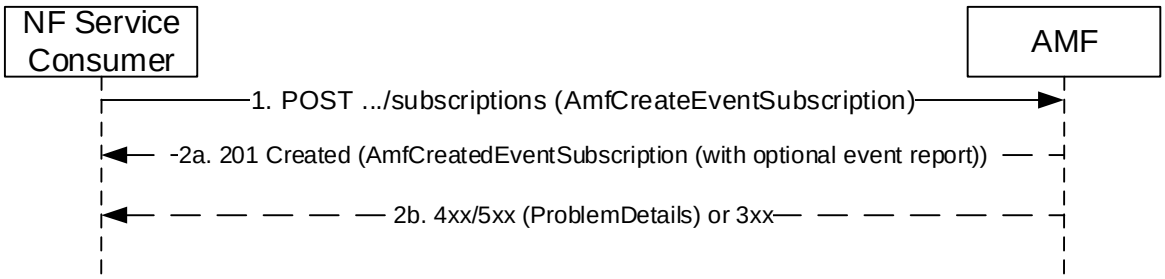

Figure 5.3.2.2.2-1 Subscribe for Creation

1. The NF Service Consumer shall send a POST request to create a subscription resource in the AMF. The payload body of the POST request shall contain a representation of the individual subscription resource to be created. The request may contain an expiry time, suggested by the NF Service Consumer as a hint, representing the time upto which the subscription is desired to be kept active and the time after which the subscribed event(s) shall stop generating report.

2a. On success, the request is accepted, the AMF shall include a HTTP Location header to provide the location of a newly created resource (subscription) together with the status code 201 indicating the requested resource is created in the response message. If the NF Service Consumer has included the immediateFlag with value as "true" in the event subscription, the AMF shall include the current status of the events subscribed, if available (e.g. last known location information is included if the subscribed event is LOCATION_REPORT). If the NF Service Consumer has set the event reporting option as ONE_TIME and if the AMF has included the current status of the events subscribed in the response, then the AMF shall not do any subsequent event notification for the events given in the AmfCreateEventSubscription parameter.

The response, based on operator policy and taking into account the expiry time included in the request, may contain the expiry time, as determined by the AMF, after which the subscription becomes invalid. Once the

subscription expires, if the NF Service Consumer wants to keep receiving notifications, it shall create a new subscription in the AMF. The AMF shall not provide the same expiry time for many subscriptions in order to avoid all of them expiring and recreating the subscription at the same time. If the expiry time is not included in the response, the NF Service Consumer shall consider the subscription to be valid without an expiry time.

If the sampling ratio ("sampRatio") attribute is included in the subscription, the AMF shall select a random subset of UEs among target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.2.3.2.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.2.3.2.3.1-3.

5.3.2.2.3 Modification of a subscription

The Subscribe service operation is invoked by a NF Service Consumer, e.g. NEF, towards the AMF, when it needs to modify an existing subscription previously created by itself at the AMF.

The NF Service Consumer shall modify the subscription by using HTTP method PATCH with the URI of the individual subscription resource (see clause 6.2.3.3) to be modified.

See also Figure 5.3.2.2.3-1 below.

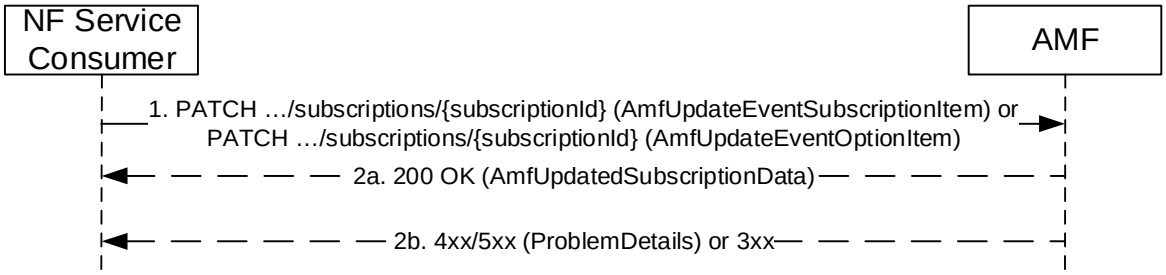

Figure 5.3.2.2.3-1 Modification of a Subscription

1. The NF Service Consumer shall send a PATCH request to modify a subscription resource in the AMF. The modification may be for the events subscribed or for updating the event options.

2a. On success, the request is accepted, the AMF shall return the representation of the modified subscription resource or its sub-resource together with the status code 200 OK. When the PATCH request is for modifying the expiry attribute of the options IE of the subscription, then the AMF based on operator policies and taking into account the expiry time included in the request, shall include an expiry time, after which the subscription becomes invalid. Once the subscription expires, if the NF Service Consumer wants to keep receiving notifications, it shall create a new subscription in the AMF, as specified in clause 5.3.2.2.2. The AMF shall not provide the same expiry time for many subscriptions in order to avoid all of them expiring and recreating the subscription at the same time.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.2.3.3.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.2.3.3.3.1-3.

5.3.2.3 Unsubscribe

5.3.2.3.1 General

The Unsubscribe service operation is invoked by a NF Service Consumer, e.g. NEF, towards the AMF, to remove an existing subscription previously created by itself at the AMF.

The NF Service Consumer shall unsubscribe to the subscription by using HTTP method DELETE with the URI of the individual subscription resource (see clause 6.2.3.3) to be deleted.

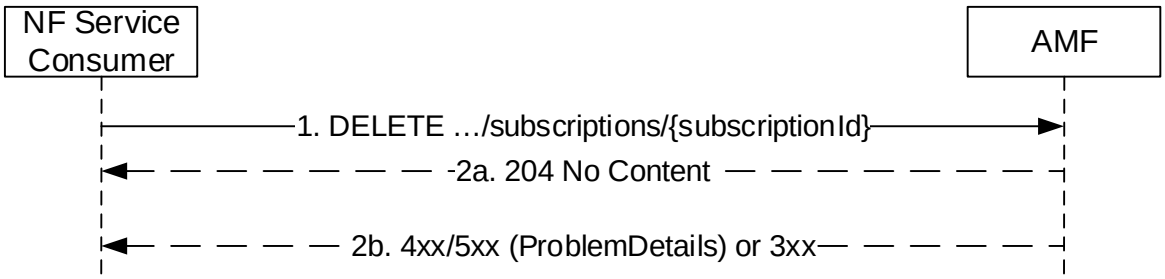

Figure 5.3.2.3.1-1 Unsubscribe a subscription

1. The NF Service Consumer shall send a DELETE request to delete an existing subscription resource in the AMF.

2a. On success, the request is accepted, the AMF shall reply with the status code 204 indicating the resource identified by subscription ID is successfully deleted in the response message.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.2.3.3.3.2-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.2.3.3.3.2-3.

5.3.2.4 Notify

5.3.2.4.1 General

The Notify service operation is invoked by the AMF, to send a notification, towards the notification URI, when certain event included in the subscription has taken place.

The AMF shall use the HTTP method POST, using the notification URI received in the subscription creation as specified in clause 5.3.2.2.2, including e.g. the subscription ID, Event ID(s) for which event has happened, notification correlation ID provided by the NF service consumer at the time of event subscription, to send a notification. See Figure 5.3.2.4.1-1.

Additionally, the Notify service operation shall also be invoked by the AMF, when there is a change of AMF during UE mobility procedures and if the subscription Id changes (i.e. Registration procedures and Handover procedures).

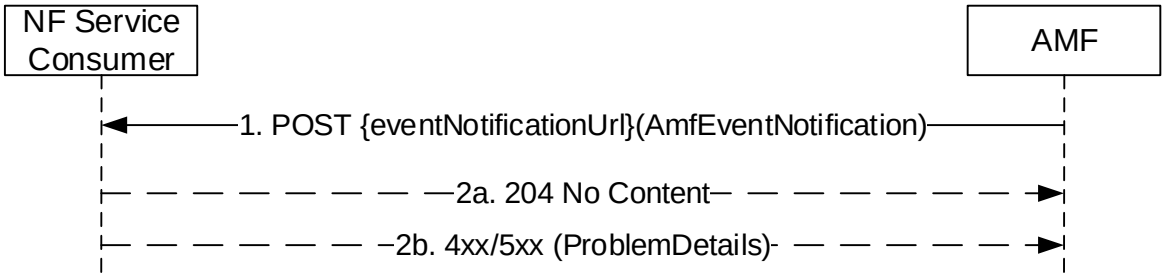

Figure 5.3.2.4.1-1 Notify

1. The AMF shall send a POST request to send a notification.

2a. On success, "204 No content" shall be returned by the NF Service Consumer.

2b. On failure, the appropriate HTTP status code (e.g. "403 Forbidden") indicating the error shall be returned and appropriate additional error information should be returned.

5.4 Namf_MT Service

5.4.1 Service Description

Namf_MT service allows a NF to request information related to capabilities to send MT signalling or data to a target UE. The following are the key functionalities of this NF service

- paging UE if UE is in IDLE state and respond other NF after the UE enters CM-CONNECTED state.
- response to the requester NF if UE is in CONNECTED state.
- providing the terminating domain selection information for IMS voice to the consumer NF.

5.4.2 Service Operations

5.4.2.1 Introduction

For the Namf_MT Service the following service operations are defined:

- EnableUEReachability
- ProvideDomainSelectionInfo

5.4.2.2 EnableUEReachability

5.4.2.2.1 General

The EnableUEReachability service operation is used in the following procedure:

- MT SMS over NAS in CM-IDLE state (see 3GPP TS 23.502 [3], clause 4.13.3.6), or in CM-CONNECTED state (see 3GPP TS 23.502 [3], clause 4.13.3.7).
- UPF anchored Mobile Terminated Data Transport in Control Plane CIoT 5GS Optimisation (see clause 4.24.2 of 3GPP TS 23.502 [3]).

The EnableUEReachability service operation shall be invoked by the NF Service Consumer (e.g. SMSF, SMF) to enable the reachability of the UE.

The NF Service Consumer shall invoke the service by using the HTTP method PUT, towards the URI of a "ueReachInd" resource as specified in clause 6.3.3.2. See also figure 5.4.2.2.1-1.

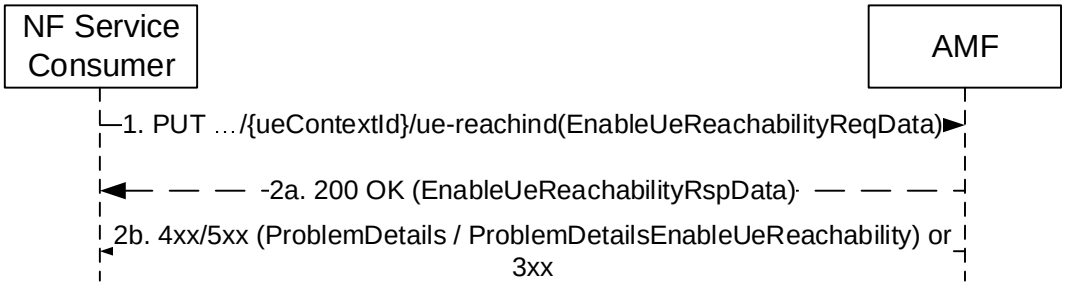

Figure 5.4.2.2.2-1: NF Service Consumer enables the reachability of the UE

1. The NF Service Consumer sends a PUT request to the resource representing the ueReachInd resource of the AMF. The payload body of the PUT request shall contain an "EnableUeReachabilityReqData" object.

2a. On success:

- if the UE is in CM-CONNECTED state, the AMF shall immediately respond using "200 OK" status code, with payload containing an "EnableUeReachabilityRspData" object.

- if the UE is in CM-IDLE state and the NAS message is to be sent over via 3GPP access, the AMF shall page the UE. When UE becomes CM-CONNECTED, "200 OK" shall be returned with payload containing an "EnableUeReachabilityRspData" object.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.3.3.2.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails or ProblemDetailsEnableUeReachability structure with the "cause" attribute set to one of the application error listed in Table 6.3.3.2.3.1-3.

The AMF shall respond with the status code "403 Forbidden", if the UE is in a Non-Allowed Area and the service request is not for regulatory prioritized service. The AMF shall set the application error as "UE_IN_NON_ALLOWED_AREA" in POST response body.

5.4.2.3 ProvideDomainSelectionInfo

5.4.2.3.1 General

The ProvideDomainSelectionInfo service operation shall be invoked by the NF Service Consumer (e.g. UDM) to get the UE information for terminating domain selection of IMS voice, including following information:

- Indication of supporting IMS voice over PS Session;
- Time stamp of the last radio contact with the UE;
- Current Access type and RAT type

The NF Service Consumer shall invoke the service by using the HTTP GET towards the URI of the "UeContext" resource (See clause 6.3.3.3.3.1). See also figure 5.4.2.3.1-1.

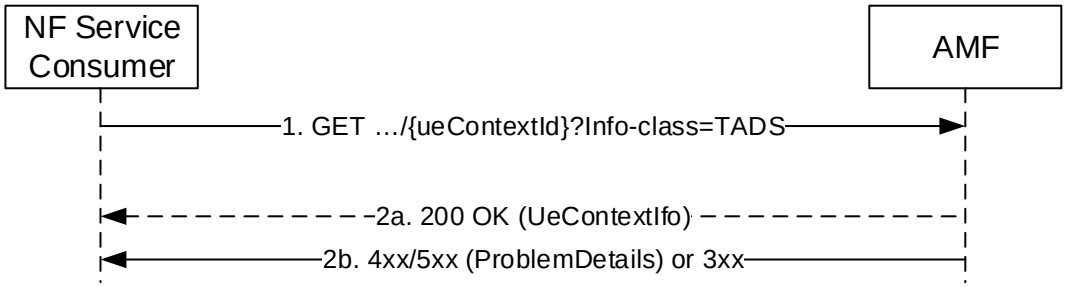

Figure 5.4.2.3.1-1: Provide UE Information for Terminating Domain Selection

1. The NF Service Consumer shall send a GET request to the URI of the "UeContext" resource on the AMF, with query parameter "info-class" set to value "TADS".

2a. On success, the AMF shall return "200 OK" status code with payload containing an "UeContextInfo" data structure including UE information for terminating domain selection for IMS voice.

2b. On failure, one of the HTTP status code listed in Table 6.3.3.3.3.1-3 shall be returned. The message body shall contain a ProblemDetails object with "detail" set to one of the corresponding application errors listed in Table 6.3.3.3.3.1-3.

5.5 Namf_Location Service

5.5.1 Service Description

The Namf_Location service is used by NF service consumers to request the AMF for initiating positioning requests and provide the location information. It is also used to subsequently notify the location change events towards the NF service consumers. The following are the key functionalities of this NF service:

- Allow NFs to request the current geodetic and optionally civic location of a target UE.
- Allow NFs to be notified of event information related to emergency sessions.

- Allow NFs to request Network Provided Location Information (NPLI) and/or local time zone corresponding to the location of a target UE.

5.5.2 Service Operations

5.5.2.1 Introduction

For the Namf_Location Service the following service operations are defined:

- ProvidePositioningInfo;
- EventNotify; and
- ProvideLocationInfo.
- CancelLocation

5.5.2.2 ProvidePositioningInfo

5.5.2.2.1 General

The ProvidePositioningInfo service operation is used in the following procedure:

- 5GC-MT-LR Procedure without UDM Query (see 3GPP TS 23.273 [42], clause 6.10.2)
- 5GC-MT-LR Procedure (see 3GPP TS 23.273 [42], clause 6.1)
- Initiation and Reporting of Location Events (see 3GPP TS 23.273 [42], clause 6.3.1)
- Location Continuity for Handover of an Emergency session from NG-RAN (see 3GPP TS 23.273 [42], clause 6.10.3)

The ProvidePositioningInfo service operation shall be invoked by the NF Service Consumer (e.g. GMLC) to request the current or deferred geodetic and optionally civic location of the UE. The service operation triggers the AMF to invoke the service towards the LMF.

The NF Service Consumer shall invoke the service operation by sending POST to the URI of the "provide-pos-info" custom operation on the "Individual UE Context" resource (See clause 6.4.3.2.4.2). See also figure 5.5.2.2.1-1.

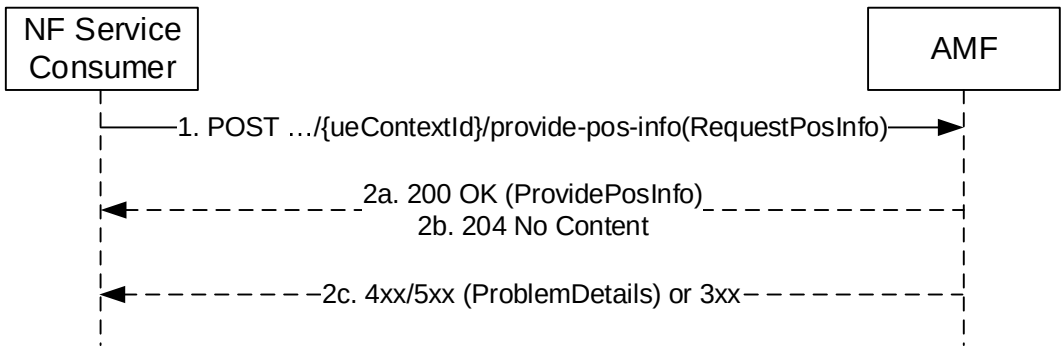

Figure 5.5.2.2.1-1: NF Service Consumer requests the positioning information of the UE

1. The NF Service Consumer shall send a POST request to the resource URI of "provide-pos-info" custom operation of the "Individual UE context" resource of the AMF. The payload body of the POST request may contain an indication of a positioning request from an emergency services or commercial services client, the

required QoS and Supported GAD shapes. If the NF service consumer wants the location change information or deferred location information to be notified (e.g. during a handover procedure or for activation or completion of deferred location), it also provides a callback URI on which the EventNotify service operation is executed (see clause 5.5.2.3).

2a. On success, "200 OK" shall be returned, the payload body containing the LCS correlation identifier, the location estimate, its age and accuracy and the information about the positioning method. If the request is invoked during a handover the response body shall also include the target AMF node identifier as specified in clause 6.10.3 of 3GPP TS 23.273 [42].

2b. On accept, "204 No Content" shall be returned to acknowledge that AMF supports a deferred location request and a deferred location is accepted as specified in step 6 of clause 6.3.1 of 3GPP TS 23.273 [42];

2c. On failure, one of the HTTP status code listed in Table 6.4.3.2.4.2.2-2 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.4.3.2.4.2.2-2.

5.5.2.3 EventNotify

5.5.2.3.1 General

The EventNotify service operation is used in the following procedure:

- 5GC-NI-LR Procedure (see 3GPP TS 23.273 [42], clause 6.10.1)
- Location Continuity for Handover of an Emergency session from NG-RAN (see 3GPP TS 23.273 [42], clause 6.10.3)
- Completion of a deferred location for the UE available event or activation of deferred location for periodic location, area event triggered location or motion event triggered location (see 3GPP TS 23.273 [42], clause 6.3.1)

The EventNotify service operation notifies the NF Service Consumer (i.e. GMLC) about a UE location related event information related to emergency sessions or deferred location, i.e. the initiation, handover or termination of an emergency session or the completion or activation of deferred location. The notification is delivered to:

- the callback URI received from the GMLC during an earlier ProvidePositioningInfo service operation, if any;

Otherwise (if not available),

- the callback URI registered in the NRF, if the GMLC registered to the NRF with notification endpoints for location notifications (see clauses 6.1.6.2.4 and 6.1.6.3.4 of 3GPP TS 29.510 [29]);

Otherwise (if not available),

- GMLC URI locally provisioned in the AMF.

NOTE: During a handover procedure, both the source AMF and the target AMF can invoke the EventNotify service operation, based on the local configuration.

The operation is invoked by issuing a POST request to the callback URI of the NF Service Consumer (See clause 6.4.5.2.2). See also figure 5.5.2.3.1-1.

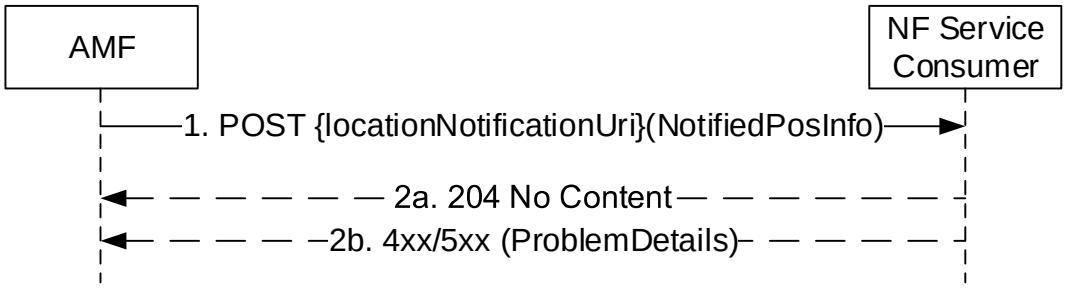

Figure 5.5.2.3.1-1: UE Location Notification

1. The AMF shall send a POST request to the callback URI provided by the NF service consumer determined as described above. The request body shall include the type of location related event and UE Identification (SUPI or PEI), and may include the GPSI, Geodetic Location, Civic Location, the Position methods used or a serving LMF identification for activation of periodic or triggered location.

2a. On success, "204 No content" shall be returned by the NF Service Consumer.

2b. On failure, the appropriate HTTP status code (e.g. "403 Forbidden") indicating the error shall be returned and appropriate additional error information should be returned.

5.5.2.4 ProvideLocationInfo

5.5.2.4.1 General

The ProvideLocationInfo service operation allows an NF Service Consumer (e.g. UDM) to request the Network Provided Location Information (NPLI) of a target UE.

The NF Service Consumer shall invoke the service operation by sending POST request to the URI of the "provide-loc-info" custom operation on the "Individual UE Context" resource (see clause 6.4.3.2.4.3), as shown in figure 5.5.2.4.1-1.

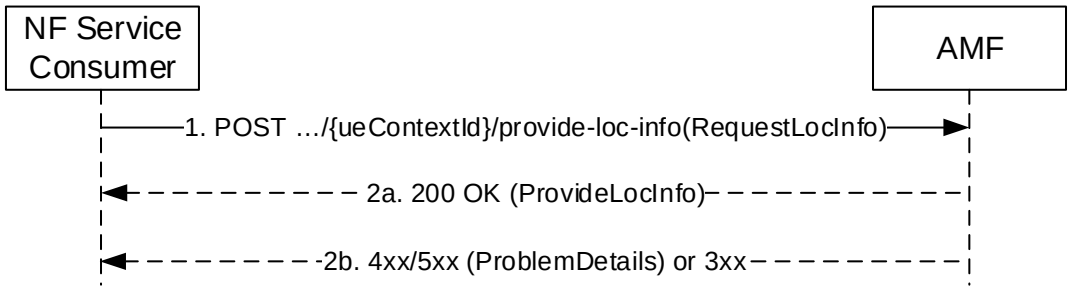

Figure 5.5.2.4.1-1: NF Service Consumer requests the Location Information of the UE

1. The NF Service Consumer shall send a POST request to the resource URI of "provide-loc-info" custom operation of the "Individual UE context" resource on the AMF. The payload body of the POST request shall contain a "requestLocInfo" data structure indicating the desired type of location information.

   If the NF Service Consumer desires the current location information of the target UE, it shall set "reqCurrentLoc" attribute to "true".

2a. On success, "200 OK" response shall be returned. The payload body of the response shall contain a "ProvideLocInfo" data structure including the Network Provide Location Information (NPLI) of the target UE.

   If "reqCurrentLoc" attribute is set to "true" and the UE is in CM-IDLE state, the AMF shall initiate a paging procedure to the UE. If the paging procedure is successful, the AMF shall return the current location information and set "currentLoc" attribute to "true" in the response; if the UE does not respond to the paging, the AMF shall provide the last known location and set "currentLoc" attribute to "false" in the response.

If "reqCurrentLoc" attribute is set to "true" and the UE is in CM-CONNECTED state, the AMF shall follow NG-RAN Location reporting procedure, as specified in clause 4.10 of 3GPP TS 23.502 [3], to trigger a single standalone report by setting "direct" event type in Location Reporting Control message. If NG-RAN reports current location of the UE, the AMF shall set "currentLoc" attribute to "true" in the response; if NG-RAN reports last known location of the UE with timestamp, the AMF shall set "currentLoc" attribute to "false" in the response.

2b. On failure, one of the HTTP status code listed in table 6.4.3.2.4.3.2-2 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in table 6.4.3.2.4.3.2-2.

5.5.2.5 CancelLocation

5.5.2.5.1 General

This service operation is used in the following procedure:

- Cancellation of Reporting of Location Events by an AF or External LCS Client (see 3GPP TS 23.273 [42], clause 6.3.3)

The CancelLocation service operation shall be invoked by the NF Service Consumer (e.g. GMLC) to cancel reporting periodic or events triggered location.

The NF Service Consumer shall invoke the service operation by sending a POST request to the URI of the "cancel-pos-info" custom operation on the "Individual UE Context" resource (See clause 6.4.3.2.4.4). See also figure 5.5.2.5.1-1.

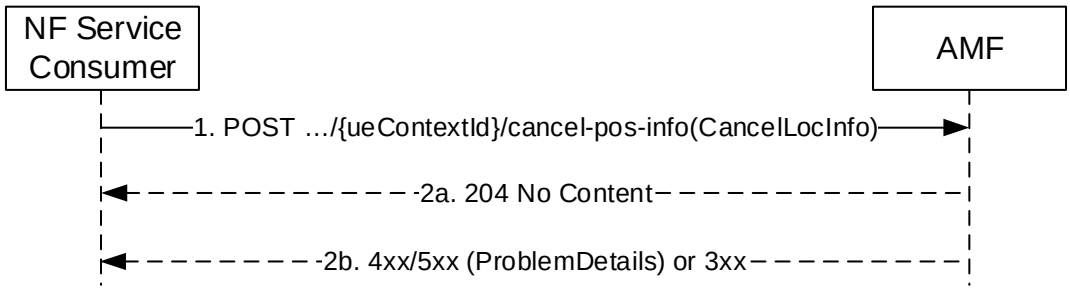

Figure 5.5.2.5.1-1: Cancellation of reporting periodic or events triggered location of the UE

1. The NF Service Consumer shall send a POST request to the resource URI of "cancel-pos-info" custom operation of the "Individual UE context" resource of the AMF. The payload body of the POST request shall contain a "CancelLocInfo" data structure indicating the desired cancellation of reporting periodic or events triggered location of the UE.

2a. On success, AMF responds with "204 No Content".

2b. On failure, one of the HTTP status code listed in Table 6.4.3.2.4.4-2 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application errors.

6 API Definitions

6.1 Namf_Communication Service API

6.1.1 API URI

The Namf_Communication shall use the Namf_Communication API.

The API URI of the Namf_Communication API shall be:

{apiRoot}/<apiName>/<apiVersion>/

The request URI used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "namf-comm".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

6.1.2 Usage of HTTP

6.1.2.1 General

HTTP/2, as defined in IETF RFC 7540 [19], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

HTTP messages and bodies for the Namf_Communication service shall comply with the OpenAPI [23] specification contained in Annex A.

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.1.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [8], shall be used as content type of the HTTP bodies specified in the present specification as indicated in clause 5.4 of 3GPP TS 29.500 [4].
- The Problem Details JSON Object (IETF RFC 7807 [36]). The use of the Problem Details JSON object in a HTTP response body shall be signalled by the content type "application/problem+json".

Multipart messages shall also be supported (see clause 6.1.2.4) using the content type "multipart/related", comprising:

- one JSON body part with the "application/json" content type; and
- one or more binary body parts with 3gpp vendor specific content subtypes.

The 3gpp vendor specific content subtypes defined in Table 6.1.2.2.2-1 shall be supported.

Table 6.1.2.2.2-1: 3GPP vendor specific content subtypes

content subtype	Description
vnd.3gpp.ngap	Binary encoded payload, encoding NG Application Protocol (NGAP) IEs, as specified in clause 9.4 of 3GPP TS 38.413 [12] (ASN.1 encoded).
vnd.3gpp.5gnas	Binary encoded payload, encoding a 5GS NAS message, as specified in 3GPP TS 24.501 [11].
NOTE: Using 3GPP vendor content subtypes allows to describe the nature of the opaque payload (e.g. NGAP or 5GS NAS information) without having to rely on metadata in the JSON payload.	

See clause 6.1.2.4 for the binary payloads supported in the binary body part of multipart messages.

6.1.2.3 HTTP custom headers

6.1.2.3.1 General

In this release of this specification, no custom headers specific to the Namf_Communication service are defined. For 3GPP specific HTTP custom headers used across all service based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.1.2.4 HTTP multipart messages

HTTP multipart messages shall be supported, to transfer opaque N1 Information (e.g. SM, LPP) and/or N2 Information (e.g. SM, NRPPa, PWS), in the following service operations (and HTTP messages):

- N1N2MessageTransfer Request and Response (POST);
- NonUeN2MessageTransfer Request and Response (POST);
- N1MessageNotify (POST);
- N2InfoNotify (POST);
- NonUeN2InfoNotify (POST);
- UEContextTransfer (POST);
- CreateUEContext (PUT)

HTTP multipart messages shall include one JSON body part and one or more binary body parts comprising:

- N1payload, and/or N2 payload (see clause 6.1.6.4).

The JSON body part shall be the "root" body part of the multipart message. It shall be encoded as the first body part of the multipart message. The "Start" parameter does not need to be included.

The multipart message shall include a "type" parameter (see IETF RFC 2387 [9]) specifying the media type of the root body part, i.e. "application/json".

NOTE: The "root" body part (or "root" object) is the first body part the application processes when receiving a multipart/related message, see IETF RFC 2387 [9]. The default root is the first body within the multipart/related message. The "Start" parameter indicates the root body part, e.g. when this is not the first body part in the message.

For each binary body part in a HTTP multipart message, the binary body part shall include a Content-ID header (see IETF RFC 2045 [10]), and the JSON body part shall include an attribute, defined with the RefToBinaryData type, that contains the value of the Content-ID header field of the referenced binary body part.

6.1.3 Resources

6.1.3.1 Overview

//{apiRoot}/namf-comm/<apiVersion>

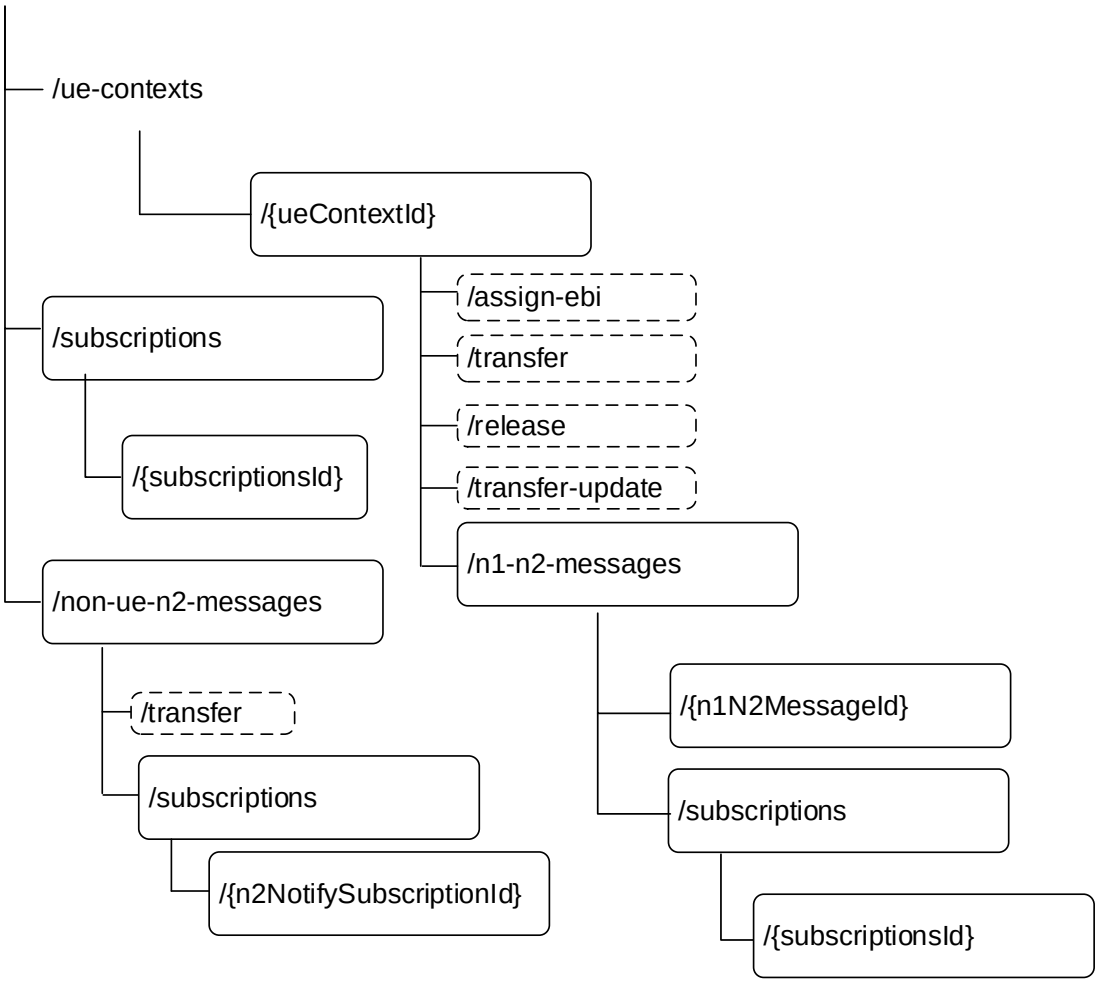

Figure 6.1.3.1-1: Resource URI structure of the Namf_Communication API

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description (Mapped Service Operations)
Individual ueContext	/ue-contexts/{ueContextId}		
		PUT	CreateUEContext
	/ue-contexts/{ueContextId}/release	release (POST)	ReleaseUEContext
	/ue-contexts/{ueContextId}/assign-ebi	assign-ebi (POST)	EBIAssignment
	/ue-contexts/{ueContextId}/transfer	transfer (POST)	UEContextTransfer
	/ue-contexts/{ueContextId}/transfer-update	transfer-update (POST)	RegistrationStatusUpdate
n1N2Message collection	/ue-contexts/{ueContextId}/n1-n2-messages	POST	N1N2MessageTransfer
N1N2 Subscriptions Collection for Individual UE Contexts	/ue-contexts/{ueContextId}/n1-n2-messages/subscriptions	POST	N1N2MessageSubscribe
N1N2 Individual Subscription	/ue-contexts/{ueContextId}/n1-n2-messages/subscriptions/{subscriptionId}	DELETE	N1N2MessageUnSubscribe
subscriptions collection	/subscriptions	POST	AMFStatusChangeSubscribe
individual subscription	/{subscriptionId}	PUT	AMFStatusChangeSubscribe
		DELETE	AMFStatusChangeUnSubscribe
Non UE N2Messages collection	/non-ue-n2-messages/transfer	transfer (POST)	NonUEN2MessageTransfer
Non UE N2Messages Subscriptions collection	/non-ue-n2-messages/subscriptions	POST	NonUEN2InfoSubscribe
Non UE N2 Message Notification Individual Subscription	/non-ue-n2-messages/subscriptions/{n2NotifySubscriptionId}	DELETE	NonUEN2InfoUnsubscribe

6.1.3.2 Resource: Individual ueContext

6.1.3.2.1 Description

This resource represents the an individual ueContext identified by the ueContextId.

This resource is modelled as the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

6.1.3.2.2 Resource Definition

Resource URI:{apiRoot}/namf-comm/<apiVersion>/ue-contexts/{ueContextId}

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	String	See clause 6.1.1
apiVersion	String	See clause 6.1.1.
ueContextId	String	Represents the 5G Globally Unique Temporary Identifier (See 3GPP TS 23.501 [2] clause 5.9.4) Pattern: "5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}" Or represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: see pattern of type Supi in 3GPP TS 29.571 [6] Or represents the Permanent Equipment Identifier (see 3GPP TS 23.501 [2] clause 5.9.3) pattern: "(imei-[0-9]{15}|imeisv-[0-9]{16}|.+)"

When the ueContextId is composed by UE's SUPI or PEI, UE's PEI shall be used for the case:

- If the UE is emergency registration and the UE is UICCless;
- If the UE is emergency registration but SUPI is not authenticated.

For other cases, UE's SUPI shall be used.

6.1.3.2.3 Resource Standard Methods

6.1.3.2.3.1 PUT

This ueContextId identifies the individual ueContext resource is composed by UE's SUPI or PEI, See table 6.1.3.2.2-1.

This method shall support the URI query parameters specified in table 6.1.3.2.3.1-1.

Table 6.1.3.2.3.1-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

Table 6.1.3.2.3.1-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
UeContextCreateData	M	1	Defines the UE Context to be created.

Table 6.1.3.2.3.1-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UeContextCreatedData	M	1	201 Created	This case represents the successful creation of a new UE Context. Upon success, a response body is returned containing the newly created UE Context.
UeContextCreateError	O	0..1	403 Forbidden	This case represents the creation of a new UE Context is not successful. The "cause" attribute may be used to indicate one of the following application errors: - HANDOVER_FAILURE

Table 6.1.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/namf-comm/<apiVersion>/ue-contexts/{ueContextId}

6.1.3.2.4 Resource Custom Operations

6.1.3.2.4.1 Overview

Table 6.1.3.2.4.1-1: Custom operations

Operation Name	Custom operation URI	Mapped HTTP method	Description
release	/ue-contexts/{ueContextId}/release	POST	Release an existing individual ueContext resource. It is used for the Release UE Context service operation.
assign-ebi	{ /ue-contexts/{ueContextId}/assign-ebi	POST	Assign EPS bearer ID(s) towards EPS bearer(s) mapped from QoS Flow(s), for a PDU session for the UE. It is used for EBIAssignment service operation.
transfer	{ /ue-contexts/{ueContextId}/transfer	POST	Transfer an existing individual ueContext resource from old AMF to new AMF. It is used for the UEContextTransfer service operation.

6.1.3.2.4.2 Operation: release (POST)

6.1.3.2.4.2.1 Description

This ueContextId identifies the individual ueContext resource is composed by UE's SUPI or PEI, See table 6.1.3.2.2-1.

6.1.3.2.4.2.2 Operation Definition

This operation shall support the request data structures specified in table 6.1.3.2.4.2.2-1 and the response data structure and response codes specified in table 6.1.3.2.4.2.2-2.

Table 6.1.3.2.4.2.2-1: Data structures supported by the (POST) release Request Body on this resource

Data type	P	Cardinality	Description
UEContextRelease	M	1	The information used for releasing of the UE Context

Table 6.1.3.2.4.2.2-2: Data structures supported by the (POST) release Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents the handover is cancelled successfully.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - UNSPECIFIED - SUPI_OR_PEI_UNKNOWN See table 6.1.7.3-1 for the description of this error.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - CONTEXT_NOT_FOUND See table 6.1.7.3-1 for the description of this error.

6.1.3.2.4.3 Operation: assign-ebi (POST)

6.1.3.2.4.3.1 Description

This ueContextId identifies the individual ueContext resource is composed by UE's SUPI or PEI, see Table 6.1.3.2.2-1.

6.1.3.2.4.3.2 Operation Definition

This operation shall support the request data structures specified in table 6.1.3.2.4.3.2-1 and the response data structure and response codes specified in table 6.1.3.2.4.3.2-2.

Table 6.1.3.2.4.3.2-1: Data structures supported by the (POST) assign-ebi Request Body on this resource

Data type	P	Cardinality	Description
AssignEbiData	M	1	The information required for AMF to allocate EPS bearer ID(s).

Table 6.1.3.2.4.3.2-2: Data structures supported by the (POST) assign-ebi Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AssignedEbiData	M	1	200 OK	Represent successful assignment of EPS bearer ID service operation, with the assigned EBIs included. AMF may allocate only a subset of the requested EBIs, when not enough available EBI(s) can be allocated, e.g. when other PDU sessions with higher ARP have occupied too many EBIs. If the POST request body contained "releasedEbiList" the AMF shall release those EBI(s) and shall include the "releaseEbiList" IE in the POST response body.
AssignEbiError	O	0..1	403 Forbidden	This represents the case when none of the requested EBI(s) can be assigned by the AMF. The "cause" attribute of the ProblemDetails shall be set to: - EBI_EXHAUSTED, if the number of EBIs allocated for the UE has already reached the maximum limit. - EBI_REJECTED_LOCAL_POLICY, if the EBI allocation is rejected due to local policies at the AMF as specified in clause 4.11.1.4.1 of 3GPP TS 23.502 [3]. - EBI_REJECTED_NO_N26, if the EBI allocation was rejected when the AMF is in a serving PLMN that does not support 5GS-EPS interworking procedures with N26 interface as specified in clause 5.17.2.3.1 of 3GPP TS 23.501 [2].
AssignEbiError	-O	0..1	409 Conflict	This represents the case when none of the requested EBI(s) can be assigned by the AMF. The "cause" attribute of the ProblemDetails shall be set to: - TEMPORARY_REJECT_REGISTRATION_ONGOING, if there is an ongoing registration procedure. - TEMPORARY_REJECT_HANDOVER_ONGOING, if there is an ongoing N2 handover procedure.

6.1.3.2.4.4 Operation: transfer (POST)

6.1.3.2.4.4.1 Description

This ueContextId identifies the individual ueContext resource is composed by UE's 5G-GUTI or SUPI, see Table 6.1.3.2.2-1.

6.1.3.2.4.4.2 Operation Definition

This operation shall support the request data structures specified in table 6.1.3.2.4.4.2-1 and the response data structure and response codes specified in table 6.1.3.2.4.4.2-2.

Table 6.1.3.2.4.4.2-1: Data structures supported by the (POST) transfer Request Body on this resource

Data type	P	Cardinality	Description
UeContextTransferReqData	M	1	Represents to start transferring of an individual ueContext resource from old AMF to new AMF.

Table 6.1.3.2.4.4.2-2: Data structures supported by the (POST) transfer Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UeContextTransferRspData	M	1	200 OK	Indicates the transferring of the individual ueContext resource is started successfully.
ProblemDetails	O	0..1	403 Forbidden	Indicates that AMF can understand the request but cannot fulfil the request due to errors. If the integrity check of the included complete registration message fails at the source AMF the "cause" attribute is set to: - INTEGRITY_CHECK_FAIL. See table 6.1.7.3-1 for the description of these errors.
ProblemDetails	O	0..1	404 Not Found	If the AMF does not have the requested UE context, the AMF shall return this status code and the "cause" attribute is set to: - CONTEXT_NOT_FOUND See table 6.1.7.3-1 for the description of these errors.

6.1.3.2.4.5 Operation: transfer-update (POST)

6.1.3.2.4.5.1 Description

This ueContextId identifies the individual ueContext resource is composed by UE's 5G-GUTI, see Table 6.1.3.2.2-1.

6.1.3.2.4.5.2 Operation Definition

This operation shall support the request data structures specified in table 6.1.3.2.4.5.2-1 and the response data structure and response codes specified in table 6.1.3.2.4.5.2-2.

Table 6.1.3.2.4.5.2-1: Data structures supported by the (POST) transfer-update Request Body on this resource

Data type	P	Cardinality	Description
UeRegStatusUpdateReqData	M	1	Represents to the update of status on the transferring of an individual ueContext resource from old AMF to new AMF.

Table 6.1.3.2.4.5.2-2: Data structures supported by the (POST) transfer-update Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UeRegStatusUpdateRspData	M	1	200 OK	Indicates the update of UE context transfer status is successful at the source AMF.
ProblemDetails	O	0..1	403 Forbidden	Indicates that AMF can understand the request but cannot fulfil the request due to errors.
ProblemDetails	O	0..1	404 Not Found	If the AMF does not have the requested UE context, the AMF shall return this status code and the "cause" attribute is set to: - CONTEXT_NOT_FOUND

6.1.3.3 Resource: N1N2 Subscriptions Collection for Individual UE Contexts

6.1.3.3.1 Description

This resource represents the collection under an individual UE context for storing the subscriptions for notifications of UE specific N1 and N2 message types. This resource is modelled as the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.1.3.3.2 Resource Definition

Resource URI: **{apiRoot}/namf-comm/<apiVersion>/{ueContextId}/n1-n2-messages/subscriptions**

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

Table 6.1.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1.
ueContextId	string	Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: see pattern of type Supi in 3GPP TS 29.571 [6] Or represents the Permanent Equipment Identifier (see 3GPP TS 23.501 [2] clause 5.9.3) pattern: "(imei-[0-9]{15})"

6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 POST

This method creates an individual N1/N2 information subscription resource for UE related N1/N2 information. This method is used by NF Service Consumers (e.g. LMF) to subscribe for notifications about UE related N1/N2 Information.

This method shall support the request data structures specified in table 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.3.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
UeN1N2InfoSubscriptionCreateData	C	0..1	Representation of the subscription for N1 and/or N2 information notification. It shall contain the information regarding N1 and/or N2 information to be notified and the callback URI for the respective notifications.

Table 6.1.3.3.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UeN1N2InfoSubscriptionCreatedData	C	0..1	201 Created	This case represents the successful creation of the subscription for N1 and/or N2 information notification. Upon success, a response body is returned containing the representation describing the status of the request. The Location header shall contain the location (URI) of the created subscription resource.

Table 6.1.3.3.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/namf-comm/<apiVersion>/{ueContextId}/ue-contexts/n1-n2-messages/subscriptions/{subscriptionId}

6.1.3.3.4 Resource Custom Operations

There are no custom operations supported on this resource.

6.1.3.4 Resource: N1N2 Individual Subscription

6.1.3.4.1 Description

This resource represents the individual subscription for the subscription for notifications of UE specific N1 and N2 message types. This resource is modelled as the Document resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.1.3.4.2 Resource Definition

Resource URI: **{apiRoot}/namf-comm/<apiVersion>/{ueContextId}/n1-n2-messages/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.1.3.4.2-1.

Table 6.1.3.4.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1.
ueContextId	string	Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: see pattern of type Supi in 3GPP TS 29.571 [6] Or represents the Permanent Equipment Identifier (see 3GPP TS 23.501 [2] clause 5.9.3) pattern: "(imei-[0-9]{15})"
subscriptionId	string	Represents the individual subscription to the UE specific N1/N2 message notification.

6.1.3.4.3 Resource Standard Methods

6.1.3.4.3.1 DELETE

This method deletes an individual N1/N2 message notification subscription resource for an individual UE. This method is used by NF Service Consumers (e.g. LMF) to unsubscribe for notifications about UE related N1/N2 information.

This method shall support the request data structures specified in table 6.1.3.4.3.1-2 and the response data structures and response codes specified in table 6.1.3.4.3.1-3.

Table 6.1.3.4.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.4.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	

6.1.3.4.4 Resource Custom Operations

There are no custom operations supported on this resource.

6.1.3.5 Resource: N1N2 Messages Collection

6.1.3.5.1 Description

This resource represents the collection on which UE related N1 messages and N2 information transfer are initiated and the N1 information for the UE is stored temporarily until the UE is reachable. This resource is modelled with the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.1.3.5.2 Resource Definition

Resource URI: {apiRoot}/namf-comm/<apiVersion>/ue-contexts/{ueContextId}/n1-n2-messages

This resource shall support the resource URI variables defined in table 6.1.3.5.2-1.

Table 6.1.3.5.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1.
ueContextId	string	Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: see pattern of type Supi in 3GPP TS 29.571 [6] Or represents the Permanent Equipment Identifier (see 3GPP TS 23.501 [2] clause 5.9.3) pattern: "(imei-[0-9]{15}|imeisv-[0-9]{16})" Or represents the LCS Correlation ID (see 3GPP TS 29.572 [25] clause 6.1.6.3.2) (NOTE) pattern: "(cid-.{1,255})"
NOTE: The LCS Correlation ID shall only be applied when transferring LCS related UE-Specific N1 and/or N2 messages.		

6.1.3.5.3 Resource Standard Methods

6.1.3.5.3.1 POST

This method initiates a N1 message and/or N2 message transfer at the AMF and may create a resource to store the N1 message if the UE is not reachable or if the UE is paged.

This method shall support the request data structures specified in table 6.1.3.5.3.1-1 and the response data structures and response codes specified in table 6.1.3.5.3.1-2.

Table 6.1.3.5.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
N1N2MessageTransferReqData	M	1	This contains: - N1 message, if the NF Service Consumer requests to transfer an N1 message to the UE or; - N2 information, if the NF Service Consumer requests to transfer an N2 information to the 5G-AN or; - both, if the NF Service Consumer requests to transfer both an N1 message to the UE and an N2 information to the 5G-AN.

Table 6.1.3.5.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
N1N2MessageTransferRspData	M	1	202 Accepted	This case represents the successful storage of the N1/N2 information at the AMF when asynchronous communication is invoked or when the AMF pages the UE. If the AMF pages the UE, it shall store the N1/N2 message information until the UE responds to paging. The cause included in the response body shall be set to one of the following values: - WAITING_FOR_ASYNCHRONOUS_TRANSFER - ATTEMPTING_TO_REACH_UE The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource.
N1N2MessageTransferRspData	M	1	200 OK	This represents the case where the AMF is able to successfully transfer the N1/N2 message to the UE and/or the AN. The cause included in the response body shall be to one of the following values: - N1_N2_TRANSFER_INITIATED - N1_MSG_NOT_TRANSFERRED
ProblemDetails	O	0..1	307 Temporary Redirect	When the related UE context is not fully available at the target NF Service Consumer (e.g. AMF) during a planned maintenance case (e.g. AMF planned maintenance without UDSF case), the "cause" attribute shall be set to: - NF_CONSUMER_REDIRECT_ONE_TXN See table 6.1.7.3-1 for the description of these errors The Location header of the response shall be set to URI of the resource located on the target NF Service Consumer (e.g. AMF) to which the request is redirected.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - UE_IN_NON_ALLOWED_AREA - UE_WITHOUT_N1_LPP_SUPPORT - UNSPECIFIED - SM_CONTEXT_RELOCATION_REQUIRED See table 6.1.7.3-1 for the description of these errors.
ProblemDetails	O	0..1	404 Not Found	When the related UE is not found in the NF Service Consumer (e.g. AMF), the "cause" attribute shall be set to: - CONTEXT_NOT_FOUND See table 6.1.7.3-1 for the description of these errors.

N1N2MessageTransferError	O	0..1	409 Conflict	This represents the case where the AMF rejects the N1N2MessageTransfer request due to one of the following reasons. The cause attribute of the ProblemDetails structure shall be set to: - HIGHER_PRIORITY_REQUEST_ONGOING, if there is already an ongoing paging procedure with higher or same priority; - TEMPORARY_REJECT_REGISTRATION_ONGOING, if there is an ongoing registration procedure (see clause 4.2.3.3 of 3GPP TS 23.502 [3]); - TEMPORARY_REJECT_HANDOVER_ONGOING, if there is an ongoing Xn or N2 handover procedure (see clause 4.9.1.2.1 and 4.9.1.3.1 of 3GPP TS 23.502 [3]). - UE_IN_CM_IDLE_STATE, if this is a request to transfer a N2 PDU Session Resource Modify Request or a N2 PDU Session Resource Release Command to a 5G-AN, and if the UE is in CM-IDLE state at the AMF for the Access Network Type associated to the PDU session. - MAX_ACTIVE_SESSIONS_EXCEEDED, if the RAT type is NB-IoT, and the UE already has 2 PDU Sessions with active user plane resources. See table 6.1.7.3-1 for the description of these errors.
N1N2MessageTransferError	O	0..1	504 Gateway Timeout	This represents the case where the UE is not reachable at the AMF and the AMF is unable to page the UE. The cause attribute of the ProblemDetails structure shall be set to: - UE_NOT_REACHABLE, if the UE is not reachable for paging; See table 6.1.7.3-1 for the description of these errors.

Table 6.1.3.5.3.1-3: Headers supported by the 202 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	The URI of the resource located on the AMF to which the status of the N1N2 message transfer is held

Table 6.1.3.5.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	The URI of the resource located on the target NF Service Consumer (e.g. AMF) to which the request is redirected

6.1.3.6 Resource: subscriptions collection

6.1.3.6.1 Description

This resource represents a collection of subscriptions of NF service consumers to the status change of the AMF identified by the GUAMI(s).

This resource is modelled as the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.1.3.6.2 Resource Definition

Resource URI:{apiRoot}/namf-comm/<apiVersion>/subscriptions

This resource shall support the resource URI variables defined in table 6.1.3.6.2-1.

Table 6.1.3.6.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1.

6.1.3.6.3 Resource Standard Methods

6.1.3.6.3.1 POST

This method creates a new subscription. This method shall support the URI query parameters specified in table 6.1.3.6.3.1-1.

Table 6.1.3.6.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.1.3.6.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.6.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SubscriptionData	M	1	The request body contains the input parameters for the subscription. These parameters include, e.g.: - GUAMI(s) - amfStatusUri

Table 6.1.3.6.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SubscriptionData	M	1	201 Created	This case represents the successful creation of a subscription. Upon success, the HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - UNSPECIFIED See table 6.1.7.3-1 for the description of this error.

Table 6.1.3.6.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/namf-comm/<apiVersion>/subscriptions/{subscriptionId}

6.1.3.7 Resource: individual subscription

6.1.3.7.1 Description

This resource represents an individual subscription of a NF service consumer to the status change of the AMF identified by the GUAMI(s).

This resource is modelled as the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

6.1.3.7.2 Resource Definition

Resource URI: {apiRoot}/namf-comm/<apiVersion>/subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 6.1.3.7.2-1.

Table 6.1.3.7.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1.
subscriptionId	string	Represents a specific subscription

6.1.3.7.3 Resource Standard Methods

6.1.3.7.3.1 DELETE

This method terminates an existing subscription. This method shall support the URI query parameters specified in table 6.1.3.7.3.1-1.

Table 6.1.3.4.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.1.3.7.3.1-2 and the response data structures and response codes specified in table 6.1.3.7.3.1-3.

Table 6.1.3.7.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.7.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
			204 No Content	This case represents a successful deletion of the subscription.
ProblemDetails	O	0..1	404 Not Found	If the AMF does not have the requested subscription, the AMF shall return this status code. The "cause" attribute is set to: - SUBSCRIPTION_NOT_FOUND

6.1.3.7.3.2 PUT

This method replaces an existing subscription completely. This method shall support the URI query parameters specified in table 6.1.3.7.3.2-1.

Table 6.1.3.7.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.1.3.7.3.2-2 and the response data structures and response codes specified in table 6.1.3.7.3.2-3.

Table 6.1.3.7.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
SubscriptionData	M	1	The request body contains the input parameters for the subscription. These parameters include, e.g.: - GUAMI(s) - amfStatusUri

Table 6.1.3.7.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SubscriptionData	M	1	200 OK	This case represents a successful replacement of the subscription.
ProblemDetails	O	0..1	403 Forbidden	This case represents the failure update of an existing subscription.

6.1.3.8 Resource: Non UE N2 Messages Collection

6.1.3.8.1 Description

This resource represents the collection on which custom operations to transfer the N2 message towards the 5G-AN are specified. This resource is modelled with the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.1.3.8.2 Resource Definition

Resource URI: **{apiRoot}/namf-comm/<apiVersion>/non-ue-n2-messages**

This resource shall support the resource URI variables defined in table 6.1.3.8.2-1.

Table 6.1.3.8.2-1: Resource URI variables for this resource

Name	Data Type	Definition
apiRoot	String	See clause 6.1.1
apiVersion	String	See clause 6.1.1.

6.1.3.8.3 Resource Standard Methods

There are no resource standard methods for the non-ue-n2-messages collection resource in this release of this specification.

6.1.3.8.4 Resource Custom Operations

6.1.3.8.4.1 Overview

Table 6.1.3.8.4.1-1: Custom operations

Operation Name	Custom operaration URI	Mapped HTTP method	Description
transfer	{resourceUri}/transfer	POST	Transfer the N2 message to 5G-AN.

6.1.3.8.4.2 Operation: transfer

6.1.3.8.4.2.1 Description

The {resourceUri}/transfer custom operation is used to initiate a non UE associated N2 information transfer to the identified 5G-AN nodes. This custom operation uses the HTTP POST method.

6.1.3.8.4.2.2 Operation Definition

This operation shall support the request data structures specified in table 6.1.3.8.4.2.2-1 and the response data structure and response codes specified in table 6.1.3.8.4.2.2-2.

Table 6.1.3.8.4.2.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
N2InformationTransferReqData	M	1	Representation of the data to be sent to the 5G-AN node(s) by the AMF.

Table 6.1.3.8.4.2.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
N2InformationTransferRspData	M	1	200 OK	Indicates AMF has successfully initiated the transferring of N2 Information to the AN..
N2InformationTransferError	O	0..1	400 Bad Request	The "cause" attribute may be set to one of the errors defined in Table 5.2.7.2-1 of 3GPP TS 29.500 [4].
N2InformationTransferError	O	0..1	403 Forbidden	The "cause" attribute may be set to one of the following application errors: - UNSPECIFIED See table 6.1.7.3-1 for the description of these errors.
N2InformationTransferError	O	0..1	404 Not Found	The "cause" attribute may be set to one of the following application errors: - CONTEXT_NOT_FOUND See table 6.1.7.3-1 for the description of these errors.
N2InformationTransferError	O	0..1	500 Internal Server Error	The "cause" attribute may be set to one of the errors defined in Table 5.2.7.2-1 of 3GPP TS 29.500 [4].
N2InformationTransferError	O	0..1	503 Service Unavailable	The "cause" attribute may be set to one of the errors defined in Table 5.2.7.2-1 of 3GPP TS 29.500 [4].

6.1.3.9 Resource: Non UE N2 Messages Subscriptions Collection

6.1.3.9.1 Description

This resource represents the collection on which individual subscriptions for non UE N2 messages from the 5G-AN are stored. This resource is modelled with the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.1.3.9.2 Resource Definition

Resource URI: **{apiRoot}/namf-comm/<apiVersion>/non-ue-n2-messages/subscriptions**

This resource shall support the resource URI variables defined in table 6.1.3.9.2-1.

Table 6.1.3.9.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1.

6.1.3.9.3 Resource Standard Methods

6.1.3.9.3.1 POST

This method creates an individual N2 information subscription resource for non UE related N2 information. This method is used by NF Service Consumers (e.g. LMF, CBCF/PWS-IWF) to subscribe for notifications about non UE related N2 Information from a specific 5G-AN node, or from any 5G-AN node.

This method shall support the request data structures specified in table 6.1.3.9.3.1-2 and the response data structures and response codes specified in table 6.1.3.9.3.1-3.

Table 6.1.3.9.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
NonUeN2InfoSubscriptionCreateData	M	1	Representation of the subscription for N2 information notification.

Table 6.1.3.9.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NonUeN2InfoSubscriptionCreatedData	M	1	201 Created	This case represents the successful creation of the subscription for N2 information notification. Upon success, a response body is returned containing the representation describing the status of the request. The Location header shall carry the location (URI) of the created subscription resource.
ProblemDetails	O	0..1	403 Forbidden	If the NF Service Consumer is not authorized to subscribe for non UE N2 message notifications, the AMF shall return this status code with the ProblemDetails

Table 6.1.3.9.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/namf-comm/<apiVersion>/non-ue-n2-messages/subscriptions/{n2NotifySubscriptionId}

6.1.3.9.4 Resource Custom Operations

There are no custom operations supported on this resource.

6.1.3.10 Resource: Non UE N2 Message Notification Individual Subscription

6.1.3.10.1 Description

This resource represents the individual subscription for the notifications of non UE specific N2 message types (e.g. NRPPa, PWS Notifications). This resource is modelled with the Store resource archetype (see clause C.3 of 3GPP TS 29.501 [5]).

6.1.3.10.2 Resource Definition

Resource URI: **{apiRoot}/namf-comm/<apiVersion>/non-ue-n2-messages/subscriptions/{n2NotifySubscriptionId}**

This resource shall support the resource URI variables defined in table 6.1.3.10.2-1.

Table 6.1.3.7.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.1.1
apiVersion	string	See clause 6.1.1.
n2NotifySubscriptionId	string	Represents the individual subscription to the non UE specific N2 message notification.

6.1.3.10.3 Resource Standard Methods

6.1.3.10.3.1 DELETE

This method deletes an individual N2 message notification subscription resource for non UE associated N2 information. This method is used by NF Service Consumers (e.g. LMF) to unsubscribe for notifications about non UE related N2 information.

This method shall support the request data structures specified in table 6.1.3.10.3.1-2 and the response data structures and response codes specified in table 6.1.3.10.3.1-3.

Table 6.1.3.10.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.1.3.10.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	

6.1.3.10.4 Resource Custom Operations

There are no custom operations supported on this resource.

6.1.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on Namf_Communication Service.

6.1.5 Notifications

6.1.5.1 General

The notifications provided by the Namf_Communication service are specified in this clause.

Table 6.1.5.1-1: Callback overview

Notification	Resource URI	HTTP method or custom operation	Description (service operation)
AMF Status Change Notification	{amfStatusCallbackUri}	POST	
Non UE N2 Information Notification	{n2NotifyCallbackUri}	POST	
N1 Message Notification	{n1NotifyCallbackUri}	POST	
UE Specific N2 Information Notification	{ueN2NotifyCallbackUri}	POST	
N1N2 Transfer Failure Notification	{n1n2MessageTransferFailureNotifyCallbackUri}	POST	

6.1.5.2 AMF Status Change Notification

6.1.5.2.1 Description

If a NF service consumer (e.g. SMF) has subscribed to AMF Status Change on Namf_Communication Service, when AMF aware of a change of its own status, AMF shall create a notification including the current state, and shall deliver the notification to the call-back URI, following Subscribe/Notify mechanism defined in 3GPP TS 29.501 [5].

6.1.5.2.2 Notification Definition

Call-back URI: {amfStatusCallbackUri}

Call-back URI is provided by NF Service Consumer during creation of the subscription.

6.1.5.2.3 Notification Standard Methods

6.1.5.2.3.1 POST

This method shall support the request data structures specified in table 6.1.5.2.3.1-1 and the response data structures and response codes specified in table 6.1.5.2.3.1-2.

Table 6.1.5.2.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
AmfStatusChangeNotification	M	1	Representation of the AMF status change notification.

Table 6.1.5.2.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful notification of the AMF status change.
ProblemDetails	O	0..1	404 Not Found	When context of the notification is not found,the "cause" attribute shall be set to: - CONTEXT_NOT_FOUND

6.1.5.3 Non UE N2 Information Notification

6.1.5.3.1 Description

This resource represents the callback reference provided by the NF Service Consumer (e.g. LMF, CBCF/PWS-IWF) to receive notifications about N2 information that are not related to a UE.

6.1.5.3.2 Notification Definition

Callback URI: {n2NotifyCallbackUri}

This notification shall support the callback URI variables defined in table 6.1.5.2.2-1.

Table 6.1.5.3.2-1: Callback URI variables for this notification

Name	Definition
n2NotifyCallbackUri	Callback reference provided by the NF Service Consumer during the subscription to this notification.

6.1.5.3.3 Notification Standard Methods

6.1.5.3.3.1 POST

This method sends an N2 information notification to the NF Service Consumer (e.g. LMF, CBCF/PWS-IWF).

This method shall support the request data structures specified in table 6.1.5.3.3.1-2 and the response data structures and response codes specified in table 6.1.5.3.3.1-3.

Table 6.1.5.3.3.1-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
N2InformationNotification	M	1	Representation of the N2 information notification.

Table 6.1.5.3.3.1-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful notification of the N2 information to the NF service consumer.

6.1.5.4 N1 Message Notification

6.1.5.4.1 Description

This resource represents the callback reference provided by the NF Service Consumer (e.g. LMF) to receive notifications about N1 message from the UE (e.g. LPP messages).

6.1.5.4.2 Notification Definition

Callback URI: { n1NotifyCallbackUri }

Callback URI is provided by the NF Service Consumer during the subscription to this notification. . The callback URI for N1 message notification may also be obtained from the NRF, if the NF Service Consumer has registered it in the NF Profile with the NRF.

6.1.5.4.3 Notification Standard Methods

6.1.5.4.3.1 POST

This method sends an N1 message notification to the NF Service Consumer (e.g. LMF).

This method shall support the request data structures specified in table 6.1.5.4.3.1-2 and the response data structures and response codes specified in table 6.1.5.4.3.1-3.

Table 6.1.5.4.3.1-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
N1MessageNotification	M	1	Representation of the N1 message notification.

Table 6.1.5.4.3.1-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful notification of the N1 message to the NF service consumer.
ProblemDetails	O	0..1	403 Forbidden	This case represents, the NF service consumer failing to accept the processing of the notified N1 message. The detailed information shall be provided in the ProblemDetails structure.

6.1.5.5 UE Specific N2 Information Notification

6.1.5.5.1 Description

This resource represents the callback reference provided by the NF Service Consumer (e.g. LMF) to receive notifications about UE specific N2 information.

6.1.5.5.2 Notification Definition

Callback URI: {n2NotifyCallbackUri}

Callback URI is provided by the NF Service Consumer during the subscription to this notification.

6.1.5.5.3 Notification Standard Methods

6.1.5.5.3.1 POST

This method sends an N2 information notification to the NF Service Consumer (e.g. LMF).

This method shall support the request data structures specified in table 6.1.5.5.3.1-2 and the response data structures and response codes specified in table 6.1.5.5.3.1-3.

Table 6.1.5.5.3.1-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
N2InformationNotification	M	1	Representation of the N2 information notification.

Table 6.1.5.5.3.1-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful notification of the N2 information to the NF service consumer.
N2InfoNotificationRspData	M	1	200 OK	This case represents a successful notification of the N2 information to the NF service consumer when information needs to be returned in the response.

6.1.5.6 N1N2 Transfer Failure Notification

6.1.5.6.1 Description

This resource represents the callback reference provided by the NF Service Consumer (e.g. SMF) to receive notifications about failure to deliver N1 / N2 message.

6.1.5.6.2 Notification Definition

Callback URI: {n1n2MessageTransferFailureNotifyCallbackUri}

Callback URI is provided by the NF Service Consumer during the UE specific N1N2MessageTransfer operation (see clause 6.1.3.5.3.1.

6.1.5.6.3 Notification Standard Methods

6.1.5.6.3.1 POST

This method sends an N1/N2 message transfer failure notification to the NF Service Consumer (e.g. SMF).

This method shall support the request data structures specified in table 6.1.5.6.3.1-1 and the response data structures and response codes specified in table 6.1.5.6.3.1-3.

Table 6.1.5.6.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
N1N2MsgTxfrFailureNotification	M	1	Representation of the N1/N2 message transfer failure notification. The "cause" attribute shall be set to one of following cause value s (see clause 6.1.6.3.6): - UE_NOT_RESPONDING - UE_NOT_REACHABLE_FOR_SESSION - TEMPORARY_REJECT_REGISTRATION_ONGOING - TEMPORARY_REJECT_HANDOVER_ONGOING

Table 6.1.5.6.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful notification of the N1 / N2 message transfer to the NF service consumer.

6.1.5.7 Void

6.1.6 Data Model

6.1.6.1 General

This clause specifies the application data model supported by the API.

Table 6.1.6.1-1 specifies the data types defined for the Namf_Communication service based interface protocol.

Table 6.1.6.1-1: Namf_Communication specific Data Types

Data type	Clause defined	Description
SubscriptionData	6.1.6.2.2	Information within AMFStatusChangeSubscribe
AmfStatusChangeNotification	6.1.6.2.3	Information within AMFStatusChangeNotify
AmfStatusInfo	6.1.6.2.4	Information within AMFStatusChangeNotify
AssignEbiData	6.1.6.2.5	Represents information needed for AMF to assign EBIs.
AssignedEbiData	6.1.6.2.6	Represents successful assignment of EBI(s).
AssignEbiFailed	6.1.6.2.7	Represents failed assignment of EBI(s)
UEContextRelease	6.1.6.2.8	Information within ReleaseUeContext
N2InformationTransferReqData	6.1.6.2.9	N2 information requested to be transferred to 5G AN.
NonUeN2InfoSubscriptionCreateData	6.1.6.2.10	Subscription information for non UE specific N2 information notification.
NonUeN2InfoSubscriptionCreatedData	6.1.6.2.11	The created subscription for non UE specific N2 information notification.
UeN1N2InfoSubscriptionCreateData	6.1.6.2.12	Subscription information for UE specific N1 and/or N2 information notification.
UeN1N2InfoSubscriptionCreatedData	6.1.6.2.13	The created subscription for UE specific N1 and/or N2 information notification.
N2InformationNotification	6.1.6.2.14	N2 information for notification.
N2InfoContainer	6.1.6.2.15	N2 information container.
N1MessageNotification	6.1.6.2.16	N1 message notification data structure.
N1MessageContainer	6.1.6.2.17	N1 Message Container
N1N2MessageTransferReqData	6.1.6.2.18	N1/N2 message container
N1N2MessageTransferRspData	6.1.6.2.19	N1/N2 message transfer response
RegistrationContextContainer	6.1.6.2.20	Registration Context Container used to send the UE context information, N1 message from UE, AN address etc during Registration with AMF re-allocation procedure.
AreaOfValidity	6.1.6.2.21	Area of validity information for N2 information transfer
UeContextTransferReqData	6.1.6.2.23	Represents to start transferring of an individual ueContext resource from old AMF to new AMF.
UeContextTransferRspData	6.1.6.2.24	Indicates the transferring of the individual ueContext resource is started successfully.
UeContext	6.1.6.2.25	Represents an individual ueContext resource
N2SmInformation	6.1.6.2.26	Represents the session management SMF related N2 information data part.
N2InfoContent	6.1.6.2.27	Represents a transparent N2 information content to be relayed by AMF.
NrppaInformation	6.1.6.2.28	Represents a NRPPa related N2 information data part.
PwsInformation	6.1.6.2.29	Represents a PWS related information data part.
N1N2MsgTxfrFailureNotification	6.1.6.2.30	N1/N2 Message Transfer Failure Notification
N1N2MessageTransferError	6.1.6.2.31	N1/N2 Message Transfer Error
N1N2MsgTxfrErrDetail	6.1.6.2.32	N1/N2 Message Transfer Error Details
N2InformationTransferRspData	6.1.6.2.33	Indicates a successful delivery of N2 Information to the AN.
MmContext	6.1.6.2.34	Represents a Mobility Management Context in UE Context
SeafData	6.1.6.2.35	Represents SEAF data derived from data received from AUSF
NasSecurityMode	6.1.6.2.36	Indicates the NAS Security Mode
PduSessionContext	6.1.6.2.37	Represents a PDU Session Context in UE Context
NssaiMapping	6.1.6.2.38	Represents a map of a S-NSSAI in serving PLMN to a S-NSSAI in home PLMN.
UeRegStatusUpdateReqData	6.1.6.2.39	Provides information on the UE registration completion at a target AMF.
AssignEbiError	6.1.6.2.40	Represents the details regarding EBI assignment failure.
UeContextCreateData	6.1.6.2.41	Indicates a request to create an individual ueContext resource
UeContextCreatedData	6.1.6.2.42	Indicates a successful creation of an individual ueContext resource

UeContextCreateError	6.1.6.2.43	Represents an error when creating a UE context
NgRanTargetId	6.1.6.2.44	Indicates a NG RAN as target of the handover
N2InformationTransferError	6.1.6.2.45	Error within NonUeN2MessageTransfer response
PWSResponseData	6.1.6.2.46	Represents the type of PWS
PWSErrorData	6.1.6.2.47	Represents the type of PWS error
NgKsi	6.1.6.2.49	Represents the ngKSI (see 3GPP TS 33.501 [27])
KeyAmf	6.1.6.2.50	Represents the K_{amf} or $K'_{amf.}$ (see 3GPP TS 33.501 [27]).
ExpectedUeBehavior	6.1.6.2.51	Represents the expected UE behavior (e.g. UE moving trajectory) and its validity period.
UeRegStatusUpdateRspData	6.1.6.2.52	Provides the status of UE context transfer status update at a source AMF.
N2RanInformation	6.1.6.2.53	Represents the RAN related N2 information data part.
N2InfoNotificationRspData	6.1.6.2.54	N2 information notification response data
SmallDataRateStatusInfo	6.1.6.2.55	Represents the small data rate status
SmfChangeInfo	6.1.6.2.56	
V2xContext	6.1.6.2.57	Represents the V2X services related parameters
ImmediateMdtConf	6.1.6.2.58	Immediate MDT Configuration
V2xInformation	6.1.6.2.59	V2X related N2 information
EpsNasSecurityMode	6.1.6.2.60	Indicates the EPS NAS Security Mode
EpsBearerId	6.1.6.3.2	EPS Bearer Identifier
Ppi	6.1.6.3.2	Paging Policy Indicator
NasCount	6.1.6.3.2	Represents a NAS COUNT
5GMmCapability	6.1.6.3.2	Represents a 5GMM capability
UeSecurityCapability	6.1.6.3.2	Represents a UE Security Capability
S1UeNetworkCapability	6.1.6.3.2	Represents a S1 UE Network Capability
DrxParameter	6.1.6.3.2	Indicates the UE DRX Parameters
OmcIdentifier	6.1.6.3.2	Represents the OMC Identifier
MSClassmark2	6.1.6.3.2	Indicates the MS Classmark 2 of a 5G SRVCC UE
SupportedCodec	6.1.6.3.2	Indicates the supported codec of a 5G SRVCC UE
StatusChange	6.1.6.3.3	
N2InformationClass	6.1.6.3.4	
N1MessageClass	6.1.6.3.5	
N1N2MessageTransferCause	6.1.6.3.6	
UeContextTransferStatus	6.1.6.3.7	Describes the status of an individual ueContext resource in UE Context Transfer procedures
N2InformationTransferResult	6.1.6.3.8	Describes the result of N2 information transfer by AMF to the AN.
CipheringAlgorithm	6.1.6.3.9	Indicates the supported Ciphering Algorithm
IntegrityAlgorithm	6.1.6.3.10	Indicates the supported Integrity Algorithm
SmsSupport	6.1.6.3.11	Indicates the supported SMS delivery of a UE.
ScType	6.1.6.3.12	Indicates the security context type.
KeyAmfType	6.1.6.3.13	Indicates the K_{amf} type.
TransferReason	6.1.6.3.14	Indicates UE Context Transfer Reason
PolicyReqTrigger	6.1.6.3.15	Policy Request Triggers
RatSelector	6.1.6.3.16	Indicates the RAT type for the transfer of N2 information
NgapIeType	6.1.6.3.17	Indicates the supported NGAP IE types
N2InfoNotifyReason	6.1.6.3.18	N2 Information Notify Reason
SmfChangeIndication	6.1.6.3.19	Indicates the I-SMF or V-SMF change or removal
SbiBindingLevel	6.1.6.3.20	SBI Binding Level
EpsNasCipheringAlgorithm	6.1.6.3.21	Indicates the supported EPS NAS Ciphering Algorithm
EpsNasIntegrityAlgorithm	6.1.6.3.22	Indicates the supported EPS NAS Integrity Algorithm

Table 6.1.6.1-2 specifies data types re-used by the Namf service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Namf service based interface.

Table 6.1.6.1-2: Namf re-used Data Types

Data type	Reference	Comments
Snssai	3GPP TS 29.571 [6]	
Arp	3GPP TS 29.571 [6]	
PduSesisonId	3GPP TS 29.571 [6]	
Guami	3GPP TS 29.571 [6]	Globally Unique AMF Identifier
AmfName	3GPP TS 29.571 [6]	The name of the AMF
Supi	3GPP TS 29.571 [6]	Subscription Permanent Identifier
IndicationFlags	3GPP TS 29.502 [16]	Indication Flags
Cause	3GPP TS 29.571 [6]	5G-AN Cause
ProblemDetails	3GPP TS 29.571 [6]	Detailed problems in failure case
supportedFeatures	3GPP TS 29.571 [6]	Supported Features
TimeZone	3GPP TS 29.571 [6]	
UserLocation	3GPP TS 29.571 [6]	
AccessType	3GPP TS 29.571 [6]	
AllowedNssai	3GPP TS 29.531 [18]	
NfInstanceId	3GPP TS 29.571 [6]	
Uri	3GPP TS 29.571 [6]	
Ecgi	3GPP TS 29.571 [6]	EUTRA Cell Identifier
Ncgi	3GPP TS 29.571 [6]	NR Cell Identifier
Uint16	3GPP TS 29.571 [6]	
5Qi	3GPP TS 29.571 [6]	5G QoS Identifier
CorrelationID	3GPP TS 29.572 [25]	LCS Correlation ID
Pei	3GPP TS 29.571 [6]	
Dnn	3GPP TS 29.571 [6]	
Gpsi	3GPP TS 29.571 [6]	
GroupId	3GPP TS 29.571 [6]	
PlmnId	3GPP TS 29.571 [6]	
RfspIndex	3GPP TS 29.571 [6]	
EbiArpMapping	3GPP TS 29.502 [16]	EBI - ARP mapping
NsiId	3GPP TS 29.531 [18]	
TraceData	3GPP TS 29.571 [6]	Trace control and configuration parameters
ConfiguredSnssai	3GPP TS 29.531 [18]	
NgApCause	3GPP TS 29.571 [6]	Represents the NG AP cause IE
Area	3GPP TS 29.571 [6]	
ServiceAreaRestriction	3GPP TS 29.571 [6]	
CoreNetworkType	3GPP TS 29.571 [6]	
Ambr	3GPP TS 29.571 [6]	
GlobalRanNodeId	3GPP TS 29.571 [6]	
NfGroupId	3GPP TS 29.571 [6]	Network Function Group Id
DurationSec	3GPP TS 29.571 [6]	
StnSr	3GPP TS 29.571 [6]	Session Transfer Number for SRVCC
CMsisdn	3GPP TS 29.571 [6]	Correlation MSISDN
DateTime	3GPP TS 29.571 [6]	
SmallDataRateStatus	3GPP TS 29.571 [6]	
NfSetId	3GPP TS 29.571 [13]	NF Set ID
NfServiceSetId	3GPP TS 29.571 [13]	NF Service Set ID
LMFIdentification	3GPP TS 29.572 [25]	LMF Identification
PlmnAssiUeRadioCapId	3GPP TS 29.571 [6]	
ManAssiUeRadioCapId	3GPP TS 29.571 [6]	
NrV2xAuth	3GPP TS 29.571 [6]	NR V2X services authorized
LteV2xAuth	3GPP TS 29.571 [6]	LTE V2X services authorized
BitRate	3GPP TS 29.571 [6]	Bit Rate
Pc5QoSPara	3GPP TS 29.571 [6]	PC5 QoS parameters
CnAssistedRanPara	3GPP TS 29.502 [16]	SMF derived CN assisted RAN Parameters Tuning
MoExpDataCounter	3GPP TS 29.571 [6]	MO Exception Data Counter
CagData	3GPP TS 29.503 [35]	Closed Access Group Data
NssaaStatus	3GPP TS 29.571 [6]	Subscribed S-NSSAI subject to NSSAA procedure and the status

6.1.6.2 Structured data types

6.1.6.2.1 Introduction

Structured data types used in Namf_Communication service are specified in this clause.

6.1.6.2.2 Type: SubscriptionData

Table 6.1.6.2.2-1: Definition of type SubscriptionData

Attribute name	Data type	P	Cardinality	Description
amfStatusUri	Uri	M	1	This IE shall include the callback URI to receive notification of AMF status change.
guamiList	array(Guami)	C	1..N	This IE shall be absent for subscribing to status change for any GUAMI supported by the AMF, it shall be present for subscribing to specific GUAMIs supported by the AMF.

6.1.6.2.3 Type: AmfStatusChangeNotification

Table 6.1.6.2.3-1: Definition of type AmfStatusChangeNotification

Attribute name	Data type	P	Cardinality	Description
amfStatusInfoList	array(AmfStatusInfo)	M	1..N	This IE shall contain the status change information about the AMF

6.1.6.2.4 Type: AmfStatusInfo

Table 6.1.6.2.4-1: Definition of type AmfStatusInfo

Attribute name	Data type	P	Cardinality	Description
guamiList	array(Guami)	M	1..N	This IE shall contain the GUAMIs
statusChange	StatusChange	M	1	This IE shall contain the Status change of the related GUAMIs
targetAmfRemoval	AmfName	C	0..1	This IE shall contain the AMF Name of the target AMF in the AMF planned removal without UDSF scenario
targetAmfFailure	AmfName	C	0..1	This IE shall contain the AMF Name of the target AMF in the AMF Auto-recovery without UDSF scenario.

6.1.6.2.5 Type: AssignEbiData

Table 6.1.6.2.5-1: Definition of type AssignEbiData

Attribute name	Data type	P	Cardinality	Description
pduSessionId	PduSessionId	M	1	Represents the identifier of the PDU Session requesting EBI(s) to be assigned.
arpList	array(Arp)	C	1..N	This IE shall be present if the NF Service Consumer (e.g SMF) requests the AMF to assign EBI(s) for the PDU session. When present, this IE shall contain the list of ARP(s)of the QoS flow(s) for which EBI(s) are requested.
releasedEbiList	array(EpsBearerId)	C	1..N	This IE shall be present if the NF Service Consumer (e.g. SMF) needs to release the assigned EBI(s) from QoS flows (e.g. when the QoS flow is released).
oldGuami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).

6.1.6.2.6 Type: AssignedEbiData

Table 6.1.6.2.6-1: Definition of type AssignedEbiData

Attribute name	Data type	P	Cardinality	Description
pduSessionId	PduSessionId	M	1	Represents the identifier of the PDU Session requesting EBI(s) to be assigned.
assignedEbiList	array(EbiArpMapping)	M	0..N	This IE shall be present if the AMF assigned the requested EBI(s). This IE shall contain the successfully assigned EBIs. (NOTE)
failedArpList	array(Arp)	C	1..N	This IE shall be present if the AMF fails to allocate EBIs for a set of ARP(s). (NOTE)
releasedEbiList	array(EpsBearerId)	C	1..N	This IE shall be present if the NF Service Consumer requested the release of EBI(s) or if the AMF revoked an already assigned EBI towards the same PDU session. This IE shall contain the list of EBI(s) released at the AMF.
NOTE: The same ARP value may be returned in the assignedEbiList and in the failedArpList, if the request included the same ARP value more than once in the arpList and the AMF is not able to allocate an EBI for every occurrence of this ARP value.				

6.1.6.2.7 Type: AssignEbiFailed

Table 6.1.6.2.7-1: Definition of type AssignEbiFailed

Attribute name	Data type	P	Cardinality	Description
pduSessionId	PduSessionId	M	1	Represents the identifier of the PDU Session requesting EBI(s) to be assigned.
failedArpList	array(Arp)	C	1..N	This IE shall be present if the AMF fails to allocate EBIs for a set of ARPs.

6.1.6.2.8 Type: UEContextRelease

Table 6.1.6.2.8-1: Definition of type UEContextRelease

Attribute name	Data type	P	Cardinality	Description
supi	Supi	C	0..1	This IE shall be present if the UE is emergency registered and the SUPI is not authenticated.
unauthenticatedSupi	boolean	C	0..1	When present, this IE shall be set as follows: - true: unauthenticated SUPI; - false (default): authenticated SUPI. This IE shall be present if the SUPI is present in the message but is not authenticated and is for an emergency registered UE.
ngapCause	NgApCause	M	1	This IE shall contain the cause value received from the source 5G-AN in the handover Cancel message received over the NGAP interface.

6.1.6.2.9 Type: N2InformationTransferReqData

Table 6.1.6.2.9-1: Definition of type N2InformationTransferReqDataTransfer

Attribute name	Data type	P	Cardinality	Description
taiList	array(Tai)	C	1..N	This IE shall be included if the N2 information needs to be sent to the 5G-AN nodes that serve the list of tracking areas provided.
ratSelector	RatSelector	C	0..1	This IE shall be included to indicate if the N2 information shall be transferred to ng-eNBs or gNBs exclusively.
globalRanNodeList	array(GlobalRanNodeId)	C	1..N	This IE shall be included if the N2 information needs to be sent to the list of RAN nodes provided.
n2Information	N2InfoContainer	M	1	This IE includes the information to be sent on the N2 interface to the identified 5G-AN nodes and additional information required for the processing of the message by the AMF.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.

6.1.6.2.10 Type: NonUeN2InfoSubscriptionCreateData

Table 6.1.6.2.10-1: Definition of type NonUeN2InfoSubscriptionCreateData

Attribute name	Data type	P	Cardinality	Description
globalRanNodeList	array(GlobalRanNodeId))	C	1..N	This IE shall be included if the subscription is for N2 information from RAN node(s) for which the N2 information notification is subscribed (i.e N3IWF identifier or gNB identifier or Ng-eNB identifier).
anTypeList	array(AccessType)	C	1..N	This IE shall be included, if the globalRanNodeId IE is not included and if the N2 information from a specific access network needs to be subscribed. When included this IE shall contain the access type of the access network from which Non UE specific N2 information is to be notified.
n2InformationClass	N2InformationClass	M	1	This IE represents the class of N2 information that the NF Service Consumer requires to be notified.
n2NotifyCallbackUri	Uri	M	1	This IE represents the callback URI on which the N2 information shall be notified.
nfId	NfInstanceId	C	0..1	This IE shall be present if the subscription is for "NRPPa" N2 information class and/or "LPP" N1 information class. When present, this IE shall carry the value to be used for NGAP "Routing ID" IE, which identifies the Network Function (e.g. LMF) instance handling the NRPPa and/or LPP data.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.

6.1.6.2.11 Type: NonUeN2InfoSubscriptionCreatedData

Table 6.1.6.2.11-1: Definition of type NonUeN2InfoSubscriptionCreatedData

Attribute name	Data type	P	Cardinality	Description
n2NotifySubscriptionId	string	M	1	Represents the Id created by the AMF for the subscription to notify a non-UE related N2 information.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.
n2InformationClass	N2InformationClass	O	0..1	This IE represents the class of N2 information that the NF Service Consumer subscribed to.

6.1.6.2.12 Type: UeN1N2InfoSubscriptionCreateData

Table 6.1.6.2.12-1: Definition of type UeN1N2InfoSubscriptionCreateData

Attribute name	Data type	P	Cardinality	Description
n2InformationClass	N2InformationClass	C	1	This IE shall be present if the NF service consumer subscribes for a N2 information notification. This IE represents the class of N2 information that the NF Service Consumer requires to be notified.
n2NotifyCallbackUri	Uri	C	1	This IE shall be present if the NF service consumer subscribes for a N2 information notification. This IE represents the callback URI on which the N2 information shall be notified.
n1MessageClass	N1MessageClass	C	1	This IE shall be present if the NF service consumer subscribes for a N1 message notification. This IE represents the class of N1 message that the NF Service Consumer requires to be notified.
n1NotifyCallbackUri	Uri	C	1	This IE shall be present if the NF service consumer subscribes for a N1 message notification. This IE represents the callback URI on which the N1 message shall be notified.
nfId	NfInstanceId	C	0..1	This IE shall be present if the subscription is for "NRPPa" N2 information class and/or "LPP" N1 information class. When present, this IE shall carry the value to be used for NGAP "Routing ID" IE, which identifies the Network Function (e.g. LMF) instance handling the NRPPa and/or LPP data.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.
oldGuami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).

6.1.6.2.13 Type: UeN1N2InfoSubscriptionCreatedData

Table 6.1.6.2.13-1: Definition of type UeN1N2InfoSubscriptionCreatedData

Attribute name	Data type	P	Cardinality	Description
n1n2NotifySubscriptionId	string	M	1	Represents the Id created by the AMF for the subscription to notify a UE related N1/N2 information.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.

6.1.6.2.14 Type: N2InformationNotification

Table 6.1.6.2.14-1: Definition of type N2InformationNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
n2NotifySubscriptionId	string	M	1	Represents the subscription Id for which the notification is generated. The NF Service Consumer uses this to co-relate the notification against a corresponding subscription. If the notification is due to an implicit subscription via NRF, then the value shall be set as "implicit". During the AMF planned removal procedure with UDSF deployed procedure, this IE shall be set to "" (empty string) and be ignored by the NF Service Consumer.	
n2InfoContainer	N2InfoContainer	C	0..1	This IE shall be present, except during Inter NG-RAN node N2 based handover procedure (see clause 5.2.2.3.6.2). When present, this IE shall contain the N2 information related to the corresponding N2 information class.	
toReleaseSessionList	array(PduSessionId)	C	1..N	This IE shall be present during N2 based handover procedure, if there are any PDU session(s) associated with Network Slice(s) which become no longer available. When present, this IE shall include all the PDU session(s) associated with no longer available S-NSSAI(s).	
lcsCorrelationId	CorrelationID	C	0..1	This IE shall be present, if an LCS correlation identifier is received in corresponding N1/N2 Message Transfer service operation. When present, this IE shall carry the LCS correlation identifier.	
notifyReason	N2InfoNotifyReason	C	0..1	This IE shall be present, if "n2InfoContainer" attribute is not present; this IE may be present otherwise. When present, this IE indicates the reason for the N2 information notification.	
smfChangeInfoList	array(SmfChangeInfo)	C	1..N	This IE shall be present during N2 based handover procedure, if there is I-SMF or V-SMF change or removal for the related PDU session(s). When present, this IE shall indicate the I-SMF/V-SMF situation after successful HO complete.	DTSSA
ranNodeId	GlobalRanNodeId	C	0..1	This IE shall be present during the AMF planned removal procedure with UDSF deployed procedure. When present, it shall contain the Global RAN Node ID. The IE shall contain either the gNB ID or the NG-eNB ID.	
initialAmfName	AmfName	C	0..1	This IE shall be present during the AMF planned removal procedure with UDSF deployed procedure. When present, it shall contain the AMF Name of the initial AMF.	

anN2IPv4Addr	Ipv4Addr	C	0..1	This IE shall be present during the AMF planned removal procedure with UDSF deployed procedure, if the Access Network N2 interface is using IPv4 address.	
anN2IPv6Addr	Ipv6Addr	C	0..1	This IE shall be present during the AMF planned removal procedure with UDSF deployed procedure, if the Access Network N2 interface is using IPv6 address.	
guami	Guami	C	0..1	This IE shall be present during Location Services procedures (see clause 5.2.2.3.6.3) and it may be present otherwise. When present, it shall contain the GUAMI serving the UE.	
notifySourceNgRan	boolean	C	0..1	This IE shall be present during an Inter NG-RAN node N2 based DAPS handover procedure , if the target AMF receives this indication in the Handover Notify from the target NG-RAN node (see clause 4.9.1.3.3a of 3GPP TS 23.502 [3]). When present, it shall be set as follows: - true: Notify the Source NG-RAN about Handover Success - false (default): Do not notify the Source NG-RAN about Handover Success	

6.1.6.2.15 Type: N2InfoContainer

Table 6.1.6.2.15-1: Definition of type N2InfoContainer

Attribute name	Data type	P	Cardinality	Description
n2InformationClass	N2InformationClass	M	1	This IE represents the class of N2 information to be transferred.
smInfo	N2SmInformation	C	0..1	This IE shall be present if session management N2 information is to be transferred. When present, it represents a session management SMF related N2 information data part.
ranInfo	N2RanInformation	C	0..1	This IE shall be present if RAN related N2 information is to be transferred (i.e. n2InformationClass is "RAN"). When present, it shall contain the RAN related N2 information data part.
nrppaInfo	NrppaInformation	C	0..1	This IE shall be present if location service related N2 information is to be transferred. When present, it represents a NRPPa related N2 information data part.
pwsInfo	PwsInformation	C	0..1	This IE shall be present if PWS related N2 information is to be transferred.
v2xInfo	V2xInformation	C	0..1	This IE shall be present if V2X related N2 information is to be transferred.

6.1.6.2.16 Type: N1MessageNotification

Table 6.1.6.2.16-1: Definition of type N1MessageNotification

Attribute name	Data type	P	Cardinality	Description
n1NotifySubscriptionId	string	C	0..1	Represents the subscription Id for which the notification is generated. The NF Service Consumer uses this to correlate the notification against a corresponding subscription. If the notification is due to an implicit subscription via NRF, then the value shall be set as "implicit". This IE shall be present if the notification is based on a subscription to N1MessgeNotification. An exception is for the case when initial AMF forwards NAS message to target AMF during AMF re-allocation procedure.
n1MessageContainer	N1MessageContainer	M	1	Contains the N1 message class and N1 message content.
lcsCorrelationId	CorrelationID	O	0..1	If the N1 message notified is for LCS procedures, the NF Service Producer (e.g. AMF) may include an LCS correlation identifier.
registrationCtxtContainer	RegistrationContextContainer	C	0..1	If the N1 message notified is of type 5GMM (i.e. during Registration with AMF re-allocation procedure), the NF Service Producer (e.g. AMF) shall include this IE, if available.
newLmfIdentification	LMFIdentification	O	0..1	If a new LMF is selected by AMF, this IE may include the new selected LMF Identification.
guami	Guami	C	0..1	This IE shall be present during UE Assisted and UE Based Positioning Procedure (see clause 5.2.2.3.5.3) or the LCS Event Report, LCS Cancel Location and LCS Periodic-Triggered Invoke Procedures (see clause 5.2.2.3.5.5) and it may be present otherwise. When present, it shall contain the GUAMI serving the UE.
cIoT5GSOptimisation	boolean	C	0..1	This IE shall be present when the N1 message class is "LPP/LCS" and the N1 message is received from the UE with Control Plane CIoT 5GS Optimisation. When present, it shall be set as follows: - true: Control Plane CIoT 5GS Optimisation was used and no signalling or data is currently pending for the UE at the AMF. - false (default): Control Plane CIoT 5GS Optimisation was not used or signalling or data is currently pending for the UE at the AMF.

6.1.6.2.17 Type: N1MessageContainer

Table 6.1.6.2.17-1: Definition of type N1MessageContainer

Attribute name	Data type	P	Cardinality	Description
n1MessageClass	N1MessageClass	M	1	This IE shall contain the N1 message class for the message content specified in n1MessageContent.
n1MessageContent	RefToBinaryData	M	1	This IE shall reference the N1 message binary data corresponding to the n1MessageClass. See 3GPP TS 24.501 [11]. See clause 6.1.6.4.2.
nfId	NfInstanceId	C	0..1	This IE shall be present when the n1MessageClass IE is set to "LPP" or "LCS". It should be present when the n1MessageClass IE is set to "SM". It may be present otherwise. When present, this IE shall carry the identifier of the Network Function (e.g. LMF or SMF) instance sending the N1 message.
serviceInstanceId	string	O	0..1	When present, this IE shall carry the Service Instance Identifier of the Service Instance (e.g. LMF) sending the N1 message.

6.1.6.2.18 Type: N1N2MessageTransferReqData

Table 6.1.6.2.18-1: Definition of type N1N2MessageTransferReqData

Attribute name	Data type	P	Cardinality	Description	Applicability
n1MessageContainer	N1MessageContainer	C	0..1	This IE shall be included if a N1 message needs to be transferred.	
n2InfoContainer	N2InfoContainer	C	0..1	This IE shall be included if a N2 information needs to be transferred.	
mtData	RefToBinaryData	C	0..1	This IE shall be included if mobile terminated data (i.e. CIoT user data container) needs to be transferred. When present, it shall reference the mobile terminated data (see clause 6.1.6.4.4).	CIOT
skipInd	boolean	C	0..1	This IE shall be present and set to "true" if the service consumer (e.g. SMF) requires the N1 message to be sent to the UE only when UE is in CM-CONNECTED, e.g. during SMF initiated PDU session release procedure (see clause 4.3.4.2 of 3GPP TS 23.502 [3]). When present, this IE shall be set as following: - true: AMF should skip sending N1 message to UE, when the UE is in CM-IDLE. - false (default): the AMF shall send the N1 message to the UE.	
lastMsgIndication	boolean	O	0..1	This flag when present shall indicate that the message transferred is the last message. (See clause 4.13.3.3 of 3GPP TS 23.502 [3].	
pduSessionId	PduSessionId	O	0..1	PDU Session ID for which the N1 / N2 message is sent, if the N1 / N2 message class is SM.	
lcsCorrelationId	CorrelationID	O	0..1	LCS Correlation ID, for which the N1/N2 message is sent, if - the N1 message class is LPP (see clause 6.11.1 of 3GPP TS 23.273 [42]) or LCS (see clause 6.3 of 3GPP TS 23.273 [42]); and/or - the N2 Information class is NRPPa (see clause 6.11.2 of 3GPP TS 23.273 [42]).	
ppi	Ppi	O	0..1	This IE when present shall indicate the Paging policy to be applied. The paging policies are configured at the AMF.	

arp	Arp	O	0..1	This IE when present shall indicate the Allocation and Retention Priority of the PDU session for which the N1/N2 message transfer is initiated. To support priority paging, the AMF shall use this IE to determine whether to include the Paging Priority IE in the NGAP Paging Message (see clause 5.4.3.3 of 3GPP TS 23.501 [2]). The set of ARP values associated with priority paging and mapping to Paging Priority IE values are configured at the AMF. This IE shall not be present when the N1/N2 message class is not SM.	
5qi	5Qi	O	0..1	This IE when present shall indicate the 5QI associated with the PDU session for which the N1 / N2 message transfer is initiated. This IE shall not be present when the N1/N2 message class is not SM.	
n1n2FailureTxfNotifURI	Uri	O	0..1	If included, this IE represents the callback URI on which the AMF shall notify the N1/N2 message transfer failure.	
smfReallocationInd	boolean	O	0..1	This IE shall indicate that the SMF is requested to be reallocated (see clause 4.3.5.2 of 3GPP TS 23.502 [3]). When present, this IE shall be set as follows: - true: the SMF is requested to be reallocated. - false (default): the SMF is not requested to be reallocated.	
areaOfValidity	AreaOfValidity	O	0..1	This IE represents the list of TAs where the provided N2 information is valid. See clause 5.2.2.2.7 and 4.2.3.3 of 3GPP TS 23.502 [3].	
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.	
oldGuami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).	
maAcceptedInd	boolean	C	0..1	This IE shall be present if a request to establish a MA PDU session was accepted or if a single access PDU session was upgraded into a MA PDU session (see clauses 4.22.2 and 4.22.3 of 3GPP TS 23.502 [3]). When present, it shall be set as follows: - true: MA PDU session - false (default): single access PDU session	MAPDU

extBufSupport	boolean	O	0..1	This IE may be present with value "true" if Extended Buffering is permitted, during Network triggered Service Request Procedure (see clause 4.2.3.3 of 3GPP TS 23.502 [3]), UPF anchored Mobile Terminated Data Transport in Control Plane CIoT 5GS Optimisation procedure (see clause 4.24.2 of 3GPP TS 23.502 [3]) or NEF Anchored Mobile Terminated Data Transport (see clause 4.25.5 of 3GPP TS 23.502 [3]). When present, this IE shall indicate whether Extended Buffering applies or not: - true: Extended Buffering applies - false (default) Extended Buffering does not apply	
targetAccess	AccessType	C	0..1	This IE shall be included by a SMF for a MA PDU session to indicate the target access type (i.e. 3GPP access or Non-3GPP access) towards which the N2 information and optionally N1 information is requested to be sent. This IE may be included by an LMF to indicate the access type through which an LPP message shall be transmitted to the UE.	MAPDU, ELCS
NOTE: For N1 message class "UPDP", as per 3GPP TS 24.501 [11] Annex D, the messages between UE and PCF carry PTI which is used by the PCF to correlate the received N1 message in the notification with a prior transaction initiated by the PCF.					

6.1.6.2.19 Type: N1N2MessageTransferRspData

Table 6.1.6.2.19-1: Definition of type N1N2MessageTransferRspData

Attribute name	Data type	P	Cardinality	Description
cause	N1N2MessageTransferCause	M	1	This IE shall provide the result of the N1/N2 message transfer processing at the AMF.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.

6.1.6.2.20 Type: RegistrationContextContainer

Table 6.1.6.2.20-1: Definition of type RegistrationContextContainer

Attribute name	Data type	P	Cardinality	Description
ueContext	UeContext	M	1	This IE shall contain the UE Context information.
localTimeZone	TimeZone	O	0..1	This IE contains the time zone UE is currently located.
anType	AccessType	M	1	This IE shall contain the current access type of the UE.
anN2ApId	integer	M	1	This IE shall contain the RAN UE NGAP ID over N2 interface.
ranNodeId	GlobalRanNodeId	M	1	This IE shall contain the Global RAN Node ID. The IE shall contain either the gNB ID or the NG-eNB ID.
initialAmfName	AmfName	M	1	This IE shall contain the AMF Name of the initial AMF.
userLocation	UserLocation	M	1	This IE shall contain the user location received from 5G-AN.
anN2IPv4Addr	Ipv4Addr	C	0..1	If the Access Network N2 interface is using IPv4 address, this IE shall be included.
anN2IPv6Addr	Ipv6Addr	C	0..1	If the Access Network N2 interface is using IPv6 address, this IE shall be included.
rrcEstCause	string	C	0..1	This IE shall contain the RRC Establishment Cause, if received from the 5G-AN (See 3GPP TS 38.413 [12], clause 9.2.5.1). It carries the value in hexadecimal representation Pattern: '^[0-9a-fA-F]+$'
ueContextRequest	boolean	C	0..1	This IE shall contain the indication on whether UE context including security information needs to be setup at the NG-RAN, if received from the NG-RAN by the initial AMF (See 3GPP TS 38.413 [12], clause 9.2.5.1). When present, it shall be set as follows: - true: UE context including security information needs to be setup at the NG-RAN. - false (default): UE context including security information does not need to be setup at the NG-RAN.
initialAmfN2ApId	integer	C	0..1	This IE shall contain the AMF UE NGAP ID of the initial AMF over N2 interface, if available.
allowedNssai	AllowedNssai	O	0..1	This IE contains the allowed NSSAI of the UE. This IE also contains the mapped home network S-NSSAI for each allowed S-NSSAI.
configuredNssai	array(ConfiguredSnssai)	O	1..N	This IE shall contain the configured S-NSSAI(s) authorized by the NSSF in the serving PLMN, if received from the NSSF.
rejectedNssaiInPlmn	array(Snssai)	O	1..N	This IE shall contain the rejected NSSAI in the PLMN, if received from the NSSF.
rejectedNssaiInTa	array(Snssai)	O	1..N	This IE shall contain the rejected NSSAI in the current TA, if received from the NSSF.

6.1.6.2.21 Type: AreaOfValidity

Table 6.1.6.2.21-1: Definition of type AreaOfValidity

Attribute name	Data type	P	Cardinality	Description
taiList	array(Tai)	M	0..N	An array of TAI representing the area of validity of the associated N2 information provided.

6.1.6.2.22 Void

6.1.6.2.23 Type: UeContextTransferReqData

Table 6.1.6.2.23-1: Definition of type UeContextTransferReqData

Attribute name	Data type	P	Cardinality	Description
reason	TransferReason	M	1	Indicate the reason for the UEContextTransfer service request
accessType	AccessType	M	1	This IE shall contain the access type of the UE.
plmnId	PlmnId	O	0..1	If present, this IE shall contain the PLMN ID of the NF service consumer (e.g target AMF).
regRequest	N1MessageContainer	O	0..1	If present, this IE shall refer to the registration request message which triggers the UE Context Transfer. The message class shall be "5GMM" and message content shall be reference to N1 Message Content binary data, See clause 6.1.6.4.2.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.

6.1.6.2.24 Type: UeContextTransferRspData

Table 6.1.6.2.24-1: Definition of type UeContextTransferRspData

Attribute name	Data type	P	Cardinality	Description	Applicability
ueContext	UeContext	M	1	Represents an individual ueContext resource after the modification is applied.	
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.	
ueRadioCapability	N2InfoContent	C	0..1	This IE shall be included to contain the "UE Radio Capability Information" if available during context transfer procedure. UE Radio Capability Information does not include NB-IoT UE radio capability, see clause 5.4.4.1 of 3GPP TS 23.501 [2]	
ueNbiotRadioCapability	N2InfoContent	C	0..1	This IE shall be included to contain "NB-IoT UE radio capability Information" if available during context transfer procedure, see clause 5.4.4.1 of 3GPP TS 23.501 [2]	CIOT

6.1.6.2.25 Type: UeContext

Table 6.1.6.2.25-1: Definition of type UeContext

Attribute name	Data type	P	Cardinality	Description	Applicability
supi	Supi	C	0..1	This IE shall be present if available. When present, this IE contains SUPI of the UE.	
supiUnauthInd	boolean	C	0..1	This IE shall be present if SUPI is present. When present, it shall indicate whether the SUPI is unauthenticated.	
gpsiList	array(Gpsi)	C	1..N	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE shall contain the GPSI(s) of the UE.	
pei	Pei	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE shall contain Mobile Equipment Identity of the UE.	
udmGroupId	NfGroupId	O	0..1	When present, it shall indicate the identity of the UDM Group serving the UE.	
ausfGroupId	NfGroupId	O	0..1	When present, it shall indicate the identity of the AUSF Group serving the UE.	
pcfGroupId	NfGroupId	O	0..1	When present, it shall indicate the identity of the PCF Group serving the UE.	
routingIndicator	string	O	0..1	When present, it shall indicate the Routing Indicator of the UE.	
groupList	array(GroupId)	C	1..N	This IE shall be present if the UE belongs to any subscribed internal group(s) and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE shall list the subscribed internal group(s) to which the UE belongs to.	
drxParameter	DrxParameter	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE shall contain the DRX parameter of the UE.	
subRfsp	RfspIndex	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, it shall indicate the subscribed RFSP Index of the UE.	
usedRfsp	RfspIndex	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, it shall indicate the used RFSP Index of the UE.	
subUeAmbr	Ambr	C	0..1	This IE shall be present if subscribed UE-AMBR has been retrieved from UDM and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE shall indicate the value of subscribed UE AMBR of the UE.	

smsfId	NfInstanceId	C	0..1	This IE shall be present if the SMS service for UE is activated and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, it indicates the identifier of the SMSF network function instance serving the UE. The NF service consumer (e.g. target AMF) may use this information to identify the SMSF NF service profile from among the SMSF NF service profiles it received from the NRF.	
seafData	SeafData	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a or the case specified in clause 5.2.2.2.1.2. When present, this IE contains the security data derived from data received from AUSF of the UE.	
5gMmCapability	5GMmCapability	C	0..1	This IE shall be present if the UE had provided this IE during Registration Procedure and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE shall contain 5G MM capability of the UE.	
pcfId	NfInstanceId	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE indicates the identity of the PCF for AM Policy and/or UE Policy.	
pcfSetId	NfSetId	C	0..1	This IE shall be present, if available. When present, it shall contain the NF Set ID of the PCF for AM Policy and/or UE Policy.	
pcfAmpServiceSetId	NfServiceSetId	C	0..1	This shall be present, if available. When present, it shall contain the NF Service Set ID of the PCF's AM Policy service.	
pcfUepServiceSetId	NfServiceSetId	C	0..1	This shall be present, if available. When present, it shall contain the NF Service Set ID of the PCF's UE Policy service.	
pcfBindingLevel	SbiBindingLevel	C	0..1	This IE shall be present if available. When present, this IE shall contain the SBI binding level of the PCF's AM policy and UE Policy association resources.	
pcfAmPolicyUri	Uri	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present this IE shall contain the URI of the individual AM policy resource (see 3GPP TS 29.507 [32] clause 5.3.3.2) used by the AMF.	

amPolicyReqTriggerList	array(PolicyReqTrigger)	C	1..N	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present this IE shall indicate the AM policy request triggers towards the PCF. The NF Service Consumer (e.g. target AMF) shall use these triggers to request AM policy from the PCF whenever these triggers are met. The possible AM policy control request triggers are specified in clause 6.1.2.5 of 3GPP TS 23.503 [7].	
pcfUePolicyUri	Uri	C	0..1	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present this IE shall contain the URI of the individual UE policy resource (see 3GPP TS 29.507 [32] clause 5.3.3.2) used by the AMF.	
uePolicyReqTriggerList	array(PolicyReqTrigger)	C	1..N	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present this IE shall indicate the UE policy request triggers towards the PCF. The NF Service Consumer (e.g. target AMF) shall use these triggers to request UE policy from the PCF whenever these triggers are met. The possible UE policy control request triggers are specified in clause 6.1.2.5 of 3GPP TS 23.503 [7].	
hpcfId	NfInstanceId	O	0..1	This IE indicates the identity of PCF for UE Policy in home PLMN, when the UE is roaming.	
restrictedRatList	array(RatType)	O	1..N	When present, this IE shall indicate the list of RAT types that are restricted for the UE; see 3GPP TS 29.571 [6] (NOTE 1)	
forbiddenAreaList	array(Area)	O	1..N	When present, this IE shall indicate the list of forbidden areas of the UE.	
serviceAreaRestriction	ServiceAreaRestriction	O	0..1	When present, this IE shall indicate Service Area Restriction for the UE.	
restrictedCnList	array(CoreNetworkType)	O	1..N	When present, this IE shall indicate the list of Core Network Types that are restricted for the UE.	
eventSubscriptionList	array(AmfEventSubscription)	C	1..N	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, it shall indicate the event subscription(s) targeting the UE or the group the UE is part of.	
mmContextList	array(MmContext)	C	1..2	This IE shall be present if available and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE contains the MM Contexts of the UE.	

sessionContextList	array(PduSessionContext)	C	1..N	This IE shall be present if available and if it is neither case a) nor case b) specified in clause 5.2.2.2.1.1 step 2a. When present, this IE contains the PDU Session Contexts of the UE. (NOTE 2)	
traceData	TraceData	C	0..1	This IE shall be present if signalling based trace has been activated (see 3GPP TS 32.422 [30]) and if it is not case b) specified in clause 5.2.2.2.1.1 step 2a.	
serviceGapExpiryTime	DateTime	C	0..1	This IE shall be present if Service Gap Control is enabled and if the AMF has started a Service Gap Timer which has not expired yet (see clause 5.31.16 of 3GPP TS 23.501 [2]). The value of the IE shall indicate the expiry time of the active Service Gap Timer for the UE.	
stnSr	StnSr	O	0..1	This IE shall be present if available, for UE supporting 5G-SRVCC (see clause 5.2.2.2.11 of 3GPP TS 23.502 [3]). When present, this IE contains STN-SR of the UE.	
cMsisdn	CMsisdn	O	0..1	This IE shall be present if available, for UE supporting 5G-SRVCC (see clause 5.2.2.2.11 of 3GPP TS 23.502 [3]). When present, this IE contains C-MSISDN of the UE.	
msClassmark2	MSClassmark2	O	0..1	This IE shall be present if available, for UE supporting 5G-SRVCC (see clause 5.2.2.2.11 of 3GPP TS 23.502 [3]). When present, this IE contains Mobile Station Classmark 2 of the UE.	
supportedCodecList	array(SupportedCodec)	O	1..N	This IE shall be present if available, for UE supporting 5G-SRVCC (see clause 5.2.2.2.11 of 3GPP TS 23.502 [3]). When present, this IE shall indicate the list of speech codecs supported by the UE.	
smallDataRateStatusInfos	array(SmallDataRateStatusInfo)	O	1..N	List of Small Data Rate Control Statuses for released PDU Sessions, see clause 5.31.14.3 of TS 23.501 [2].	CIOT
restrictedPrimaryRatList	array(RatType)	O	1..N	When present, this IE shall indicate the list of RAT types that are restricted for use as primary RAT for the UE; see 3GPP TS 29.571 [6] (NOTE)	
restrictedSecondaryRatList	array(RatType)	O	1..N	When present, this IE shall indicate the list of RAT types that are restricted for use as secondary RAT for the UE; see 3GPP TS 29.571 [6] (NOTE)	
v2xContext	V2xContext	O	0..1	This IE shall be present if available (see clause 6.5.4 of 3GPP TS 23.287 [47]). When present, this IE shall indicate the parameters related to the V2X services.	

lteCatMInd	boolean	C	0..1	This IE shall be present with value "true" if the UE is a LTE Category M UE based on indication provided by the NG-RAN or by the MME at EPS to 5GS handover, as specified in 3GPP TS 23.502 [3]. When present, this IE shall be set as following: - true: the UE is a Category M UE - false (default): this UE is not a Category M UE.	
moExpDataCounter	MoExpDataCounter	C	0..1	This IE shall be present if a non-zero MO Exception counter has not been reported yet to SMF. When present, this IE shall contain the MO Exception Data Counter, as specified in clause 5.31.14.3 of 3GPP TS 23.501 [2].	
cagData	CagData	O	0..1	Closed Access Group Data When present, the provisioningTime attribute (from the CagData data type) shall be absent.	NPN
managementMdtInd	boolean	C	0..1	This flag shall be present with value "true" if Management Based Minimization of Drive Tests (MDT) is allowed, as specified in 3GPP TS 32.422 [30]. When present, this IE shall be set as following: - true: management based MDT is allowed. - false (default): management based MDT is not allowed.	
immediateMdtConf	ImmediateMdtConf	C	0..1	This IE shall be sent by the source AMF to the target AMF, if the Job Type indicates Immediate MDT. See clause 4.10 of 3GPP TS 32.422 [30].	

NOTE 1: If the restrictedPrimaryRatList and restrictedSecondaryRatList attributes are supported by the sender, the sender shall include the list of RAT Types that are restricted, if any, in the restrictedRatList attribute, shall include the list of RAT Types that are restricted for use as primary RAT, if any, in the restrictedPrimaryRatList attribute and shall include the list of RAT Types that are restricted for use as secondary RAT, if any, in the restrictedSsecondaryRatList attribute. If the restrictedPrimaryRatList and restrictedSecondaryRatList attributes are supported by the receiver, the receiver shall use the data in the restrictedPrimaryRatList attribute, if received, as the list of RAT Types that are restricted for use as primary RAT for the UE, and shall use the data in the restrictedSecondaryRatList attribute, if received, as the list of RAT Types that are restricted for use as secondary RAT for the UE, otherwise the receiver shall use the data in the restrictedRatList attribute, if received, as the list of RAT Types that are restricted for the UE.

NOTE 2: A particular PDU session not supported by the target AMF shall not be transferred, e.g. MA-PDU session context shall not be transferred if target AMF does not support ATSSS.

6.1.6.2.26 Type: N2SmInformation

Table 6.1.6.2.26-1: Definition of type N2SmInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
pduSessionId	PduSessionId	M	1	Indicates the PDU Session Identity	
n2InfoContent	N2InfoContent	C	0..1	This IE shall be present if a SMF related IE should be transferred. When present, the IE contains one of NGAP SMF related IEs specified in clause 9.3.4 of 3GPP TS 38.413 [12].	
sNssai	Snssai	C	0..1	This IE shall be present if network slice information to be transferred for session management. When present, the IE indicates the network slice the PDU session belongs to.	
homePlmnSnssai	Snssai	C	0..1	This IE shall be present during EPS to 5GS handover procedure for Home Routed PDU session. When present, it shall carry the S-NSSAI for home PLMN.	ENS
subjectToHo	boolean	C	0..1	This IE shall be present if n2InfoContent carries a " Handover Required Transfer" IE. When present, it Indicates whether the PDU session shall be subject to handover to the target node.	

6.1.6.2.27 Type: N2InfoContent

Table 6.1.6.2.27-1: Definition of type N2InfoContent

Attribute name	Data type	P	Cardinality	Description
ngapMessageType	Uinteger	C	0..1	This IE shall be present if PWS related N2 information is to be transferred, or during the AMF planned removal procedure with UDSF deployed procedure to transfer a RAN N2 message. When present, it shall indicate the NGAP Message type of the ngapData as specified in clause 6.1.6.4.3.3. Its value equals the value of the Procedure Code defined in ASN.1 in clause 9.4.7 in 3GPP TS 38.413 [12].
ngapIeType	NgapIeType	C	0..1	This IE shall be present if SM, RAN, V2X or NRPPa related N2 information is to be transferred. When present, it shall indicate the NGAP IE type of the ngapData as specified in clause 6.1.6.4.3.2.
ngapData	RefToBinaryData	M	1	This IE reference the N2 Information binary data corresponding to the N2 information class. See clause 6.1.6.4.3.

6.1.6.2.28 Type: NrppaInformation

Table 6.1.6.2.28-1: Definition of type NrppaInformation

Attribute name	Data type	P	Cardinality	Description
nfId	NfInstanceId	M	1	This IE shall carry the identifier of the Network Function (e.g. LMF) instance that is sending or receiving the NRPPa data.
nrppaPdu	N2InfoContent	M	1	This IE represents the encoded NGAP NRPPa-PDU IE, which is transparent to AMF.
serviceInstanceId	string	O	0..1	When present, this IE shall carry the Service Instance Identifier of the Service Instance (e.g. LMF) that is sending or receiving the NRPPa data.

6.1.6.2.29 Type: PwsInformation

Table 6.1.6.2.29-1: Definition of type PwsInformation

Attribute name	Data type	P	Cardinality	Description
messageIdentifier	Uint16	M	1	Identifies the warning message. Sender shall set this field to 0, if the pwsContainer IE carries PWS Failure Indication or PWS Restart Indication. The receiver shall ignore this IE if the pwsContainer IE carries PWS Failure Indication or PWS Restart Indication.
serialNumber	Uint16	M	1	identifies a particular message from the source and type indicated by the Message Identifier. Sender shall set this field to 0, if the pwsContainer IE carries PWS Failure Indication or PWS Restart Indication. The receiver shall ignore this IE if the pwsContainer IE carries PWS Failure Indication or PWS Restart Indication.
pwsContainer	N2InfoContent	M	1	This IE represents the PWS N2 information data part to be relayed between CBCF and AN.
bcEmptyAreaList	array(GlobalRanNodeId)	C	1..N	This IE shall be present if the NF consumer has previously requested the AMF to send the N2 reponse information for PWS-CANCEL-REQUEST and the AMF has received PWS-CANCEL-RESPONSE from RAN node(s) not including the *Broadcast Cancelled Area List* IE. When present, this IE shall list the RAN node(s) that has sent a PWS-CANCEL-RESPONSE not including the *Broadcast Cancelled Area List* IE.
sendRanResponse	boolean	O	0..1	This IE shall be present to request the AMF to send the N2 response information it has received from the RAN nodes to the NF Service Consumer. When present, this IE shall be set as follows: - true: send RAN response - false (default): do not send RAN response. The N2 information received from the RAN corresponds to the *Broadcast-Completed-Area-List* IE or the *Broadcast-Cancelled-Area-List* IE defined in 3GPP TS 38.413 [12]. See clause 6.1.6.4.3.3.
omcId	OmcIdentifier	O	0..1	IE shall be present if the AMF is required to write the n2Information it has received from the RAN nodes into trace records on the OMC. When present, it indicates the identifier of OMC.

6.1.6.2.30 Type: N1N2MsgTxfrFailureNotification

Table 6.1.6.2.30-1: Definition of type N1N2MsgTxfrFailureNotification

Attribute name	Data type	P	Cardinality	Description
cause	N1N2MessageTransferCause	M	1	This IE shall provide the result of the N1/N2 message transfer at the AMF.
n1n2MsgDataUri	Uri	M	1	This IE shall contain the N1N2MessageTransfer request resource URI returned in the Location header when the N1/N2 message transfer was initiated (see clause 6.1.3.5.3.1). This IE shall be used by the NF Service Consumer to correlate the notification with the UE or session for which the earlier N1/N2 message transfer was initiated. If no Location header was returned when the N1/N2 message transfer was initiated, e.g. when a 200 OK response was sent for a UE in RRC inactive state, this IE shall be set to a dummy URI, i.e. an URI with no authority and an empty path (e.g. "http:").

6.1.6.2.31 Type: N1N2MessageTransferError

Table 6.1.6.2.31-1: Definition of type N1N2MessageTransferError

Attribute name	Data type	P	Cardinality	Description
error	ProblemDetails	M	1	This IE shall provide the result of the N1/N2 message transfer processing at the AMF.
errInfo	N1N2MsgTxfrErrDetail	O	0..1	This IE may be included to provide additional information related to the error.

6.1.6.2.32 Type: N1N2MsgTxfrErrDetail

Table 6.1.6.2.32-1: Definition of type N1N2MsgTxfrErrDetail

Attribute name	Data type	P	Cardinality	Description
retryAfter	Uinteger	O	0..1	This IE may be included if the AMF requests the NF Service Consumer to stop sending the N1/N2 message before timeout, and to retry the N1/N2 message transfer request that was rejected after a timeout. The value shall be in seconds. When included, the value shall be set to an estimate of the AMF on how long it will take before the AMF considers paging procedure as completed.
highestPrioArp	Arp	O	0..1	This IE may be included if the "cause" attribute in the ProblemDetails is set to "HIGHER_PRIORITY_REQUEST_ONGOING". When included this IE shall contain the ARP value of the highest priority QoS flow for which currently paging is ongoing. The NF Service Consumer shall not initiate an Namf_Communication_N1N2MessageTransfer operation for the same UE with an ARP value having a lower priority than this or the same priority as this, until the retryAfter timer expires.
maxWaitingTime	DurationSec	C	0..1	This IE shall be present when: - extBufSupport attribute with value "true" received in the request; and - the UE is not reachable due to the UE in MICO mode or the UE using extended idle mode DRX. When present, this IE shall indicate the estimated maximum waiting time in seconds before the UE will be reachable. If the UE is in MICO mode, the AMF determines the Estimated Maximum Wait time based on the next expected periodic registration by the UE or by implementation. If the UE is using extended idle mode DRX, the AMF determines the Estimated Maximum Wait time based on the start of the next Paging Time Window.

6.1.6.2.33 Type: N2InformationTransferRspData

Table 6.1.6.2.33-1: Definition of type N2InformationTransferRspData

Attribute name	Data type	P	Cardinality	Description
result	N2InformationTransferResult	M	1	This IE shall provide the result of the N2 information transfer processing at the AMF.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.
pwsRspData	PWSResponseData	C	0..1	This IE shall be present if the n2InformationClass is "PWS" in N2InformationTransferReqData.

6.1.6.2.34 Type: MmContext

Table 6.1.6.2.34-1: Definition of type MmContext

Attribute name	Data type	P	Cardinality	Description
accessType	AccessType	M	1	This IE shall contain the access type of the MM context.
nasSecurityMode	NasSecurityMode	C	0..1	This IE shall be present if available in 3GPP access MM context. When present, this IE shall contain the used NAS security mode of the UE.
epsNasSecurityMode	EpsNasSecurity Mode	C	0..1	This IE shall be present in 3GPP access MM context if selected EPS NAS security algorithms have been previously provided to the UE, as specified in clause 6.7.2 of 3GPP TS 33.501 [27]. When present, this IE shall contain the selected EPS NAS security algorithms provided to the UE.
nasDownlinkCount	NasCount	C	0..1	This IE shall be present if available in 3GPP access MM context. When present, this IE shall contain the NAS downlink count of the UE.
nasUplinkCount	NasCount	C	0..1	This IE shall be present if available in 3GPP access MM context. When present, this IE shall contain the NAS uplink count of the UE.
ueSecurityCapability	UeSecurityCapab ility	C	0..1	This IE shall be present if available in 3GPP access MM context. When present, this IE shall contain the UE security capability
s1UeNetworkCapability	S1UeNetworkCa pability	C	0..1	This IE shall be present if available in 3GPP access MM context. When present, this IE shall contain the S1 UE network capabilities.
allowedNssai	array(Snssai)	C	1..N	This IE shall be present if the source AMF and the target AMF are in the same PLMN and if available. When present, this IE shall contain the allowed NSSAI for the access type.
nssaiMappingList	array(NssaiMappi ng)	C	1..N	This IE shall be present if the source AMF and the target AMF are in the same PLMN and if available. When present, this IE shall contain the mapping of the allowed NSSAI for the UE.
allowedHomeNssai	array(Snssai)	C	1..N	This IE shall be present if the source AMF and the target AMF are in different PLMNs and if available. When present, this IE shall contain the home S-NSSAIs corresponding to the allowed NSSAI for the access type.
nsInstanceList	array(NsiId)	C	1..N	This IE shall be present if available. When present, it shall indicate the Network Slice Instances selected for the UE.
expectedUEbehavior	ExpectedUeBeha vior	C	0..1	This IE shall be present if available. When present it shall indicate the expected UE moving trajectory and its validity period. See 3GPP TS 23.502 [3] clause 4.15.6.3.
plmnAssiUeRadioCapId	PlmnAssiUeRadi oCapId	C	0..1	This IE shall be present if the source AMF supports RACS feature and if available. When present it shall be the PLMN-assigned UE Radio Capability ID. (NOTE 1)
manAssiUeRadioCapId	ManAssiUeRadio CapId	C	0..1	This IE shall be present if the source AMF supports RACS feature and if available. When present it shall be the Manufacturer-assigned UE Radio Capability ID.
ucmfDicEntryId	string	C	0..1	This IE shall be present if the source AMF supports RACS feature and if available. When present it shall be the UCMF allocated dicEntryId received from the UCMF.
n3IwfId	GlobalRanNodeI d	C	0..1	This IE shall be present during Registration procedure with AMF changes as specified in clause 4.2.2.2 of 3GPP TS 23.502 [3], if old AMF holds UE context established via N3IWF. When present, this IE shall contain the Global RAN Node ID of N3IWF.

wagfId	GlobalRanNodeId	C	0..1	This IE shall be present during Registration procedure with AMF changes as specified in clause 4.2.2.2 of 3GPP TS 23.502 [3], if old AMF holds UE context established via W-AGF. When present, this IE shall contain the Global RAN Node ID of W-AGF.
tngfId	GlobalRanNodeId	C	0..1	This IE shall be present during Registration procedure with AMF changes as specified in clause 4.2.2.2 of 3GPP TS 23.502 [3], if old AMF holds UE context established via TNGF. When present, this IE shall contain the Global RAN Node ID of TNGF.
anN2ApId	integer	C	0..1	This IE shall be present during Registration procedure with AMF changes, as specified in clause 4.2.2.2 of 3GPP TS 23.502 [3], if old AMF holds UE context established via N3IWF/W-AGF/TNGF and the UE is in CM-CONNECTED state via N3IWF/W-AGF/TNGF. When present, this IE shall contain the RAN UE NGAP ID over N2 interface.
nssaaStatusList	array(NssaaStatus)	C	1..N	This IE shall be present if available. When present, it shall contain the subscribed S-NSSAIs subject to NSSAA procedure and for which a status information is available. See 3GPP TS 23.501 [2] clause 5.15.5.2.1 and 3GPP TS 23.502 [3] clause 5.2.2.2.2.
pendingNssaiMappingList	array(NssaiMapping)	C	1..N	This IE shall be present if available. When present, this IE shall contain the mapping of the pending NSSAI for the UE.
NOTE 1: If the AMF supports RACS and the AMF detects that the selected PLMN during a service request procedure is different from the currently registered PLMN for the UE, the AMF stores the UE Radio Capability ID of the newly selected PLMN in the UE context as described in clause 5.2.3.2 of 3GPP TS 23.502 [3], and provides this UE Radio Capability ID to the target AMF during any subsequent inter-AMF mobility.				

6.1.6.2.35 Type: SeafData

Table 6.1.6.2.35-1: Definition of type SeafData

Attribute name	Data type	P	Cardinality	Description
ngKsi	NgKsi	M	1	Indicates the KSI used for the derivation of the keyAmf sent.
keyAmf	KeyAmf	M	1	Indicates the K_{amf} or K'_{amf}
nh	string	C	0..1	This IE shall be present during N2 handover procedure as specified in clause 6.9.2.3.3 of 3GPP TS 33.501 [27]. When present, this IE indicates the Next Hop value used for the key derivation. The value is encoded as a string of hexadecimal characters. Pattern: '^[A-Fa-f0-9]+$'
ncc	integer	C	0..1	This IE shall be present during N2 handover procedure as specified in clause 6.9.2.3.3 of 3GPP TS 33.501 [27]. When present, this IE indicates the NH Chaining Counter. The value is within the range 0 to 7.
keyAmfChangeInd	boolean	C	0..1	This IE shall be included, with a value "true", if the source AMF requires the target AMF to perform AS key re-keying, during N2 handover procedure as specified in clause 6.9.2.3.3 of 3GPP TS 33.501 [27].
keyAmfHDerivationInd	boolean	C	0..1	This IE shall be included, with a value "true", if the source AMF has performed horizontal K_{AMF} derivation, which means a new K_{AMF} has been calculated.

6.1.6.2.36 Type: NasSecurityMode

Table 6.1.6.2.36-1: Definition of type NasSecurityMode

Attribute name	Data type	P	Cardinality	Description
integrityAlgorithm	IntegrityAlgorithm	M	1	Indicates the integrity protection algorithm
cipheringAlgorithm	CipheringAlgorithm	M	1	Indicates the ciphering algorithm

6.1.6.2.37 Type: PduSessionContext

Table 6.1.6.2.37-1: Definition of type PduSessionContext

Attribute name	Data type	P	Cardinality	Description	Applicability
pduSessionId	PduSessionId	M	1	Indicates the identifier of the PDU Session.	
smContextRef	Uri	M	1	Indicates the resource URI of the SM context, including the apiRoot (see clause 6.1.3.3.2 of 3GPP TS 29.502 [16]). When present, it shall carry the URI of SM Context of: - I-SMF, for a PDU session with I-SMF; or - V-SMF, for HR PDU session; or - SMF, for non-roaming PDU session without I-SMF, or LBO roaming PDU session;	
sNssai	Snssai	M	1	Indicates the associated S-NSSAI for the PDU Session.	
dnn	Dnn	M	1	This IE shall indicate the Data Network Name. The DNN shall be the full DNN (i.e. with both the Network Identifier and Operator Identifier) for a HR PDU session, and it should be the full DNN in LBO and non-roaming scenarios. If the Operator Identifier is absent, the serving core network operator shall be assumed.	
accessType	AccessType	M	1	Indicates the access type of the PDU session.	
additionalAccessType	AccessType	C	0..1	Indicates the additional access type for a MA PDU session, if the UE registers to both 3GPP access and Non-3GPP access.	
allocatedEbiList	array(EbiArpMapping)	C	1..N	This IE shall be present when at least one EBI is allocated to the PDU session. When present, this IE shall contain the EBIs currently allocated to the PDU session.	
hsmfId	NfInstanceId	C	0..1	This IE shall be present for non-roaming and home-routed PDU sessions. This IE should also be present for LBO PDU sessions. When present, it shall indicate the associated: - home SMF for HR PDU Session, or - SMF, for non-roaming PDU session or LBO PDU Session, regardless whether an I-SMF is involved or not.	
hsmfSetId	NfSetId	C	0..1	This IE shall be present, if available. When present, this IE shall contain the NF Set ID of the home SMF or the SMF indicated by hsmfId.	
hsmfServiceSetId	NfServiceSetId	C	0..1	This IE shall be present, if available. When present, this IE shall contain the NF Service Set ID of the selected PDUSession service instance of home SMF or the SMF indicated by hsmfId.	

smfBinding	SbiBindingLevel	C	0..1	This IE shall be present if available, for a non-roaming PDU session or LBO PDU session. When present, this IE shall contain the SBI binding level of the SMF's SM context resource.	
vsmfId	NfInstanceId	C	0..1	This IE shall be present for roaming PDU sessions. When present, it shall indicate the associated visit SMF for home-routed the PDU Session, or the SMF for the local-breakout PDU session.	
vsmfSetId	NfSetId	C	0..1	This IE shall be present, if available. When present, this IE shall contain the NF Set ID of the V-SMF.	
vsmfServiceSetId	NfServiceSetId	C	0..1	This IE shall be present, if available. When present, this IE shall contain the NF Service Set ID of the V-SMF's PDUSession service instance.	
vsmfBinding	SbiBindingLevel	C	0..1	This IE shall be present, if available. When present, this IE shall contain the SBI binding level of the V-SMF's SM context resource.	
ismfId	NfInstanceId	C	0..1	This IE shall be present if I-SMF is involved in the PDU session. When present, it shall indicate the associated I-SMF for the PDU Session.	DTSSA
ismfSetId	NfSetId	C	0..1	This IE shall be present, if available. When present, this IE shall contain the NF Set ID of the I-SMF.	DTSSA
ismfServiceSetId	NfServiceSetId	C	0..1	This IE shall be present, if available. When present, this IE shall contain the NF Service Set ID of the I-SMF's PDUSession service instance.	DTSSA
ismfBinding	SbiBindingLevel	C	0..1	This IE shall be present if available. When present, this IE shall contain the SBI binding level of the I-SMF's SM Context resource.	DTSSA
nsInstance	NsiId	C	1	This IE shall be present if available. When present, this IE shall Indicate Network Slice Instance for the PDU Session	
smfServiceInstanceId	string	O	0..1	When present, this IE shall contain the serviceInstanceId of the SMF PDUSession service instance serving the SM Context, i.e. of: - the I-SMF, for a PDU session with I-SMF; - the V-SMF, for a HR PDU session; or - the SMF, for a non-roaming or an LBO roaming PDU session without I-SMF. This IE may be used by the AMF to identify PDU session contexts affected by a failure or restart of the SMF service instance (see clause 6.2 of 3GPP TS 23.527 [33]).	
maPduSession	boolean	C	0..1	This IE shall be present if available. When present, this IE shall indicate whether it is an MA PDU session. true: indicates the PDU session is MA PDU session; false (default): the PDU session is not MA PDU session.	

cnAssistedRanPara	CnAssistedRanPara	C	0..1	This IE shall be present if available. When present, this IE shall contain the PDU Session specific parameters received from the SMF and used by the AMF to derive the Core Network assisted RAN parameters tuning.	

6.1.6.2.38 Type: NssaiMapping

Table 6.1.6.2.38-1: Definition of type NssaiMapping

Attribute name	Data type	P	Cardinality	Description
mappedSnssai	Snssai	M	1	Indicates the mapped S-NSSAI in the serving PLMN
hSnssai	Snssai	M	1	Indicates the S-NSSAI in home PLMN

6.1.6.2.39 Type: UeRegStatusUpdateReqData

Table 6.1.6.2.39-1: Definition of type UeRegStatusUpdateReqData

Attribute name	Data type	P	Cardinality	Description	Applicability
transferStatus	UeContextTransferStatus	M	1	This IE shall indicate if the previous UE context transfer was completed.	
toReleaseSessionList	array(PduSessionId)	C	1..N	This IE shall be present during UE Context Transfer procedure, if there are any PDU session(s) associated with Network Slice(s) which become no longer available. When present, this IE shall include all the PDU session(s) associated with no longer available S-NSSAI(s).	
pcfReselectedInd	boolean	C	0..1	This IE shall be present and set to true if the target AMF has decided to select a new PCF for AM Policy and/or UE Policy other than the one which was included in the UeContext by the old AMF.	
smfChangeInfoList	array(SmfChangeInfo)	C	1..N	This IE shall be present during an inter-AMF registration procedure, if there is an I-SMF change or removal or V-SMF change for the related PDU session(s). When present, this IE shall indicate the I-SMF/V-SMF situation after the registration completion at the target AMF.	DTSSA

6.1.6.2.40 Type: AssignEbiError

Table 6.1.6.2.40-1: Definition of type AssignEbiError

Attribute name	Data type	P	Cardinality	Description
error	ProblemDetails	M	1	Represents the application error information. The application level error cause shall be encoded in the "cause" attribute.
failureDetails	AssignEbiFailed	M	1	Describes the details of the failure including the list of ARPs for which the EBI assignment failed.

6.1.6.2.41 Type: UeContextCreateData

Table 6.1.6.2.41-1: Definition of type UeContextCreateData

Attribute name	Data type	P	Cardinality	Description	Applicability
ueContext	UeContext	M	1	Represents an individual ueContext resource to be created	
targetId	NgRanTargetId	M	1	Represents the identification of target RAN	
sourceToTargetData	N2InfoContent	M	1	This IE shall be included to contain the "Source to Target Transparent Container".	
pduSessionList	array(N2SmInformation)	M	1..N	This IE shall be included to contain the list of N2SmInformation, where each N2SmInformation includes the "Handover Required Transfer" received from the source RAN per PDU session ID.	
n2NotifyUri	Uri	M	1	This IE shall contain a callback URI to receive the N2 Information Notification.	
ueRadioCapability	N2InfoContent	C	0..1	This IE shall be included to contain the "UE Radio Capability Information" if available.	
ngapCause	NgApCause	C	0..1	This IE shall be present, if available. When present, it shall represent the NGAP Cause received from RAN.	
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.	
mmeControlFteid	Bytes	C	0..1	Base64-encoded characters, encoding the MME F-TEID for Control Plane as specified in Figure 8.22-1 of 3GPP TS 29.274 [41] (starting from octet 1). This IE shall be included during EPS to 5GS handover procedure, if a new target AMF is reselected by the initial AMF.	ENS

6.1.6.2.42 Type: UeContextCreatedData

Table 6.1.6.2.42-1: Definition of type UeContextCreatedData

Attribute name	Data type	P	Cardinality	Description
ueContext	UeContext	M	1	Represents the newly created individual ueContext resource
targetToSourceData	N2InfoContent	M	1	This IE shall contain the "Target to Source Transparent Container".
pduSessionList	array(N2SmInformation)	M	1..N	This IE shall be included to contain the list of N2SmInformation, where each N2SmInformation includes the "Handover Command Transfer" received from the SMF, per PDU session ID.
pcfReselectedInd	boolean	C	0..1	This IE shall be present and set to true if the target AMF has decided to select a new PCF for AM Policy other than the one which was included in the UeContext by the old AMF.
failedSessionList	array(N2SmInformation)	C	1..N	This IE shall be included to contain a list of N2SmInformation, where each N2SmInformation includes the "Handover Preparation Unsuccessful Transfer" N2 SM content either received from the SMF for a PDU session failed to be handed over or generated by the target AMF for a PDU session not accepted by the target AMF (e.g. due to no response from the SMF within a maximum wait timer or due to non-available S-NSSAI in the target AMF). See NOTE.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported.
NOTE: As an exception, the AMF generates N2 SM Information (Handover Preparation Unsuccessful Transfer IE) for a PDU session not accepted by the AMF, since this N2 SM IE needs to be included in the Handover Command sent by the source AMF to the source NG-RAN; this N2 SM IE carries a Cause value.				

6.1.6.2.43 Type: UeContextCreateError

Table 6.1.6.2.43-1: Definition of type UeContextCreateError

Attribute name	Data type	P	Cardinality	Description	Applicability
error	ProblemDetails	M	1	Represents the detailed application error information. The application level error cause shall be encoded in the "cause" attribute.	
ngapCause	NgApCause	C	0..1	This IE shall be present, if available. When present, it shall represent the NGAP Cause received from RAN.	
targetToSourceFailureData	N2InfoContent	C	0..1	This IE shall be present if a "Target to Source Failure Transparent Container" has been received from the target NG-RAN. When present, this IE shall contain this container.	NPN

6.1.6.2.44 Type: NgRanTargetId

Table 6.1.6.2.44-1: Definition of type NgRanTargetId

Attribute name	Data type	P	Cardinality	Description
ranNodeId	GlobalRanNodeId	M	1	Indicates the identity of the RAN node. The IE shall contain either the gNB ID or the NG-eNB ID.
tai	Tai	M	1	Indicates the selected TAI.

6.1.6.2.45 Type: N2InformationTransferError

Table 6.1.6.2.45-1: Definition of type N2InformationTransferError

Attribute name	Data type	P	Cardinality	Description
error	ProblemDetails	M	1	More information on the error shall be provided in the "cause" attribute of the "ProblemDetails" structure.
pwsErrorInfo	PWSErrorData	C	0..1	This IE shall be present if the n2InformationClass is "PWS" in N2InformationTransferReqData.

6.1.6.2.46 Type: PWSResponseData

Table 6.1.6.2.46-1: Definition of type PWSResponseData

Attribute name	Data type	P	Cardinality	Description
ngapMessageType	Uinteger	M	1	This IE shall identify the message type of the message being sent. Its value is the numeric code of the Procedure Code defined in ASN.1 in clause 9.4.7 in 3GPP TS 38.413 [12].
serialNumber	Uint16	M	1	This IE shall contain the Serial Number of the associated PWS response message.
messageIdentifier	integer	M	1	This IE shall contain the Message Identifier of the associated PWS response message.
unknownTAIList	array(Tai)	O	1..N	This IE shall contain the Unknown Tracking Area List which may be present in the associated PWS response message.

6.1.6.2.47 Type: PWSErrorData

Table 6.1.6.2.47-1: Definition of type PWSErrorData

Attribute name	Data type	P	Cardinality	Description
namfCause	integer	M	1	Represents the cause value for the error that the AMF detected. Cause values: 0 - Message accepted 1 - Parameter not recognised 2 - Parameter value invalid 3 - Valid message not identified 4 - Tracking area not valid 5 - Unrecognised message 6 - Missing mandatory element 7 - AMF capacity exceeded 8 - AMF memory exceeded 9 - Warning broadcast not supported 10 - Warning broadcast not operational 11 - Message reference already used 12 - Unspecified error 13 - Transfer syntax error 14 - Semantic error 15 - Message not compatible with receiver state

6.1.6.2.48 Void

6.1.6.2.49 Type: NgKsi

Table 6.1.6.2.49-1: Definition of type NgKsi

Attribute name	Data type	P	Cardinality	Description
tsc	ScType	M	1	Indicates whether the security context type is native or mapped.
ksi	integer	M	1	Indicates the key set identifier value. The value is within the range 0 to 6.

6.1.6.2.50 Type: KeyAmf

Table 6.1.6.2.50-1: Definition of type KeyAmf

Attribute name	Data type	P	Cardinality	Description
keyType	KeyAmfType	M	1	Indicates whether the keyAmf represents K_{amf} or $K'_{amf.}$
keyVal	string	M	1	Indicates the key value. The key value is encoded as a string of hexadecimal characters. Pattern: '^[A-Fa-f0-9]$'

6.1.6.2.51 Type: ExpectedUeBehavior

Table 6.1.6.2.25-1: Definition of type ExpectedUeBehavior

Attribute name	Data type	P	Cardinality	Description
expMoveTrajectory	array(UserLocation)	M	1..N	This IE shall contain a list of user location areas where the UE is expected to move.
validityTime	DateTime	M	1	This IE shall contain the time upto which the UE moving trajectory is valid.

6.1.6.2.52 Type: UeRegStatusUpdateRspData

Table 6.1.6.2.52-1: Definition of type UeRegStatusUpdateRspData

Attribute name	Data type	P	Cardinality	Description
regStatusTransferComplete	boolean	M	1	This IE shall indicate if the status update of UE context transfer is completed successfully at the source AMF or not. The value shall be set to true if the context transfer is completed successfully and false if the context transfer did not complete successfully. Default is true.

6.1.6.2.53 Type: N2RanInformation

Table 6.1.6.2.53-1: Definition of type N2RanInformation

Attribute name	Data type	P	Cardinality	Description
n2InfoContent	N2InfoContent	M	1	This IE shall contain the N2 RAN information to transfer.

6.1.6.2.54 Type: N2InfoNotificationRspData

Table 6.1.6.2.54-1: Definition of type N2InfoNotificationRspData

Attribute name	Data type	P	Cardinality	Description
n2Info	N2InfoContent	C	0..1	This IE shall be present in the N2InfoNotify response sent by the source AMF to the target AMF during an Inter NG-RAN node N2 based handover procedure (see clause 5.2.2.3.6.2), if Secondary Rat Usage Data are available at the source AMF. When present, this IE shall contain N2 Information.

6.1.6.2.55 Type: SmallDataRateStatusInfo

Table 6.1.6.2.55-1: Definition of type SmallDataRateStatusInfo

Attribute name	Data type	P	Cardinality	Description
singleNssai	Snssai	M	1	S-NSSAI
dnn	Dnn	M	1	This IE shall indicate the Data Network Name. The DNN shall be the full DNN (i.e. with both the Network Identifier and Operator Identifier) for a HR PDU session, and it should be the full DNN in LBO and non-roaming scenarios. If the Operator Identifier is absent, the serving core network operator shall be assumed.
smallDataRateStatus	SmallDataRateStatus	M	1	Small data rate status related to the S-NSSAI and Dnn.

6.1.6.2.56 Type: SmfChangeInfo

Table 6.1.6.2.56-1: Definition of type SmfChangeInfo

Attribute name	Data type	P	Cardinality	Description
pduSessionIdList	array(PduSessionId)	M	1..N	PDU Session ID(s) for which the smfChangeInd applies.
smfChangeInd	SmfChangeIndication	M	1	Indicates the I-SMF or V-SMF change or removal.

6.1.6.2.57 Type: V2xContext

Table 6.1.6.2.57-1: Definition of type V2xContext

Attribute name	Data type	P	Cardinality	Description
nrV2xServicesAuth	NrV2xAuth	C	0..1	This IE shall be present if the UE is authorized to use the NR sidelink for V2X services.
lteV2xServicesAuth	LteV2xAuth	C	0..1	This IE shall be present if the UE is authorized to use the LTE sidelink for V2X services.
nrUeSidelinkAmbr	BitRate	C	0..1	This IE shall be present if the UE is authorized for NR V2X services. When present, this IE contains subscription data on UE-PC5-AMBR for NR V2X services.
lteUeSidelinkAmbr	BitRate	C	0..1	This IE shall be present if the UE is authorized for LTE V2X services. When present, this IE contains subscription data on UE-PC5-AMBR for LTE V2X services.
pc5QoSPara	Pc5QoSPara	C	0..1	This IE shall be present if the UE is authorized for NR V2X services. When present, this IE contains policy data on the PC5 QoS parameters.

6.1.6.2.58 Type: ImmediateMdtConf

Table 6.1.6.2.58-1: Definition of type ImmediateMdtConf

Attribute name	Data type	P	Cardinality	Description
jobType	JobType	M	1	This IE shall indicate the Job type for MDT, see 3GPP TS 32.422 [30].
measurementLteList	array(MeasurementLteForMdt)	C	1..N	This IE shall be present if available. When present, this IE shall contain a list of the measurements that shall be collected for LTE.
measurementNrList	array(MeasurementNrForMdt)	C	1..N	This IE shall be present if available, when present, this IE shall contain a list of the measurements that shall be collected for NR.
reportingTriggerList	array(ReportingTrigger)	C	1..N	This IE shall be present if available. When present, this IE shall contain a list of the reporting triggers.
reportInterval	ReportIntervalMdt	C	0..1	This IE shall be present if available. When present, this IE shall indicate the interval between the periodical measurements to be taken when UE is in connected.
reportAmount	ReportAmountMdt	C	0..1	This IE shall be present if available. When present, this IE shall indicate the number of measurement reports that shall be taken for periodical reporting while UE is in connected.
eventThresholdRsrp	integer	C	0..1	This IE shall be present if available. When present, this IE shall indicate the Event Threshold for RSRP. Minimum = 0. Maximum = 97.
eventThresholdRsrq	integer	C	0..1	This IE shall be present if available. When present, this IE shall indicate the Event Threshold for RSRQ. Minimum = 0. Maximum = 34.
collectionPeriodRmmLte	CollectionPeriodRmmLteMdt	C	0..1	This IE shall be present if available. When present, it shall contain the collection period that should be used to collect available measurement samples in case of RRM configured measurements.
measurementPeriodLte	MeasurementPeriodLteMdt	C	0..1	This IE shall be present if available. When present, it shall contain the measurement period that should be used for the Data Volume and Scheduled IP Throughput measurements in LTE.
areaScope	AreaScope	O	0..1	When present, this IE shall contain the area in Cells or Tracking Areas where the MDT data collection shall take place, see 3GPP TS 32.422 [30].
positioningMethod	PositioningMethodMdt	O	0..1	When present, it shall indicate the positioning method that shall be used for the MDT job in LTE.
mdtAllowedPlmnIdList	array(PlmnId)	O	1..16	When present, this IE shall contain the PLMNs related to MDT.

6.1.6.2.59 Type: V2xInformation

Table 6.1.6.2.59-1: Definition of type V2xInformation

Attribute name	Data type	P	Cardinality	Description
n2Pc5Pol	N2InfoContent	C	0..1	This IE shall be present if N2 PC5 policy should be transferred. When present, the IE contains the NGAP V2X related IEs specified in clause 9.2.1.z of 3GPP TS 38.413 [12].

6.1.6.2.60 Type: EpsNasSecurityMode

Table 6.1.6.2.60-1: Definition of type EpsNasSecurityMode

Attribute name	Data type	P	Cardinality	Description
integrityAlgorithm	EpsNasIntegrityAlgorithm	M	1	Indicates the integrity protection algorithm for EPS NAS
cipheringAlgorithm	EpsNasCipheringAlgorithm	M	1	Indicates the ciphering algorithm for EPS NAS.

6.1.6.3 Simple data types and enumerations

6.1.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

Type Name	Type Definition	Description
EpsBearerId	integer	Integer identifying an EPS bearer, within the range 0 to 15, as specified in clause 11.2.3.1.5, bits 5 to 8, of 3GPP TS 24.007 [15].
Ppi	integer	This represents the Paging Policy Indicator. The value is within the range 0 to 7.
NasCount	Uinteger	Unsigned integer identifying the NAS COUNT as specified in 3GPP TS 33.501 [27]
5GMmCapability	Bytes	String with format "byte" as defined in OpenAPI Specification [23], i.e. base64-encoded characters, encoding the "5GMM capability" IE as specified in clause 9.11.3.1 of 3GPP TS 24.501 [11] (starting from octet 1).
UeSecurityCapability	Bytes	String with format "byte" as defined in OpenAPI Specification [23], i.e. base64-encoded characters, encoding the " UE security capability" IE as specified in clause 9.11.3.54 of 3GPP TS 24.501 [11] (starting from octet 1).
S1UeNetworkCapability	Bytes	String with format "byte" as defined in OpenAPI Specification [23], i.e. base64-encoded characters, encoding the " S1 UE network capability" IE as specified in clause 9.11.3.48 of 3GPP TS 24.501 [11] (starting from octet 1).
DrxParameter	Bytes	String with format "byte" as defined in OpenAPI Specification [23], i.e. base64-encoded characters, encoding the "5GS DRX Parameters" IE as specified in clause 9.11.3.2A of 3GPP TS 24.501 [11] (starting from octet 1).
OmcIdentifier	string	The OMC Identifier indicates the identity of an Operation and Maintenance Centre to which Trace Records shall be sent. minLength: 1 maxLength: 20
MSClassmark2	Bytes	String with format "byte" as defined in OpenAPI Specification [23], i.e. base64-encoded characters, encoding the Mobile Station Classmark 2 as specified in clause 9.11.3.31C of 3GPP TS 24.501 [11]) (starting from octet 1).
SupportedCodec	Bytes	String with format "byte" as defined in OpenAPI Specification [23], i.e. base64-encoded characters, encoding the Supported Codec as specified in clause 9.11.3.51A of 3GPP TS 24.501 [11]) (starting from octet 1).

6.1.6.3.3 Enumeration: StatusChange

Table 6.1.6.3.3-1: Enumeration StatusChange

Enumeration value	Description
"AMF_UNAVAILABLE"	The AMF is unavailable to serve the UEs identified by the GUAMI(s).
"AMF_AVAILABLE"	The AMF is available to serve the UEs identified by the GUAMI(s).

6.1.6.3.4 Enumeration: N2InformationClass

Table 6.1.6.3.4-1: Enumeration N2InformationClass

Enumeration value	Description
"SM"	N2 SM information.
"NRPPa"	N2 NRPPa information.
"PWS"	N2 PWS information of PWS type.
"PWS-BCAL"	N2 Broadcast Completed Area List or the Broadcast Cancelled Area List.
"PWS-RF"	N2 Restart Indication or Failure Indication
"RAN"	N2 RAN related information.
"V2X"	N2 V2X information

6.1.6.3.5 Enumeration: N1MessageClass

Table 6.1.6.3.5-1: Enumeration N1MessageClass

Enumeration value	Description
"5GMM"	The whole NAS message as received (for e.g. used in forwarding the Registration message to target AMF during Registration procedure with AMF redirection).
"SM"	N1 Session Management message
"LPP"	N1 LTE Positioning Protocol message
"SMS"	N1 SMS message as specified in 3GPP TS 23.040 [44] and 3GPP TS 24.011 [45]
"UPDP"	The N1 messages for UE Policy Delivery (See Annex D of 3GPP TS 24.501 [11].
"LCS"	The N1 message of Location service message type

6.1.6.3.6 Enumeration: N1N2MessageTransferCause

Table 6.1.6.3.6-1: Enumeration N1N2MessageTransferCause

Enumeration value	Description
"ATTEMPTING_TO_REACH_UE"	This cause represents the case where the AMF has initiated paging to reach the UE in order to deliver the N1 message.
"N1_N2_TRANSFER_INITIATED"	This cause represents the case where the AMF has initiated the N1/N2 message transfer towards the UE and/or the AN.
"WAITING_FOR_ASYNCHRONOUS_TRANSFER"	This cause represents the case where the AMF has stored the N1/N2 message due to Asynchronous Transfer.
"UE_NOT_RESPONDING"	This cause represents the case that the AMF has initiated paging to reach the UE but the UE is not responding to the paging, or the case of a UE in RRC Inactive state when NG-RAN paging is not successful (e.g. NG-RAN initiated a UE context release with a cause indicating the non-delivery of the N1 message).
"N1_MSG_NOT_TRANSFERRED"	This cause represents the case where the AMF has skipped sending N1 message to the UE, when UE is in CM-IDLE and the "skipInd" is set to "true" in the request.
"UE_NOT_REACHABLE_FOR_SESSION"	This cause indicates that the UE is not reachable for the non-3GPP PDU session, due to the UE being in CM-IDLE for non-3GPP access and the PDU session is not allowed to move to 3GPP access.
"TEMPORARY_REJECT_REGISTRATION_ONGOING"	This cause represents the case that the AMF has initiated paging to reach the UE but there is an ongoing registration procedure.
"TEMPORARY_REJECT_HANDOVER_ONGOING"	This cause indicates that the AMF has initiated N1 signalling towards the UE but the N1 message could not be delivered due to an ongoing Xn or N2 handover procedure.

6.1.6.3.7 Enumeration: UeContextTransferStatus

Table 6.1.6.3.7-1: Enumeration UeContextTransferStatus

Enumeration value	Description
"TRANSFERRED"	Indicates a UE Context Transfer procedure is completed successful for the individual ueContext resource
"NOT_TRANSFERRED"	Indicates a UE Context Transfer procedure either did not complete successfully or the Registration request from the UE is redirected to another NF Service Consumer (e.g. AMF).

6.1.6.3.8 Enumeration: N2InformationTransferResult

Table 6.1.6.3.8-1: Enumeration N2InformationTransferResult

Enumeration value	Description
"N2_INFO_TRANSFER_INITIATED"	This cause code represents the case where the AMF has initiated the N2 information transfer towards the AN.

6.1.6.3.9 Enumeration: CipheringAlgorithm

Table 6.1.6.3.9-1: Enumeration CipheringAlgorithm

Enumeration value	Description
"NEA0"	Null ciphering algorithm
"NEA1"	128-bit SNOW 3G based algorithm
"NEA2"	128-bit AES based algorithm
"NEA3"	128-bit ZUC based algorithm

6.1.6.3.10 Enumeration: IntegrityAlgorithm

Table 6.1.6.3.10-1: Enumeration IntegrityAlgorithm

Enumeration value	Description
"NIA0"	Null Integrity Protection algorithm
"NIA1"	128-bit SNOW 3G based algorithm
"NIA2"	128-bit AES based algorithm
"NIA3"	128-bit ZUC based algorithm

6.1.6.3.11 Enumeration: SmsSupport

Table 6.1.6.3.11-1: Enumeration SmsSupport

Enumeration value	Description
"3GPP"	Support SMS delivery over NAS in 3GPP access
"NON_3GPP"	Support SMS delivery via non-3GPP access
"BOTH"	Support SMS delivery over NAS or via non-3GPP access
"NONE"	Don't support SMS delivery

6.1.6.3.12 Enumeration: ScType

Table 6.1.6.3.12-1: Enumeration ScType

Enumeration value	Description
"NATIVE"	Native security context (for KSI_{AMF})
"MAPPED"	Mapped security context (for KSI_{ASME})

6.1.6.3.13 Enumeration: KeyAmfType

Table 6.1.6.3.13-1: Enumeration KeyAmfType

Enumeration value	Description
"KAMF"	The K_{amf} value is sent.
"KPRIMEAMF"	The $K'_{amf.}$ value is sent.

6.1.6.3.14 Enumeration: TransferReason

Table 6.1.6.3.14-1: Enumeration TransferReason

Enumeration value	Description
"INIT_REG"	It indicates the AMF requests UE context for initial registration.
"MOBI_REG"	It indicates the AMF requests UE context for mobility registration.
"MOBI_REG_UE_VALIDATED"	It indicates the AMF requests UE context for mobility registration of a validated UE.

6.1.6.3.15 Enumeration: PolicyReqTrigger

Table 6.1.6.3.15-1: Enumeration PolicyReqTrigger

Enumeration value	Description
"LOCATION_CHANGE"	The AM policy request shall be triggered when the UE's location (Tracking Area) changes.
"PRA_CHANGE"	The AM policy request shall be triggered when the UE is entering / leaving a Presence Reporting Area.
"SARI_CHANGE"	The AM policy request shall be triggered when the Service Area Restriction Information of the UE has changed.
"RFSP_INDEX_CHANGE"	The AM policy request shall be triggered when the RFSP index of the UE has changed.
"ALLOWED_NSSAI_CHANGE"	The policy request shall be triggered when the allowed NSSAI of the UE has changed.

6.1.6.3.16 Enumeration: RatSelector

Table 6.1.6.3.16-1: Enumeration RatSelector

Enumeration value	Description
"E-UTRA"	The N2 information shall be transferred to ng-eNBs only.
"NR"	The N2 information shall be transferred to gNBs only.

6.1.6.3.17 Enumeration: NgapIeType

Table 6.1.6.3.17-1: Enumeration NgapIeType

Enumeration value	Description
"PDU_RES_SETUP_REQ"	PDU Session Resource Setup Request Transfer
"PDU_RES_REL_CMD"	PDU Session Resource Release Command Transfer
"PDU_RES_MOD_REQ"	PDU Session Resource Modify Request Transfer
"HANDOVER_CMD"	Handover Command Transfer
"HANDOVER_REQUIRED"	Handover Required Transfer
"HANDOVER_PREP_FAIL"	Handover Preparation Unsuccessful Transfer
"SRC_TO_TAR_CONTAINER"	Source to Target Transparent Container
"TAR_TO_SRC_CONTAINER"	Target to Source Transparent Container
"TAR_TO_SRC_FAIL_CONTAINER"	Target to Source Failure Transparent Container
"RAN_STATUS_TRANS_CONTAINER"	RAN Status Transfer Transparent Container
"SON_CONFIG_TRANSFER"	SON Configuration Transfer
"NRPPA_PDU"	NRPPa-PDU
"UE_RADIO_CAPABILITY"	UE Radio Capability
"RIM_INFO_TRANSFER"	RIM Information Transfer
"SECONDARY_RAT_USAGE"	Secondary RAT Data Usage Report Transfer
"PC5_QOS_PARA"	PC5 QoS Parameters
"EARLY_STATUS_TRANS_CONTAINER"	Early Status Transfer Transparent Container

6.1.6.3.18 Enumeration: N2InfoNotifyReason

Table 6.1.6.3.18-1: Enumeration N2InfoNotifyReason

Enumeration value	Description
"HANDOVER_COMPLETED"	Indicates that the N2 Information Notification is delivered when the handover procedure is completed successfully.

6.1.6.3.19 Enumeration: SmfChangeIndication

Table 6.1.6.3.19-1: Enumeration SmfChangeIndication

Enumeration value	Description
"CHANGED"	I-SMF or V-SMF changed.
"REMOVED"	I-SMF or V-SMF is removed.

6.1.6.3.20 Enumeration: SbiBindingLevel

Table 6.1.6.3.20-1: Enumeration SbiBindingLevel

Enumeration value	Description
"NF_INSTANCE_BINDING"	Indicates binding to NF instance
"NF_SET_BINDING"	Indicates binding to NF Set
"NF_SERVICE_SET_BINDING"	Indicates binding to NF Service Set

6.1.6.3.21 Enumeration: EpsNasCipheringAlgorithm

This data type enumerates the algorithms for data ciphering in EPS NAS, as specified in clause 5.1.3.2 of 3GPP TS 33.401 [49].

Table 6.1.6.3.21-1: Enumeration EpsNasCipheringAlgorithm

Enumeration value	Description
"EEA0"	Null ciphering algorithm
"EEA1"	128-bit SNOW 3G based algorithm
"EEA2"	128-bit AES based algorithm
"EEA3"	128-bit ZUC based algorithm

6.1.6.3.22 Enumeration: EpsNasIntegrityAlgorithm

This data type enumerates the algorithms for data integrity protection in EPS NAS, as specified in clause 5.1.4.2 of 3GPP TS 33.401 [49].

Table 6.1.6.3.22-1: Enumeration EpsNasIntegrityAlgorithm

Enumeration value	Description
"EIA0"	Null Integrity Protection algorithm
"EIA1"	128-bit SNOW 3G based algorithm
"EIA2"	128-bit AES based algorithm
"EIA3"	128-bit ZUC based algorithm

6.1.6.4 Binary data

6.1.6.4.1 Introduction

This clause defines the binary data that shall be supported in a binary body part in an HTTP multipart message (see clauses 6.1.2.2.2 and 6.1.2.4).

Table 6.1.6.4.1-1: Binary Data Types

Name	Clause defined	Content type
N1 Message	6.1.6.4.2	vnd.3gpp.5gnas
N2 Information	6.1.6.4.3	vnd.3gpp.ngap

6.1.6.4.2 N1 Message

N1 Message shall encode a 5GS NAS message of a specified type (e.g. SM, LPP) as specified in 3GPP TS 24.501 [11], using the vnd.3gpp.5gnas content-type.

N1 Message may encode e.g. the following 5GS NAS messages:

- For message class SM:
  - PDU Session Modification Command (see clause 8.3.8 of 3GPP TS 24.501 [11]) during network initiated PDU session modification procedure (see clause 4.3.3 of 3GPP TS 23.502 [3]);
  - PDU Session Release Command (see clause 8.3.13 of 3GPP TS 24.501 [11]) during network initiated PDU session release procedure (see clause 4.3.4 of 3GPP TS 23.502 [3]).
  - PDU Session Establishment Accept (see clause 8.3.2 in 3GPP TS 24.501 [11]) during UE-requested PDU Session Establishment (see clause 4.3.2.2 in 3GPP TS 23.502 [3]).
- For message class LPP:
  - UE Positioning Request messages as specified in 3GPP TS 36.355 [13] during UE assisted and UE based positioning procedure (see clause 6.11.1 of 3GPP TS 23.273 [42]).
- For message class 5GMM:
  - REGISTRATION REQUEST message as specified in see clause 8.2.5 of 3GPP TS 24.501 [11], during registration procedures (see clause 4.2.2.2 of 3GPP TS 23.502 [3]).
- For message class UPDP:
  - MANAGE UE POLICY COMMAND / MANAGE UE POLICY COMPLETE / MANAGE UE POLICY REJECT (see Annex D.5.1 to Annex D.5.3 of 3GPP TS 24.501 [11]) during network initiated UE policy management procedure (see Annex D.2.1 of 3GPP TS 24.501 [11]);
  - UE STATE INDICATION (see Annex D.5.4 of 3GPP TS 24.501 [11]) during UE initiated UE state indication procedure (see Annex D.2.2 of 3GPP TS 24.501 [11]).
- For message class LCS:
  - Location services messages between UE and LMF (lcs-PeriodicTriggeredInvoke/lcs-EventReport/lcs-CancelDeferredLocation) as specified in 3GPP TS 24.080 [43] during deferred 5GC-MT-LR procedure procedure (see clause 6.3 of 3GPP TS 23.273 [42]).
- For message class SMS:
  - SMS payload information as specified in 3GPP TS 23.040 [44] and 3GPP TS 24.011 [45], e.g. CP-DATA, CP-ACK, CP-ERROR.

6.1.6.4.3 N2 Information

6.1.6.4.3.1 Introduction

N2 Information shall encode NG Application Protocol (NGAP) IEs, as specified in clause 9.4 of 3GPP TS 38.413 [12] (ASN.1 encoded), using the vnd.3gpp.ngap content-type.

6.1.6.4.3.2 NGAP IEs

For N2 information class SM, N2 Information may encode following NGAP SMF related IE specified in 3GPP TS 38.413 [12], as summarized in Table 6.1.6.4.3-1.

Table 6.1.6.4.3-1: N2 Information content for class SM

NGAP IE	Reference (3GPP TS 38.413 [12])	Related NGAP message
PDU Session Resource Setup Request Transfer	9.3.4.1	PDU SESSION RESOURCE SETUP REQUEST
PDU Session Resource Release Command Transfer	9.3.4.3	PDU SESSION RESOURCE RELEASE COMMAND
PDU Session Resource Modify Request Transfer	9.3.4.5	PDU SESSION RESOURCE MODIFY REQUEST
Handover Command Transfer	9.3.4.12	HANDOVER COMMAND
Handover Required Transfer	9.3.4.14	HANDOVER REQUIRED
Handover Preparation Unsuccessful Transfer	9.3.4.18	HANDOVER COMMAND
Secondary RAT Data Usage Report Transfer	9.3.4.23	SECONDARY RAT DATA USAGE REPORT

For N2 information class RAN, N2 Information may encode one of the following NGAP Transparent Container IEs specified in 3GPP TS 38.413 [12], as summarized in Table 6.1.6.4.3-2.

Table 6.1.6.4.3-2: N2 Information content for class RAN

NGAP IE	Reference (3GPP TS 38.413 [12])	Related NGAP message
Source to Target Transparent Container	9.3.1.20	HANDOVER REQUIRED, HANDOVER REQUEST
Target to Source Transparent Container	9.3.1.21	HANDOVER COMMAND, HANDOVER REQUEST ACKNOWLEDGE
Target to Source Failure Transparent Container	9.3.1.x	HANDOVER FAILURE
UE Radio Capability	9.3.1.74	UE CAPABILITY INFO INDICATION. (NOTE 1).
SON Configuration Transfer	9.3.3.6	UPLINK RAN CONFIGURATION TRANSFER, DOWNLINK RAN CONFIGURATION TRANSFER
RAN Status Transfer Transparent Container	9.2.3.13, 9.2.3.14	UPLINK RAN STATUS TRANSFER, DOWNLINK RAN STATUS TRANSFER
Early Status Transfer Transparent Container	9.2.3.16, 9.2.3.17	UPLINK RAN EARLY STATUS TRANSFER DOWNLINK RAN EARLY STATUS TRANSFER
RIM Information Transfer	9.3.3.28	UPLINK RIM INFORMATION TRANSFER, DOWNLINK RIM INFORMATION TRANSFER
NOTE 1: The AMF receives the UE Radio Capability within a UE CAPABILITY INFO INDICATION message and then the AMF shall store the UE Radio Capability information and transfer it to the target AMF during an inter AMF mobility procedure.		

For N2 information class NRPPa, N2 Information may encode the following NGAP NRPPA Transport related IE specified in 3GPP TS 38.413 [12], as summarized in Table 6.1.6.4.3-3

Table 6.1.6.4.3-3: N2 Information content for class NRPPa

NGAP IE	Reference (3GPP TS 38.413 [12])	Related NGAP message
NRPPa-PDU	9.3.3.14	DOWNLINK UE ASSOCIATED NRPPA TRANSPORT UPLINK UE ASSOCIATED NRPPA TRANSPORT DOWNLINK NON UE ASSOCIATED NRPPA TRANSPORT UPLINK NON UE ASSOCIATED NRPPA TRANSPORT

For N2 information class V2X, N2 Information may encode the following V2X related IE specified in 3GPP TS 38.413 [12], as summarized in Table 6.1.6.4.3-4

Table 6.1.6.4.3-4: N2 Information content for class V2X

NGAP IE	Reference (3GPP TS 38.413 [12])	Related NGAP message
PC5 QoS Parameters	9.2.1.z	INITIAL CONTEXT SETUP REQUEST UE CONTEXT MODIFICATION REQUEST HANDOVER REQUEST PATH SWITCH REQUEST ACKNOWLEDGE

6.1.6.4.3.3 NGAP Messages

For N2 information class PWS, N2 Information shall encode NGAP Messages specified in 3GPP TS 38.413 [12].

Table 6.1.6.4.3.3-1: N2 PWS Request Information content

NGAP message	Reference (3GPP TS 38.413 [12])
WRITE-REPLACE WARNING REQUEST	9.2.8.1
PWS CANCEL REQUEST	9.2.8.3

N2 Information received by the AMF for PWS may be processed by the AMF before re-encoding and transferring to the Service Consumer:

- If a subscription exists for N2InformationClass "PWS-BCAL" and the received N2 Message Type is a WRITE-REPLACE-WARNING-RESPONSE, then the AMF may aggregate the Broadcast Completed Area Lists it has received from the NG-RAN nodes for a message identified by its Serial Number and Message Identifier (see table 6.1.6.4.3-1).

- If a subscription exists for N2InformationClass "PWS-BCAL" and the received N2 Message Type is a PWS-CANCEL-RESPONSE, then the AMF may aggregate the Broadcast Cancelled Area Lists IE it has received from the NG-RAN nodes for a message identified by its Serial Number and Message Identifier (see table 6.1.6.4.3-1). If an NG-RAN node has responded without the Broadcast Cancelled Area List, then the AMF shall include the ID of that NG-RAN node in "bcEmptyAreaList" attribute in the PWS N2 information.

Table 6.1.6.4.3.3-2: N2 PWS Response Information content

NGAP message	Reference (3GPP TS 38.413 [12])
WRITE-REPLACE WARNING RESPONSE	9.2.8.2
PWS CANCEL RESPONSE	9.2.8.4

If a subscription exists for N2InformationClass "PWS-BCAL" and the received N2 Message Type is a WRITE-REPLACE-WARNING-RESPONSE, then the AMF may transfer the ASN.1 (re-)encoded Message Type, Message Identifier, Serial Number and the (aggregated) Broadcast Completed Area List IE in the N2 Info Container in the N2InfoNotify.

If a subscription exists for N2InformationClass "PWS-BCAL" and the received N2 Message Type is a PWS-CANCEL-RESPONSE, then the AMF may transfer the ASN.1 (re-)encoded the Message Type, Message Identifier, Serial

Number, the (aggregated) Broadcast Cancelled Area List IE in the N2 Info Container in the N2InfoNotify, and the "bcEmptyAreaList" attribute if not empty in the PWS N2 information.

For the ASN.1 definition for encoding the WRITE-REPLACE-WARNING-RESPONSE and the PWS-CANCEL-RESPONSE, see clause 9.4 of 3GPP TS 38.413 [12].

If a subscription exists for N2InformationClass "PWS-RF" and the received N2 Message Type is a PWS-RESTART-INDICATION, then the AMF may transfer the ASN.1 encoded string from the PWS-RESTART-INDICATION (see table 6.1.6.4.3-2) in the N2 Info Container in the N2InfoNotify.

If a subscription exists for N2InformationClass "PWS-RF" and the received N2 Message Type is a PWS-FAILURE-INDICATION (see table 6.1.6.4.3-2), then the AMF may transfer the ASN1 encoded string from the PWS-FAILURE-INDICATION in the N2 Info Container in the N2InfoNotify.

Table 6.1.6.4.3.3-3: N2 PWS Indication Information content

NGAP message	Reference (3GPP TS 38.413 [12])
PWS RESTART INDICATION	9.2.8.5
PWS FAILURE INDICATION	9.2.8.6

The Message Type shall be present and encoded as the first N2 PWS Indication IE in any NonUeN2InfoNotify for PWS messages to enable the receiver to decode the N2 PWS IEs

For N2 information class RAN, N2 Information shall encode one of the following NGAP messages specified in 3GPP TS 38.413 [12], as summarized in Table 6.1.6.4.3.3-4.

Table 6.1.6.4.3.3-4: N2 Information content for class RAN

NGAP message	Reference (3GPP TS 38.413 [12])
Any UE specific Uplink NGAP message	

6.1.6.4.4 Mobile Terminated Data

Mobile Terminated Data shall encode the user data to be sent by the AMF to the UE in the Payload Container specified in 3GPP TS 24.501 [7], using the vnd.3gpp.5gnas content-type, as summarized in Table 6.1.6.4.4-1.

Table 6.1.6.4.4-1: Mobile Terminated Data

Mobile Terminated Data	Reference (3GPP TS 24.501 [7])	Related NAS SM message
Payload container contents in octets 4 to n	9.11.3.39 (Figure 9.11.3.39.1)	DL NAS Transport

6.1.7 Error Handling

6.1.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.1.7.2 Protocol Errors

Protocol Error Handling shall be supported as specified in clause 5.2.7.2 of 3GPP TS 29.500 [4].

6.1.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Namf_Communication service. The following application errors listed in Table 6.1.7.3-1 are specific for the Namf_Communication service.

Table 6.1.7.3-1: Application errors

Application Error	HTTP status code	Description
NF_CONSUMER_REDIRECT_ONE_TXN	307 Temporary Redirect	The request has been asked to be redirected to a specified target.
HANDOVER_FAILURE	403 Forbidden	Creation of UE context in the target AMF failed during Handover procedure causing a failure of handover.
INTEGRITY_CHECK_FAIL	403 Forbidden	Integrity check of the complete registration message included in the UE context transfer request failed.
EBI_EXHAUSTED	403 Forbidden	Allocation of EPS Bearer ID failed due to exhaustion of EBI as the maximum number of EBIs has already been allocated to the UE.
EBI_REJECTED_LOCAL_POLICY	403 Forbidden	Allocation of EPS Bearer ID failed due to local policy at the AMF as specified in clause 4.11.1.4.1 of 3GPP TS 23.502 [3].
EBI_REJECTED_NO_N26	403 Forbidden	The allocation of EPS Bearer ID was rejected when the AMF is in a serving PLMN that does not support 5GS-EPS interworking procedures with N26 interface.
SUPI_OR_PEI_UNKNOWN	403 Forbidden	The SUPI or PEI included in the message is unknown.
UE_IN_NON_ALLOWED_AREA	403 Forbidden	UE is currently in a non-allowed area hence the N1/N2 message transfer cannot be completed because the request is not associated with a regulatory prioritized service.
UNSPECIFIED	403 Forbidden	The request is rejected due to unspecified reasons.
SM_CONTEXT_RELOCATION_REQUIRED	403 Forbidden	The request is rejected because the SM Context should be relocated to another SMF, e.g. when AMF detects that an I-SMF or V-SMF insertion, change or removal is needed, as specified in clause 4.23 of 3GPP TS 23.502 [3].
UE_WITHOUT_N1_LPP_SUPPORT	403 Forbidden	UE does not support LPP in N1 mode hence the N1 LPP message cannot be sent to the UE.
CONTEXT_NOT_FOUND	404 Not Found	The requested UE Context does not exist on the AMF
HIGHER_PRIORITY_REQUEST_ONGOING	409 Conflict	Paging triggered N1/N2 transfer cannot be initiated since already there is a paging due to a higher priority session ongoing.
TEMPORARY_REJECT_REGISTRATION_ONGOING	409 Conflict	N1/N2 message transfer towards UE / AN cannot be initiated or the EBI assignment fails due to an ongoing registration procedure.
TEMPORARY_REJECT_HANDOVER_ONGOING	409 Conflict	N1/N2 message transfer towards UE / AN cannot be initiated due to an ongoing Xn or N2 handover procedure, or the EBI assignment fails due to an ongoing N2 handover procedure.
UE_IN_CM_IDLE_STATE	409 Conflict	N2 message transfer towards 5G-AN cannot be initiated due to the UE being in CM-IDLE state for the Access Network Type associated to the PDU session.
MAX_ACTIVE_SESSIONS_EXCEEDED	409 Conflict	If the RAT type is NB-IoT, and the UE already has 2 PDU Sessions with active user plane resources.
UE_NOT_REACHABLE	504 Gateway Timeout	The UE is not reachable for paging.

6.1.8 Feature Negotiation

The feature negotiation mechanism specified in clause 6.6 of 3GPP TS 29.500 [4] shall be used to negotiate the optional features applicable between the AMF and the NF Service Consumer, for the Namf_Communication service, if any.

The NF Service Consumer shall indicate the optional features it supports for the Namf_Communication service, if any, by including the supportedFeatures attribute in payload of the HTTP Request Message for following service operations:

- N1N2MessgeTransfer, as specified in clause 5.2.2.3.1;
- N1N2MessageSubscribe, as specified in clause 5.2.2.3.3;
- NonUeN2InfoSubscribe, as specified in clause 5.2.2.4.2;
- UeContextTransfer, as specified in clause 5.2.2.2.1;
- CreateUEContext, as specified in clause 5.2.2.2.3

The AMF shall determine the supported features for the service operations as specified in clause 6.6 of 3GPP TS 29.500 [4] and shall indicate the supported features by including the supportedFeatures attribute in payload of the HTTP response for the service operation.

The syntax of the supportedFeatures attribute is defined in clause 5.2.2 of 3GPP TS 29.571 [6].

The following features are defined for the Namf_Communication service.

Table 6.1.8-1: Features of supportedFeatures attribute used by Namf_Communication service

Feature Number	Feature	M/O	Description
1	DTSSA	O	Deployments Topologies with specific SMF Service Areas. An AMF that supports this feature shall support the procedures specified in clause 5.34 of 3GPP TS 23.501 [2] and in clause 4.23 of 3GPP TS 23.502 [3].
2	ENS	O	This feature bit indicates whether the AMF supports procedures related to Network Slicing (see 3GPP TS 23.501 [2] clause 5.15.7).
3	CIOT	O	Cellular IoT Support of this feature implies the support of all the CIoT features specified in clause 5.31 of 3GPP TS 23.501 [2], including in particular corresponding service's extensions to support: - NB-IoT and LTE-M RAT types; - Control Plane CIoT 5GS Optimisation; - Rate control of user data.
4	MAPDU	O	This feature bit indicates whether the AMF supports Multi-Access PDU session procedures related to Access Traffic Steering, Switching and Splitting (see clauses 4.2.10 and 5.32 of 3GPP TS 23.501 [2]).
5	NPN	O	Non-Public Network Support of this feature implies support of NPN information and receipt of a Create UE context error response with a binary part during an Inter-AMF N2 Handover.
6	ELCS	O	This feature indicates supports of enhanced LCS, including the capability for the AMF to send an LCS message through the target access type requested by the LMF.
Feature number: The order number of the feature within the supportedFeatures attribute (starting with 1). Feature: A short name that can be used to refer to the bit and to the feature. M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O"). Description: A clear textual description of the feature.			

6.1.9 Security

As indicated in 3GPP TS 33.501 [27], the access to the Namf_Communication API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [28]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [29]) plays the role of the authorization server.

If Oauth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Namf_Communication API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [29], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Namf_Communication service.

The Namf_Communication API defines scopes for OAuth2 authorization as specified in 3GPP TS 33.501 [27]; it defines a single scope consisting on the name of the service (i.e., "namf-comm"), and it does not define any additional scopes at resource or operation level.

6.2 Namf_EventExposure Service API

6.2.1 API URI

The Namf_EventExposure shall use the Namf_EventExposure API.

The API URI of the Namf_EventExposure API shall be:

{apiRoot}/<apiName>/<apiVersion>/

The request URI used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "namf-evts".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.2.3.

6.2.2 Usage of HTTP

6.2.2.1 General

HTTP/2, as defined in IETF RFC 7540 [19], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

HTTP messages and bodies for the Namf_EventExposure service shall comply with the OpenAPI [23] specification contained in Annex A.

6.2.2.2 HTTP standard headers

6.2.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.2.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [8], shall be used as content type of the HTTP bodies specified in the present specification as indicated in clause 5.4 of 3GPP TS 29.500 [4].
- The Problem Details JSON Object (IETF RFC 7807 [36]). The use of the Problem Details JSON object in a HTTP response body shall be signalled by the content type "application/problem+json".
- JSON Patch (IETF RFC 6902 [14]). The use of the JSON Patch format in a HTTP request body shall be signalled by the content type "application/json-patch+json".

6.2.2.3 HTTP custom headers

6.2.2.3.1 General

In this release of this specification, no custom headers specific to the Namf_EventExposure service are defined. For 3GPP specific HTTP custom headers used across all service based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.2.3 Resources

6.2.3.1 Overview

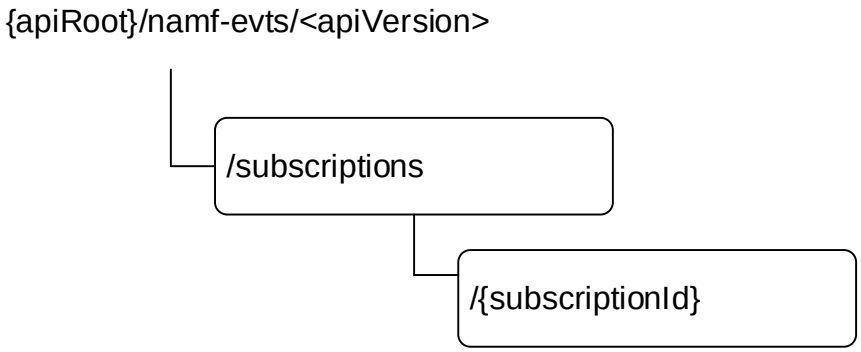

Figure 6.2.3.1-1: Resource URI structure of the Namf_EventExposure API

Table 6.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.2.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Subscriptions collection	/subscriptions	POST	Mapped to the service operation Subscribe, when to create a subscription
Individual subscription	/{subscriptionId}	PATCH	Mapped to the service operation Subscribe, when to modify
		DELETE	Mapped to the service operation Unsubscribe

6.2.3.2 Resource: Subscriptions collection

6.2.3.2.1 Description

This resource represents a collection of subscriptions created by NF service consumers of Namf_EventExposure service.

This resource is modelled as the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

6.2.3.2.2 Resource Definition

Resource URI: **{apiRoot}/namf-evts/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.2.3.2.2-1.

Table 6.2.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.2.1
apiVersion	string	See clause 6.2.1.

6.2.3.2.3 Resource Standard Methods

6.2.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.2.3.2.3.1-1.

Table 6.2.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.2.3.2.3.1-2 and the response data structures and response codes specified in table 6.2.3.2.3.1-3.

Table 6.2.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AmfCreateEventSubscription	M	1	Describes of an AMF Event Subscription to be created

Table 6.2.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AmfCreatedEventSubscription	M	1	201 Created	Represents successful creation of an AMF Event Subscription
ProblemDetails	O	0..1	403 Forbidden	Indicates the creation of subscription has failed due to application error. The "cause" attribute may be used to indicate one of the following application errors: - UE_NOT_SERVED_BY_AMF

Table 6.2.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/namf-evts/<apiVersion>/subscriptions/{subscriptionId}

6.2.3.2.4 Resource Custom Operations

None.

6.2.3.3 Resource: Individual subscription

6.2.3.3.1 Description

This resource represents an individual of subscription created by NF service consumers of Namf_EventExposure service.

This resource is modelled as the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

6.2.3.3.2 Resource Definition

Resource URI: **{apiRoot}/namf-evts/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.2.3.3.2-1.

Table 6.2.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.2.1
apiVersion	string	See clause 6.2.1.
subscriptionId	string	String identifies an individual subscription to the AMF event exposure service

6.2.3.3.3 Resource Standard Methods

6.2.3.3.3.1 PATCH

This method shall support the URI query parameters specified in table 6.2.3.3.3.1-1.

Table 6.2.3.3.3.1-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.2.3.3.3.1-2 and the response data structures and response codes specified in table 6.2.3.3.3.1-3.

Table 6.2.3.3.3.1-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
AmfUpdateEventSubscriptionItem	M	1	Document describes the modification(s) to a AMF Event Subscription
AmfUpdateEventOptionItem	M	1	Document describing the modification to the event subscription options (e.g subscription expiry time).

Table 6.2.3.3.3.1-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AmfUpdatedEventSubscription	M	1	200 OK	Represents a successful update on AMF Event Subscription
ProblemDetails	O	0..1	403 Forbidden	Indicates the modification of subscription has failed due to application error. The "cause" attribute may be used to indicate one of the following application errors: - UE_NOT_SERVED_BY_AMF
ProblemDetails	O	0..1	404 Not Found	Indicates the modification of subscription has failed due to application error. The "cause" attribute may be used to indicate one of the following application errors: - SUBSCRIPTION_NOT_FOUND

6.2.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.2.3.3.3.2-1.

Table 6.2.3.3.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.2.3.3.3.2-2 and the response data structures and response codes specified in table 6.2.3.3.3.2-3.

Table 6.2.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.2.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	
ProblemDetails	O	0..1	404 Not Found	Indicates the modification of subscription has failed due to application error. The "cause" attribute may be used to indicate one of the following application errors: - SUBSCRIPTION_NOT_FOUND.

6.2.3.3.4 Resource Custom Operations

None.

6.2.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on Namf_EventExposure Service.

6.2.5 Notifications

6.2.5.1 General

This clause specifies the notifications provided by the Namf_EventExposure service.

Table 6.2.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
AMF Event Notification	{eventNotifyUri}	POST	
AMF Event Notification	{subsChangeNotifyUri}	POST	

6.2.5.2 AMF Event Notification

If a NF service consumer has subscribed to an event(s) supported by Namf_EventExposure service, when AMF aware of a state change of the event, AMF shall create a notification including the event state report, and shall deliver the notification to the call-back URI, following Subscribe/Notify mechanism defined in 3GPP TS 29.501 [5].

6.2.5.2.1 Notification Definition

Call-back URI: **{callbackUri}**

Call-back URI is provided by NF Service Consumer during creation of the subscription. If the notification is to inform the change of subscription ID and if the "subsChangeNotifyUri" was provided in the AmfEventSubscription, then this callback URI shall be the "subsChangeNotifyUri" provided in the AmfEventSubscription. Otherwise, this callback URI shall be the "eventNotifyUri" provided in the AmfEventSubscription.

6.2.5.2.3 Notification Standard Methods

6.2.5.2.3.1 POST

This method shall support the request data structures specified in table 6.2.5.2.3.1-1 and the response data structures and response codes specified in table 6.2.5.2.3.1-2.

Table 6.2.5.2.3.1-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
AmfEventNotification	M	1	Represents the notification to be delivered

Table 6.2.5.2.3.1-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	

6.2.6 Data Model

6.2.6.1 General

This clause specifies the application data model supported by the API.

Table 6.2.6.1-1 specifies the data types defined for the Namf_EventExposure service based interface protocol.

Table 6.2.6.1-1: Namf_EventExposure specific Data Types

Data type	Clause defined	Description
AmfEventSubscription	6.2.6.2.2	Represents an individual event subscription resource on AMF
AmfEvent	6.2.6.2.3	Describes an event to be subscribed
AmfEventNotification	6.2.6.2.4	Represents a notification generated by AMF to be delivered
AmfEventReport	6.2.6.2.5	Represents a report triggered by a subscribed event type, except the report triggered by UES_IN_AREA_REPORT event type
AmfEventMode	6.2.6.2.6	Describes how the reports shall be generated by a subscribed event
AmfEventState	6.2.6.2.7	Represents the state of a subscribed event
RmInfo	6.2.6.2.8	Represents the registration state of a UE for an access type
CmInfo	6.2.6.2.9	Represents the connection management state of a UE for an access type
CommunicationFailure	6.2.6.2.11	Describes a communication failure detected by AMF
AmfCreateEventSubscription	6.2.6.2.12	Describes of an AMF Event Subscription to be created
AmfCreatedEventSubscription	6.2.6.2.13	Represents successful creation of an AMF Event Subscription
AmfUpdateEventSubscriptionItem	6.2.6.2.14	Document describes the modification(s) to an AMF Event Subscription
AmfUpdatedEventSubscription	6.2.6.2.15	Represents a successful update on an AMF Event Subscription
AmfEventArea	6.2.6.2.16	Represents an area to be monitored by an AMF event.
LadnInfo	6.2.6.2.17	LADN Information
AmfUpdateEventOptionItem	6.2.6.2.18	Document describing the modifications to AMF event subscription options.
5GsUserStateInfo	6.2.6.2.19	Represents the 5GS User state of the UE for an access type
TrafficDescriptor	6.2.6.2.20	Represents the Traffic Descriptor
UEIdExt	6.2.6.2.21	UE Identity
AmfEventType	6.2.6.3.3	Describes the supported event types of Namf_EventExposure Service
AmfEventTrigger	6.2.6.3.4	Describes how AMF should generate the report for the event
LocationFilter	6.2.6.3.5	Describes the supported filters of LOCATION_REPORT event type
UeReachability	6.2.6.3.7	Describes the reachability of the UE
RmState	6.2.6.3.9	Describes the registration management state of a UE
CmState	6.2.6.3.10	Describes the connection management state of a UE
5GsUserState	6.2.6.3.11	Describes the 5GS User State of a UE
LossOfConnectivityReason	6.2.6.3.12	Describes the reason for loss of connectivity
ReachabilityFilter	6.2.6.3.13	Event filter for REACHABILITY_REPORT event type.

Table 6.2.6.1-2 specifies data types re-used by the Namf_EventExposure service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Namf_EventExposure service based interface.

Table 6.2.6.1-2: Namf_EventExposure re-used Data Types

Data type	Reference	Comments
Supi	3GPP TS 29.571 [6]	
GroupId	3GPP TS 29.571 [6]	
DurationSec	3GPP TS 29.571 [6]	
Gpsi	3GPP TS 29.571 [6]	
Uri	3GPP TS 29.571 [6]	
Pei	3GPP TS 29.571 [6]	
UserLocation	3GPP TS 29.571 [6]	
TaI	3GPP TS 29.571 [6]	
TimeZone	3GPP TS 29.571 [6]	
AccessType	3GPP TS 29.571 [6]	
Ecgi	3GPP TS 29.571 [6]	EUTRA Cell Identifier
Ncgi	3GPP TS 29.571 [6]	NR Cell Identifier
NfInstanceId	3GPP TS 29.571 [6]	
ProblemDetails	3GPP TS 29.571 [6]	Problem Details
SupportedFeatures	3GPP TS 29.571 [6]	Supported Features
DateTime	3GPP TS 29.571 [6]	
NgApCause	3GPP TS 29.571 [6]	
PresenceInfo	3GPP TS 29.571 [6]	Presence Reporting Area Information
PresenceState	3GPP TS 29.571 [6]	Describes the presence state of the UE to a specified area of interest
Dnn	3GPP TS 29.571 [6]	
Snssai	3GPP TS 29.571 [6]	
DddTrafficDescriptor	3GPP TS 29.571 [6]	Downlink Data Delivery Traffic Descriptor
ReferenceId	3GPP TS 29.503 [35]	
NsiId	3GPP TS 29.531 [18]	NSI ID
SamplingRatio	3GPP TS 29.571 [6]	Sampling Ratio.

6.2.6.2 Structured data types

6.2.6.2.1 Introduction

Structured data types used in Namf_EventExposure service are specified in this clause.

6.2.6.2.2 Type: AmfEventSubscription

Table 6.2.6.2.2-1: Definition of type AmfEventSubscription

Attribute name	Data type	P	Cardinality	Description
eventList	array(AmfEvent)	M	1..N	Describes the events to be subscribed for this subscription.
eventNotifyUri	Uri	M	1	Identifies the recipient of notifications sent by AMF for this subscription (NOTE 1)
notifyCorrelationId	string	M	1	Identifies the notification correlation ID. The AMF shall include this ID in the notifications. The value of this IE shall be unique per subscription for a given NF service consumer.
nfId	NfInstanceId	M	1	Indicates the instance identity of the network function creating the subscription.
subsChangeNotifyUri	Uri	C	0..1	This IE shall be present if the subscription is created by an NF service consumer on behalf of another NF (e.g UDM creating event subscription at AMF for event notifications towards NEF). When present, this IE Identifies the recipient of notifications sent by AMF, for the creation of a new subscription ID, that is considered as a change of subscription ID by the NF service consumer for event subscriptions related to single UE or as the creation of a new subscription Id for event subscriptions related to UE groups (e.g during mobility procedures involving AMF change). (NOTE 3).
subsChangeNotifyCorelationId	string	C	0..1	This IE shall be present when an NF Service Consumer (e.g. UDM) is subscribing for events on behalf of another NF Service Consumer (e.g. NEF). When present, this IE shall contain the notification correlation ID. The AMF shall include it in the notifications for the creation of a new subcription ID that is considered as a change of subscription ID by the NF service consumer for event subscriptions related to single UE or as the creation of a new subscription Id for event subscriptions related to UE groups. The value of this IE shall be unique per subscription for a given NF service consumer that is sending this IE. (NOTE 3)..
supi	Supi	C	0..1	Subscription Permanent Identifier (NOTE 2)
groupId	GroupId	C	0..1	Identifies a group of UEs. (NOTE 2)
gpsi	Gpsi	C	0..1	Generic Public Subscription Identifier (NOTE 2)
pei	Pei	C	0..1	Permanent Equipment Identifier (NOTE 2)
anyUE	boolean	C	0..1	This IE shall be present if the event subscription is applicable to any UE. Default value "FALSE" is used, if not present (NOTE 2)
options	AmfEventMode	O	0..1	This IE may be included if the NF service consumer wants to describe how the reports of the event have to be generated. The absence of this IE, when creating an AMF event subscription or when transferring the UE context to another AMF, shall be interpreted as a "ONE_TIME" AMF event trigger.

NOTE 1: When an NF Service Consumer subscribes on behalf of another NF, the Notification URI identifies a resource under the authority of the other NF.
NOTE 2: Either information about a single UE (i.e. SUPI, GPSI, PEI) or groupId, or anyUE set to "TRUE" shall be included.
NOTE 3: Same values of "subsChangeNotifyUri" and "subsChangeNotifyCorrelationId" shall be provided by an NF service consumer to all the serving AMF if the subscriptions apply to a group and triggered by one subscription from another NF. This allows the NF service consumer to associate the subscription Id creation notifications received from different serving AMFs to the same group Id subscription,

6.2.6.2.3 Type: AmfEvent

Table 6.2.6.2.3-1: Definition of type AmfEvent

Attribute name	Data type	P	Cardinality	Description
type	AmfEventType	M	1	Describes the AMF event type to be reported
immediateFlag	boolean	O	0..1	Indicates if an immediate event report in the subscription response is requested. The report contains the current value / status of the event stored at the time of the subscription in the AMF (NOTE 1). If the flag is not present then immediate reporting shall not be done.
areaList	array(AmfEventArea)	O	1..N	Identifies the area to be applied. More than one instance of AmfEventArea IE shall be used only when the AmfEventArea is provided during event subscription for Presence Reporting Area subscription.
locationFilterList	array(LocationFilter)	O	1..N	Describes the filters to be applied for LOCATION_REPORT event type. If this attribute is not present in the request, it indicates the change of the TA used by the UE should be reported.
refId	ReferenceId	O	0..1	Indicates the Reference Id associated with the event.
trafficDescriptorList	array(TrafficDescriptor)	O	1..N	Indicates the filters to be applied for AVAILABILITY_AFTER_DDN_FAILURE event type.
reportUeReachable	boolean	C	0..1	This IE shall be present and set to value "true" by the source AMF to request the target AMF to notify the subscriber when UE becomes reachable, during inter-AMF mobility procedures. When present, this IE shall be set as following: - true: target AMF shall notify the subscriber when UE becomes reachable - false (default): target AMF shall not notify the subscriber when UE becomes reachable, until next reporting trigger is detected, i.e. DDN failure detected (for AVAILABILITY_AFTER_DDN_FAILURE event) or UE becomes unreachable for downlink traffic (for "UE Reachable for DL Traffic" of REACHABILITY_REPORT event) This IE only applies to following Event Types: - AVAILABILITY_AFTER_DDN_FAILURE - REACHABILITY_REPORT (for "UE Reachable for DL Traffic")

reachabilityFilter	ReachabilityFilter	O	0..1	When present, this IE shall indicate the filter to be applied for the REACHABILITY_REPORT event type. If the subscription of REACHABILITY_REPORT is for "UE Reachability Status Change", the AMF shall report current reachability state and subsequent updated reachability state of the UE, when AMF becomes aware of a UE reachability state change between REACHABLE, UNREACHABLE and REGULATORY_ONLY. If the subscription of REACHABILITY_REPORT is for "UE Reachable for DL Traffic", the AMF shall report the "REACHABLE" state, when the UE transitions to CM-CONNECTED mode or when the UE will become reachable for paging, as specified in table 4.15.3.1-1, clauses 4.2.5 and 4.3.3 of 3GPP TS 23.502 [3]. If this IE is absent, the subscription of REACHABILITY_REPORT is for "UE Reachability Status Change".
maxReports	integer	O	0..1	This IE may be present if the trigger is set to "CONTINUOUS". When present, this IE describes the maximum number of reports that can be generated by the subscribed event. If the AMF event subscription is for a group of UEs, this parameter shall be applied to each individual member UE of the group. If the event subscription is transferred from source AMF to target AMF, this IE shall contain: - the remaining number of reports for the event subscription, in the case of individual UE event subscription; - the remaining number of reports for the event subscription for this specific UE in a group, in the case of group ID specific event subscription. (NOTE 2)

NOTE 1: The current value of the location is the last known location if the immediate report filter request to provide the 3GPP location information down to the Cell-ID or the TAI. An NF Service Consumer willing to only receive the current location shall not set the immediateFlag to true when subscribing to a location event report.
NOTE 2: maxReports in this attribute shall have precedence over the maxReports in the AmfEventMode.

6.2.6.2.4 Type: AmfEventNotification

Table 6.2.6.2.4-1: Definition of type AmfEventNotification

Attribute name	Data type	P	Cardinality	Description
notifyCorrelationId	string	C	0..1	This IE shall be included if the notification is not for informing creation of a new subscription Id. This IE shall also be included if the notification is for informing the creation of a new subscription Id and the corresponding event subscription did not contain subsChangeNotifyCorrelationId attribute (see clause 6.2.6.2.2). When present, this IE shall indicate the notification correlation Id provided by the NF service consumer during event subscription. This parameter can be useful if the NF service consumer uses a common call-back URI for multiple subscriptions.
subsChangeNotifyCorrelationId	string	C	0..1	This IE shall be included if the notification is for informing the creation of a new subscription Id at the AMF and the corresponding event subscription contains the subsChangeNotifyCorrelationId attribute (see clause 6.2.6.2.2). When present, this IE shall be set to the value of the subsChangeNotifyCorrelationId provided during subscription (see clause 6.2.6.2.2).
reportList	array(AmfEventReport)	C	1..N	This IE shall be present if a event is reported. When present, this IE represents the event reports to be delivered.

6.2.6.2.5 Type: AmfEventReport

Table 6.2.6.2.5-1: Definition of type AmfEventReport

Attribute name	Data type	P	Cardinality	Description	Applicability
type	AmfEventType	M	1	Describes the type of the event which triggers the report	
state	AmfEventState	M	1	Describes the state of the event which triggered the report. This IE shall be set to "TRUE" when subscriptionId IE is present.	
timeStamp	DateTime	M	1	This IE shall contain the time at which the event is generated.	
subscriptionId	Uri	C	0..1	This IE shall be included when the event notification is for informing the creation of a subscription Id at the AMF during mobility of a UE across AMFs. When present, this IE shall contain the URI of the created subscription resource at the AMF; this shall contain an absolute URI set to the Resource URI specified in clause 6.2.3.3.2. The type IE shall be set to: - SUBSCRIPTION_ID_CHANGE, when the AMFcreates a subscription Id for a UE specific event subscription during mobility registration and handover procedures involving an AMF change. - SUBSCRIPTION_ID_ADDITION, when the AMF creates a subscription Id for a group Id specific event subscription during mobility registration and handover procedures involving an AMF change.	
anyUe	boolean	C	0..1	This IE shall be included and shall be set to "true", if the event subscription is a bulk subscription for number of UEs and the event reported is for one of those UEs.	
supi	Supi	C	0..1	This IE shall be present if available. When present, this IE identifies the SUPI of the UE associated with the report (NOTE).	
areaList	array(AmfEventArea)	C	1..N	This IE shall be present when the AMF event type is "PRESENCE_IN_AOI_REPORT". When present, this IE represents the specified Area(s) of Interest the UE is currently IN / OUT / UNKNOWN. If the AMF event is subscribed towards a PRA identifier referring to a Set of Core Network predefined Presence Reporting Areas, the AMF shall report both the subscribed PRA Identifier and the additional PRA identifier of the actually individual PRA(s) where the UE is currently IN / OUT, as specified in clause 5.6.11 of 3GPP TS 23.501 [2].	
refId	ReferenceId	C	0..1	This IE shall be present if a Reference Id has previously been associated with the event triggering the report. When present, this IE shall indicate the Reference Id associated with the event which triggers the report.	
gpsi	Gpsi	C	0..1	This IE shall be present if available. When present, this IE identifies the GPSI of the UE associated with the report (NOTE).	
pei	Pei	O	0..1	This IE may be included if the event reported is for a particular UE or any UE. This IE identifies the PEI of the UE associated with the report (NOTE).	
location	UserLocation	O	0..1	Represents the location information of the UE	

timezone	TimeZone	O	0..1	Describes the time zone of the UE	
accessTypeList	array(AccessType)	O	1..N	Describes the access type(s) of the UE	
rmInfoList	array(RmInfo)	O	1..N	Describes the registration management state of the UE	
cmInfoList	array(CmInfo)	O	1..N	Describes the connection management state of the UE	
reachability	UeReachability	O	0..1	Describes the reachability of the UE	
commFailure	CommunicationFailure	O	0..1	Describes a communication failure for the UE.	
numberOfUes	integer	O	0..1	Represents the number of UEs in the specified area	
5gsUserStateList	array(5GsUserStateInfo)	O	1..N	Represents the 5GS User State of the UE per access type	
typeCode	string	C	0..1	This IE shall be present when the AMF event type is "TYPE_ALLOCATION_CODE_REPORT". When present, this IE represents the Type Allocation code (TAC), to indicate terminal model and vendor information of the UE. Pattern: '^imeitac-[0-9]{8}$'.	ENA
registrationNumber	integer	C	0..1	This IE shall be present when the AMF event type is "FREQUENT_MOBILITY_REGISTRATION_REPORT". When present, this IE represents the number of the mobility registration procedures during a period identified by the expiry time included in the event subscription request.	ENA
ueIdExtList	array(UEIdExt)	C	1..N	This IE shall be present if multiple SUPIs and / or GPSIs need to be included, the AMF event type is "UES_IN_AREA_REPORT" and the subscribing NF indicated support of the ENA feature. This attribute provides additional SUPIs and / or GPSIs to the supi attribute or gpsi attribute. The ueIdExt attribute may be present even if both the supi and gpsi attributes are absent.	ENA
lossOfConnectReason	LossOfConnectivityReason	O	0..1	Describes the reason for loss of connectivity. This IE should be present when the AMF event type is "LOSS_OF_CONNECTIVITY".	
maxAvailabilityTime	DateTime	O	0..1	Indicates the time (in UTC) until which the UE is expected to be reachable. This IE may be present in REACHABILITY_REPORT event report for "UE Reachable_for DL Traffic". This information may be used by the SMS Service Center to prioritize the retransmission of pending Mobile Terminated Short Message to UEs using a power saving mechanism (eDRX, PSM etc.).	
NOTE: If the event report corresponds to an event subscription of a single UE, then the same UE identifier (i.e. SUPI and/or GPSI and/or PEI) received during subscription creation shall be included in the report. If the event report corresponds to an event subscription for group of UEs or any UE, then the SUPI and if available the GPSI shall be included in the event report. SUPI, PEI and GPSI shall not be present in report for UES_IN_AREA_REPORT event type.					

6.2.6.2.6 Type: AmfEventMode

Table 6.2.6.2.6-1: Definition of type AmfEventMode

Attribute name	Data type	P	Cardinality	Description
trigger	AmfEventTrigger	M	1	Describes how the reports are triggered.
maxReports	integer	C	0..1	This IE shall be present if the trigger is set to "CONTINUOUS". When present, this IE describes the maximum number of reports that can be generated by the subscribed event. If the AMF event subscription is for a list of events, this parameter shall be applied to each individual event in the list. If the AMF event subscription is for a group of UEs, this parameter shall be applied to each individual member UE of the group. If the event subscription is transferred from source AMF to target AMF, this IE shall contain: - the remaining number of reports for the event subscription, in the case of individual UE event subscription; - the remaining number of reports for the event subscription for this specific UE in a group, in the case of group ID specific event subscription. (NOTE 1) (NOTE 2)
expiry	DateTime	C	0..1	This IE shall be included in an event subscription response, if, based on operator policy and taking into account the expiry time included in the request, the AMF needs to include an expiry time. This IE may be included in an event subscription request. When present, this IE shall represent the time after which the subscribed event(s) shall stop generating report and the subscription becomes invalid. If the trigger value included in an event subscription response is "ONE_TIME" and if an event report is included in the subscription response then the value of the expiry included in the response shall be an immediate timestamp. (NOTE 1)
repPeriod	DurationSec	C	0..1	This IE shall be present if the trigger is set to "PERIODIC". When present, this IE describes the period time for the event reports. If the AMF event subscription is for a group of UEs, this parameter shall be applied to each individual member UE of the group.
sampRatio	SamplingRatio	O	0..1	This IE may be included in an event subscription request for a group of UEs or any UE to indicate the ratio of the random subset to target UEs. Event reports only relate to the subset. If the AMF event subscription is for a list of AMF event, this parameter shall be applied to each individual event.
NOTE 1: If the AmfEventTrigger is set to "CONTINOUS", at least one of the "maxReports" and "expiry" attributes shall be included. NOTE 2: maxReports in the AmfEvent shall have precedence over the maxReports in this attribute.				

6.2.6.2.7 Type: AmfEventState

Table 6.2.6.2.7-1: Definition of type AmfEventState

Attribute name	Data type	P	Cardinality	Description
active	boolean	M	1	Represents the active state of the subscribe event. "TRUE" value indicates the event will continue generating reports; "FALSE" value indicates the event will not generate further report.
remainReports	integer	O	0..1	Represents the number of remain reports to be generated by the subscribed event.
remainDuration	DurationSec	O	0..1	Represents how long the subscribed event will continue generating reports.

6.2.6.2.8 Type: RmInfo

Table 6.2.6.2.8-1: Definition of type RmInfo

Attribute name	Data type	P	Cardinality	Description
rmState	RmState	M	1	Describes the registration management state of the UE
accessType	AccessType	M	1	Describes the access type of the UE that applies to the registration management state reported.

6.2.6.2.9 Type: CmInfo

Table 6.2.6.2.9-1: Definition of type CmInfo

Attribute name	Data type	P	Cardinality	Description
cmState	CmState	M	1	Describes the Connection management state of the UE
accessType	AccessType	M	1	Describes the access type of the UE that applies to the Connection management state reported.

6.2.6.2.10 Void

6.2.6.2.11 Type: CommunicationFailure

Table 6.2.6.2.11-1: Definition of type CommunicationFailure

Attribute name	Data type	P	Cardinality	Description
nasReleaseCode	string	O	0..1	Describes the NAS release code for the communication failure. This IE shall be formatted following the regular expression pattern: "^(MM|SM)-[0-9]{1,3}$" Examples: MM-7 SM-27
ranReleaseCode	NgApCause	O	0..1	Describes the RAN release code for the communication failure. If present, this IE shall contain the decimal value of the NG AP cause code values as specified in 3GPP TS 38.413 [12].

6.2.6.2.12 Type: AmfCreateEventSubscription

Table 6.2.6.2.12-1: Definition of type AmfCreateEventSubscription

Attribute name	Data type	P	Cardinality	Description
subscription	AmfEventSubscription	M	1	Represents the AMF Event Subscription resource to be created.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.2.8 is supported.
oldGuami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).

6.2.6.2.13 Type: AmfCreatedEventSubscription

Table 6.2.6.2.13-1: Definition of type AmfCreatedEventSubscription

Attribute name	Data type	P	Cardinality	Description
subscription	AmfEventSubscription	M	1	Represents the newly created AMF Event Subscription resource.
subscriptionId	Uri	M	1	Represents the URI of the newly created AMF Event Subscription resource. This shall contain an absolute URI set to the Resource URI specified in clause 6.2.3.3.2. (NOTE 2)
reportList	array(AmfEventReport)	O	1..N	Represents the immediate event reports (i.e. the current value / status of the events subscribed), if available (NOTE 1).
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.2.8 is supported.
NOTE 1: If the subscription is on behalf of another NF then the reports attribute shall be absent. NOTE 2: 3GPP TS 23.502 [3] specifies this attribute as "Subscription Correlation ID".				

6.2.6.2.14 Type: AmfUpdateEventSubscriptionItem

Table 6.2.6.2.14-1: Definition of type AmfUpdateEventSubscriptionItem

Attribute name	Data type	P	Cardinality	Description
op	string	M	1	This IE indicates the patch operation as defined in IETF RFC 6902 [14] to be performed on resource. This IE shall support the following values: Enum: "add" Enum: "replace" Enum: "remove"
path	string	M	1	This IE contains a JSON pointer value (as defined in IETF RFC 6901 [40]) that references a location of a resource on which the patch operation shall be performed. This IE shall contain the JSON pointer to a valid index of the "/eventList" array in the AMF Event Subscription, formatted with following pattern: '\/eventList\/[0-]$\|\/eventList\/[1-9][0-9]*$' Example: "/eventList/0" stands for the first member of the array; "/eventList/10" stands for the 11th member of the array; "/eventList/-" stands for a new (non-existent) member after the last existing array element. Only allowed with "add" operation.
value	AmfEvent	C	0..1	This IE indicates a new AMF event to be added or updated value of an existing AMF event to be modified. It shall be present if the patch operation is "add" or "replace"

6.2.6.2.15 Type: AmfUpdatedEventSubscription

Table 6.2.6.2.15-1: Definition of type AmfUpdatedEventSubscription

Attribute name	Data type	P	Cardinality	Description
subscription	AmfEventSubscription	M	1	Represents the updated AMF Event Subscription resource.
reportList	array(AmfEventReport)	O	1..N	Represents the immediate event reports (i.e. the current value / status of the events subscribed), if available (NOTE).
NOTE: For newly added AMF event subscription(s) with the immediateFlag attribute set to true, immediate event report(s) of the corresponding AMF event subscription shall be provided if available.				

6.2.6.2.16 Type: AmfEventArea

Table 6.2.6.2.16-1: Definition of type AmfEventArea

Attribute name	Data type	P	Cardinality	Description	Applicability
presenceInfo	PresenceInfo	C	0..1	This IE shall be present if the Area of Interest subscribed is not a LADN service area (e.g Presence Reporting Area or a list of TAIs / cell Ids) . (See NOTE1, NOTE 2)	
ladnInfo	LadnInfo	C	0..1	This IE shall be present if the Area of Interest subscribed is a LADN service area.	
sNssai	Snssai	O	0..1	When present, it shall contain the associated S-NSSAI of the area.	ENA
nsiId	NsiId	O	0..1	When present, this IE shall contain the associated NSI ID of the S-NSSAI.	ENA

NOTE 1: When the AmfEventArea is provided during event subscription, then for UE specific presence reporting area subscription, the praId along with what constitutes that UE specific presence reporting area (i.e. set of Tai and/or set of ecgi and/or set of ncgi and/or set of globalRanNodeId) shall be provided.

NOTE 2: If the subscription is for a Set of Core Network Predefined Presence Reporting Areas and both the AMF and the NF service consumer support the "APRA" feature, the PRA Identifier for the Set shall be carried in the "praId" IE and the individual PRA identifier shall be carried in the "additionalPraId" IE; if the subscription is for a Set of Core Network Predefined Presence Reporting Areas and the AMF or NF service consumer does not support the "APRA" feature, the individual PRA identifier shall be carried in the "praId" IE and the "additionalPraId" IE shall not be present.

6.2.6.2.17 Type: LadnInfo

Table 6.2.6.2.17-1: Definition of type LadnInfo

Attribute name	Data type	P	Cardinality	Description
ladn	string	M	1	Represents the Local Access Data Network DNN. The AMF shall identify the list of tracking areas corresponding to the LADN DNN based on local configuration.
presence	PresenceState	C	0..1	This IE shall be included when the UE presence in area of interest is reported. When present, this IE contains the status of UE presence within the Area of Interest (IN / OUT / UNKNOWN).

6.2.6.2.18 Type: AmfUpdateEventOptionItem

Table 6.2.6.2.18-1: Definition of type AmfUpdateEventOptionItem

Attribute name	Data type	P	Cardinality	Description
op	string	M	1	This IE indicates the patch operation as defined in IETF RFC 6902 [14] to be performed on resource. This IE shall support the following values: Enum: "replace"
path	string	M	1	This IE contains a JSON pointer value (as defined in IETF RFC 6901 [40]) that references a location of a resource on which the patch operation shall be performed. This IE shall contain the JSON pointer to "/options/expiry" attribute of the event subscription resource. Pattern: "\/options\/expiry$"
value	DateTime	M	1	This IE indicates the updated expiry timer value as suggested by the NF service consumer.

6.2.6.2.19 Type: 5GsUserStateInfo

Table 6.2.6.2.19-1: Definition of type 5GsUserStateInfo

Attribute name	Data type	P	Cardinality	Description
5gsUserState	5GsUserState	M	1	Describes the 5GS user state of the UE
accessType	AccessType	M	1	Describes the access type of the UE that applies to the 5GS user state reported.

6.2.6.2.20 Type: TrafficDescriptor

Table 6.2.6.2.20-1: Definition of type TrafficDescriptor

Attribute name	Data type	P	Cardinality	Description
dnn	Dnn	C	0..1	This IE shall be present if it is available. When present, it shall indicate the Data Network Name.
sNssai	Snssai	C	0..1	This IE shall be present if it is available. When present, it shall indicate the associated S-NSSAI for the PDU Session.
dddTrafficDescriptorList	array(DddTrafficDescriptor)	C	1..N	This IE shall be present if it is available. When present, it shall indicate the Traffic Descriptor related to the traffic.

6.2.6.2.21 Type: UEIdExt

Table 6.2.6.2.21-1: Definition of type UEIdExt

Attribute name	Data type	P	Cardinality	Description
supi	Supi	C	0..1	This IE shall be present if available. When present, this IE identifies the SUPI of the UE associated with the report.
gpsi	Gpsi	C	0..1	This IE shall be present if available. When present, this IE identifies the GPSI of the UE associated with the report.

6.2.6.3 Simple data types and enumerations

6.2.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.2.6.3.2 Simple data types

The simple data types defined in table 6.2.6.3.2-1 shall be supported.

Table 6.2.6.3.2-1: Simple data types

Type Name	Type Definition	Description
5gGuti	string	5G Global Unique Temporary Identifier, defined in clause 5.9.4 of 3GPP TS 23.501 [2]

6.2.6.3.3 Enumeration: AmfEventType

Table 6.2.6.3.3-1: Enumeration AmfEventType

Enumeration value	Description
"LOCATION_REPORT"	A NF subscribes to this event to receive the Last Known Location of a UE or a group of UEs, and Updated Location of the UE or any UE in the group when AMF becomes aware of a location change of the UE.
"PRESENCE_IN_AOI_REPORT"	A NF subscribes to this event to receive the current present state of a UE in a specific Area of Interest (AOI), and notification when a specified UE enters or leaves the specified area. The area could be identified by a TA list, an area ID or specific interest area name like "LADN".
"TIMEZONE_REPORT"	A NF subscribes to this event to receive the current time zone of a UE or a group of UEs, and updated time zone of the UE or any UE in the group when AMF becomes aware of a time zone change of the UE.
"ACCESS_TYPE_REPORT"	A NF subscribes to this event to receive the current access type(s) of a UE or a group of UEs, and updated access type(s) of the UE or any UE in the group when AMF becomes aware of the access type change of the UE.
"REGISTRATION_STATE_REPORT"	A NF subscribes to this event to receive the current registration state of a UE or a group of UEs, and report for updated registration state of a UE or any UE in the group when AMF becomes aware of a registration state change of the UE.
"CONNECTIVITY_STATE_REPORT"	A NF subscribes to this event to receive the current connection management state of a UE or a group of UEs, and report for updated connection management state of a UE or any UE in the group when AMF becomes aware of a connection management state change of the UE.
"REACHABILITY_REPORT"	A NF subscribes to this event to receive the current reachability of a UE or a group of UEs, and report for updated reachability of a UE or any UE in the group when AMF becomes aware of a reachability change of the UE.
"COMMUNICATION_FAILURE_REPORT"	A NF subscribes to this event to receive the Communication failure report of a UE or group of UEs or any UE.
"UES_IN_AREA_REPORT"	A NF subscribes to this event to receive the number of UEs in a specific area.
"SUBSCRIPTION_ID_CHANGE"	This event type is used by the AMF to inform the NF service consumer that the subscription Id for the event subscription is changed (e.g. Subscription Id creation at the target AMF for individual UE level event subscriptions, during mobility registration or handover procedures involving an AMF change). This event needs no explicit subscription form an NF service consumer.
"SUBSCRIPTION_ID_ADDITION"	This event type is used by the AMF to inform the NF service consumer that a new subscription Id is added (e.g creation of an event subscription for a UE group level event subscription at the target AMF, during mobility registration or handover procedures involving AMF change for a UE belonging to a group Id and when such a UE is the first UE of the group registering at the target AMF). This event needs no explicit subscription form the NF service consumer.

"LOSS_OF_CONNECTIVITY"	An NF subscribes to this event to receive the event report of a UE or group of UEs when AMF detects that a target UE is no longer reachable for either signalling or user plane communication. Such condition is identified when Mobile Reachable timer expires in the AMF (see 3GPP TS 23.501 [2]), when the UE detaches and when AMF deregisters from UDM for an active UE. If the UE is already not reachable for either signalling or user plane communication when the event is subscribed, the AMF reports the event directly.
"5GS_USER_STATE_REPORT"	A NF subscribes to this event to receive the 5GS user state of a UE.
"AVAILABILITY_AFTER_DDN_FAILURE"	A NF subscribes to this event to be notified about the Availability of a UE after a DDN failure.
"TYPE_ALLOCATION_CODE_REPORT"	A NF subscribes to this event to receive the TAC of a UE or group of UEs.
"FREQUENT_MOBILITY_REGISTRATION_REPORT"	A NF subscribes to this event to receive the number of mobility registration procedures during a period of a UE or group of UEs.

6.2.6.3.4 Enumeration: AmfEventTrigger

Table 6.2.6.3.4-1: Enumeration AmfEventTrigger

Enumeration value	Description
"ONE_TIME"	Defines that AMF should generate report for the event only once. After reporting, the subscription to this event will be terminated.
"CONTINUOUS"	Defines that AMF should continuously generate reports for the event, until the subscription to this event ends, due to end of report duration or up to the maximum number of reports or the event being unsubscribed explicitly
"PERIODIC"	Defines that AMF should periodically generate reports for the event, until the subscription to this event ends, due to end of report duration or up to the maximum number of reports or the event being unsubscribed explicitly.

6.2.6.3.5 Enumeration: LocationFilter

Table 6.2.6.3.5-1: Enumeration LocationFilter

Enumeration value	Description
"TAI"	Indicates any change of the TA used by the UE should be reported
"CELL_ID"	Indicates any change of the Cell used by the UE should be reported
"N3IWF"	Indicates any change of the N3IWF node used by the UE should be reported
"UE_IP"	Indicates any change of the UE local IP address should be reported
"UDP_PORT"	Indicates any change of local UDP port used by the UE reported
"TNAP_ID"	Indicates any change of the TNAP ID used by the UE should be reported
"GLI"	Indicates any change of the Global Line Id used by the UE should be reported
"TWAP_ID"	Indicates any change of the TWAP ID used by the UE should be reported

6.2.6.3.6 Void

6.2.6.3.7 Enumeration: UeReachability

Table 6.2.6.3.7-1: Enumeration UeReachability

Enumeration value	Description
"UNREACHABLE"	Indicates the UE is not reachable, e.g. when the Mobile Reachable Timer in AMF expires.
"REACHABLE"	Indicates the UE is reachable for services and downlink traffic.
"REGULATORY_ONLY"	Indicates the UE is reachable only for Regulatory Prioritized Service as the UE is in Not Allowed Areas.

6.2.6.3.8 Void

6.2.6.3.9 Enumeration: RmState

Table 6.2.6.3.9-1: Enumeration RmState

Enumeration value	Description
"REGISTERED"	Indicates the UE in RM-REGISTERED state
"DEREGISTERED"	Indicates the UE in RM-DEREGISTERED state

6.2.6.3.10 Enumeration: CmState

Table 6.2.6.3.10-1: Enumeration CmState

Enumeration value	Description
"IDLE"	Indicates the UE is in CM-IDLE state
"CONNECTED"	Indicates the UE is in CM-CONNECTED state

6.2.6.3.11 Enumeration: 5GsUserState

Table 6.2.6.3.11-1: Enumeration 5GsUserState

Enumeration value	Description
"DEREGISTERED"	Indicates the UE in RM-DEREGISTERED state
"REGISTERED_NOT_REACHABLE_FOR_PAGING"	Indicates the UE in RM-REGISTERED state, in CM-IDLE state and not reachable for paging
"REGISTERED_REACHABLE_FOR_PAGING"	Indicates the UE in RM-REGISTERED state, in CM-IDLE state and reachable for paging
"CONNECTED_NOT_REACHABLE_FOR_PAGING"	Indicates the UE is in RM-REGISTERED state, in CM-CONNECTED state and not reachable for paging
"CONNECTED_REACHABLE_FOR_PAGING"	Indicates the UE is in RM-REGISTERED state , in CM-CONNECTED state and reachable for paging
"NOT_PROVIDED_FROM_AMF"	Indicates that the 5GS User State cannot be retrieved from the AMF (NOTE)
NOTE: This value is not sent by AMF (it may be sent by UDM to HSS).	

6.2.6.3.12 Enumeration: LossOfConnectivityReason

Table 6.2.6.3.12-1: Enumeration LossOfConnectivityReason

Enumeration value	Description
"DEREGISTERED"	Indicates the UE is deregistered.
"MAX_DETECTION_TIME_EXPIRED"	Indicates the mobile reachable timer is expired.
"PURGED"	Indicates the UE is purged.

6.2.6.3.13 Enumeration: ReachabilityFilter

Table 6.2.6.3.13-1: Enumeration ReachabilityFilter

Enumeration value	Description
"UE_REACHABILITY_STATUS_CHANGE"	Indicates subscription for "UE Reachability Status Change".
"UE_REACHABLE_DL_TRAFFIC"	Indicates subscription for "UE Reachable for DL Traffic".

6.2.6.4 Binary data

None.

6.2.7 Error Handling

6.2.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.2.7.2 Protocol Errors

Protocol Error Handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.2.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Namf_EventExposure service, and the following application errors listed in Table 6.2.7.3-1 are specific for the Namf_EventExposure service.

Table 6.2.7.3-1: Application errors

Application Error	HTTP status code	Description
UE_NOT_SERVED_BY_AMF	403 Forbidden	Indicates the creation or the modification of a subscription has failed due to an application error when the UE is not served by the AMF.
SUBSCRIPTION_NOT_FOUND	404 Not Found	Indicates the modification of subscription has failed due to an application error when the subscription is not found in the AMF.

6.2.8 Feature Negotiation

The feature negotiation mechanism specified in clause 6.6 of 3GPP TS 29.500 [4] shall be used to negotiate the optional features applicable between the AMF and the NF Service Consumer, for the Namf_EventExposure service, if any.

The NF Service Consumer shall indicate the optional features it supports for the Namf_EventExposure service, if any, by including the supportedFeatures attribute in payload of the HTTP Request Message for subscription resource creation.

The AMF shall determine the supported features for the service operations as specified in clause 6.6 of 3GPP TS 29.500 [4] and shall indicate the supported features by including the supportedFeatures attribute in payload of the HTTP response for subscription resource creation.

The syntax of the supportedFeatures attribute is defined in clause 5.2.2 of 3GPP TS 29.571 [6].

The following features are defined for the Namf_EventExposure service:

Table 6.2.8-1: Features of supportedFeatures attribute used by Namf_EventExposure service

Feature Number	Feature	M/O	Description
1	ENA	O	Enablers for Network Automation for 5G An AMF and an NF that support this feature shall support the procedures specified in 3GPP TS 23.288 [38].
2	APRA	O	Additional Presence Reporting Area An AMF that supports this feature shall support subscription of "PRESENCE_IN_AOI_REPORT" event with a Set of Core Network Predefined Presence Reporting Areas and generating event report including both PRA Set ID and additional PRA ID referring to an individual PRA in the Set. An NF service consumer that supports this feature shall support receiving "PRESENCE_IN_AOI_REPORT" event with additional PRA ID referring to an individual PRA in the Set.
Feature number: The order number of the feature within the supportedFeatures attribute (starting with 1). Feature: A short name that can be used to refer to the bit and to the feature. M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O"). Description: A clear textual description of the feature.			

6.2.9 Security

As indicated in 3GPP TS 33.501 [27], the access to the Namf_EventExposure API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [28]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [29]) plays the role of the authorization server.

If Oauth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Namf_EventExposure API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [29], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Namf_EventExposure service.

The Namf_EventExposure API defines scopes for OAuth2 authorization as specified in 3GPP TS 33.501 [27]; it defines a single scope consisting on the name of the service (i.e., "namf-evts"), and it does not define any additional scopes at resource or operation level.

6.3 Namf_MT Service API

6.3.1 API URI

The Namf_MT shall use the Namf_MT API.

The API URI of the Namf_MT API shall be:

{apiRoot}/<apiName>/<apiVersion>/

The request URI used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "namf-mt".
- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 6.3.3.

6.3.2 Usage of HTTP

6.3.2.1 General

HTTP/2, as defined in IETF RFC 7540 [19], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

HTTP messages and bodies for the Namf_MT service shall comply with the OpenAPI [23] specification contained in Annex A.

6.3.2.2 HTTP standard headers

6.3.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.3.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [8], shall be used as content type of the HTTP bodies specified in the present specification as indicated in clause 5.4 of 3GPP TS 29.500 [4].
- The Problem Details JSON Object (IETF RFC 7807 [36]). The use of the Problem Details JSON object in a HTTP response body shall be signalled by the content type "application/problem+json".

6.3.2.3 HTTP custom headers

6.3.2.3.1 General

In this release of this specification, no custom headers specific to the Namf_MT service are defined. For 3GPP specific HTTP custom headers used across all service based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.3.3 Resources

6.3.3.1 Overview

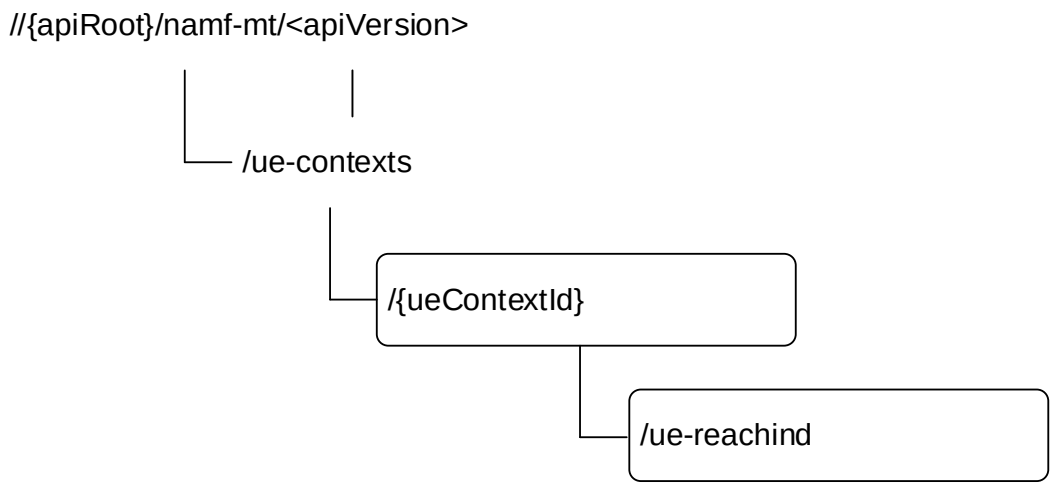

Figure 6.3.3.1-1: Resource URI structure of the Namf_MT Service API

Table 6.3.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.3.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
ueReachInd	{apiRoot}/namf-mt/<apiVersion>/ue-contexts/{ueContextId}/ue-reachind	PUT	Update the ueReachInd to UE Reachable
ueContext	{apiRoot}/namf-mt/<apiVersion>/ue-contexts/{ueContextId}	GET	Map to following service operation: - ProvideDomainSelectionInfo

6.3.3.2 Resource: ueReachInd

6.3.3.2.1 Description

This resource represents the ueReachInd for a SUPI.

This resource is modelled as the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

6.3.3.2.2 Resource Definition

Resource URI: {apiRoot}/namf-mt/<apiVersion>/ue-contexts/{ueContextId}/ue-reachind

This resource shall support the resource URI variables defined in table 6.3.3.2.2-1.

Table 6.3.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.3.1
apiVersion	string	See clause 6.3.1.
ueContextId	Supi	Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: see pattern of type Supi in 3GPP TS 29.571 [6]

6.3.3.2.3 Resource Standard Methods

6.3.3.2.3.1 PUT

This method shall support the URI query parameters specified in table 6.3.3.2.3.1-1.

Table 6.3.3.2.3.1-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.3.3.2.3.1-2 and the response data structures and response codes specified in table 6.3.3.2.3.1-3.

Table 6.3.3.2.3.1-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
EnableUeReachabilityReqData	M	1	Contain the State of the UE, the value shall be set to UE Reachable.

Table 6.3.3.2.3.1-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
EnableUeReachabilityRspData	M	1	200 OK	Indicate the ueReachInd is updated to UE Reachable.
ProblemDetails	O	0..1	307 Temporary Redirect	When the related UE context is not fully available at the target NF Service Consumer (e.g. AMF) during a planned maintenance case (e.g. AMF planned maintenance without UDSF case) the "cause" attribute shall be set to the following application error: - NF_CONSUMER_REDIRECT_ONE_TXN See table 6.3.7.3-1 for the description of these errors The Location header of the response shall be set to the URI of the resource located on the target NF Service Consumer (e.g. AMF) to which the request is redirected.
ProblemDetailsEnableUeReachability	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - UNABLE_TO_PAGE_UE - UNSPECIFIED - UE_IN_NON_ALLOWED_AREA See table 6.3.7.3-1 for the description of this error.
ProblemDetails	O	0..1	404 Not Found	When the related UE is not found in the NF Service Consumer (e.g. AMF) the "cause" attribute shall be set to: - CONTEXT_NOT_FOUND See table 6.3.7.3-1 for the description of these errors
ProblemDetails	O	0..1	503 Service Unavailable	The "cause" attribute may be used to indicate one of the errors defined in Table 5.2.7.2-1 of 3GPP TS 29.500 [4]. The HTTP header field "Retry-After" shall not be included in this scenario.
ProblemDetailsEnableUeReachability	O	0..1	504 Gateway Timeout	The "cause" attribute may be used to indicate one of the following application errors: - UE_NOT_RESPONDING See table 6.3.7.3-1 for the description of this error.

Table 6.3.3.2.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	The URI of the resource located on the target NF Service Consumer (e.g. AMF) to which the request is redirected

6.3.3.2.4 Resource Custom Operations

There is no custom operation supported on this resource.

6.3.3.3 Resource: ueContext

6.3.3.3.1 Description

This resource represents the UeContext for a UE.

This resource is modelled as the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

6.3.3.3.2 Resource Definition

Resource URI: {apiRoot}/namf-mt/<apiVersion>/ue-contexts/{ueContextId}

This resource shall support the resource URI variables defined in table 6.3.3.3.2-1.

Table 6.3.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.3.1
apiVersion	string	See clause 6.3.1.
ueContextId	Supi	Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: see pattern of type Supi in 3GPP TS 29.571 [6]

6.3.3.3.3 Resource Standard Methods

6.3.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.3.3.3.3.1-1.

Table 6.3.3.2.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
Info-class	UeContextInfoClass	M	1	Indicates the class of the UE Context information elements to be fetched.
Supported-features	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.3.8 is supported.
old-guami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).

This method shall support the request data structures specified in table 6.3.3.3.3.1-2 and the response data structures and response codes specified in table 6.3.3.3.3.1-3.

Table 6.3.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.3.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UeContextInfo	M	1	200 OK	This represents the operation is successful and request UE Context information is returned.
ProblemDetails	O	0..1	307 Temporary Redirect	When the related UE context is not fully available at the target NF Service Consumer (e.g. AMF) during a planned maintenance case (e.g. AMF planned maintenance without UDSF case) the "cause" attribute shall be set to: - NF_CONSUMER_REDIRECT_ONE_TXN See table 6.3.7.3-1 for the description of these errors The Location header of the response shall be set to the URI of the resource located on the target NF Service Consumer (e.g. AMF) to which the request is redirected.
ProblemDetails	O	0..1	403 Forbidden	Indicates the operation has failed due to application error. The "cause" attribute may be used to indicate one of the following application errors: - UNABLE_TO_PAGE_UE See table 6.3.7.3-1 for the description of these errors.
ProblemDetails	O	0..1	404 Not Found	Indicates the operation has failed due to application error. The "cause" attribute may be used to indicate one of the following application errors: - CONTEXT_NOT_FOUND See table 6.3.7.3-1 for the description of these errors

Table 6.3.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	The URI of the resource located on the target NF Service Consumer (e.g. AMF) to which the request is redirected

6.3.3.3.4 Resource Custom Operations

There is no custom operation supported on this resource.

6.3.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on Namf_MT service.

6.3.5 Notifications

There are no notifications supported on Namf_MT service.

6.3.6 Data Model

6.3.6.1 General

This clause specifies the application data model supported by the API.

Table 6.3.6.3-1 specifies the data types defined for the Namf_MT service based interface protocol.

Table 6.3.6.3-1: Namf_MT specific Data Types

Data type	Clause defined	Description
EnableUeReachabilityReqData	6.3.6.2.2	Contain the UeReachability, indicates the desired reachability status of the UE
EnableUeReachabilityRspData	6.3.6.2.3	Indicates the reachability of UE has been changed as requested.
UeContextInfo	6.3.6.2.4	Contains the UE Context Information
ProblemDetailsEnableUeReachability	6.3.6.2.5	Enable UE Reachability Error Detail
AdditionInfoEnableUeReachability	6.3.6.2.6	Additional information to be returned in EnableUeReachability error response.
UeContextInfoClass	6.3.6.3.5	Indicates the UE Context information class

Table 6.3.6.3-2 specifies data types re-used by the Namf_MT service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Namf_MT service based interface.

Table 6.3.6.3-2: Namf_MT re-used Data Types

Data type	Reference	Comments
ProblemDetails	3GPP TS 29.571 [6]	Common data type used in response bodies
supportedFeatures	3GPP TS 29.571 [6]	Supported Features
AccessType	3GPP TS 29.571 [6]	Access Type
RatType	3GPP TS 29.571 [6]	RAT Type
DurationSec	3GPP TS 29.571 [6]	
UeReachability	6.2.6.3.7	Describes the reachability of the UE

6.3.6.2 Structured data types

6.3.6.2.1 Introduction

Structured data types used in Namf_MT service are specified in this clause.

6.3.6.2.2 Type: EnableUeReachabilityReqData

Table 6.3.6.3.2-1: Definition of type EnableUeReachabilityReqData

Attribute name	Data type	P	Cardinality	Description
reachability	UeReachability	M	1	Indicates the desired reachability of the UE
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.3.8 is supported.
oldGuami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).
extBufSupport	boolean	C	0..1	This IE shall be present and set to "true", if the extended buffering is supported(see clauses 4.24.2 and clause 4.25.5 of 3GPP TS 23.502 [3]), When present, the IE shall be set as following: - true: the extended buffering is supported - false (default): the extended buffering is not supported

6.3.6.2.3 Type: EnableUeReachabilityRspData

Table 6.3.6.2.3-1: Definition of type EnableUeReachabilityRspData

Attribute name	Data type	P	Cardinality	Description
reachability	UeReachability	M	1	Indicates the current reachability of the UE
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.3.8 is supported.

6.3.6.2.4 Type: UeContextInfo

Table 6.3.6.2.3-1: Definition of type UeContextInfo

Attribute name	Data type	P	Cardinality	Description
supportVoPS	boolean	C	0..1	This IE shall be present when following UE Context Information class are required: - "TADS" When present, this IE shall indicate whether or not IMS voice over PS Session is supported in the registration area (s) where the UE is currently registered in 3GPP access.
supportVoPSn3gpp	boolean	C	0..1	This IE shall be present when the UE is registered in WLAN non 3GPP access and the following UE Context Information class are required: - "TADS" When present, this IE shall indicate whether or not IMS voice over PS Session Supported Indication over non-3GPP access is supported in the WLAN where the UE is currently registered.
lastActTime	DateTime	C	0..1	This IE shall be present when following UE Context Information class are required: - "TADS" When present, this IE shall indicate the time stamp of the last radio contact with the UE.
accessType	AccessType	C	0..1	This IE shall be present when following UE Context Information class are required: - "TADS" When present, this IE shall indicate the current access type of the UE.
ratType	RatType	C	0..1	This IE shall be present when following UE Context Information class are required: - "TADS" When present, this IE shall indicate the current RAT type of the UE.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.3.8 is supported.

6.3.6.2.5 Type: ProblemDetailsEnableUeReachability

Table 6.3.6.2.5-1: Definition of type ProblemDetailsEnableUeReachability as a list of to be combined data

Data type	Cardinality	Description	Applicability
ProblemDetails	1	Detail information of the problem	
AdditionInfoEnableUeReachability	1	Additional information to be returned in error response.	

6.3.6.2.6 Type: AdditionInfoEnableUeReachability

Table 6.3.6.2.6-1: Definition of type AdditionInfoEnableUeReachability

Attribute name	Data type	P	Cardinality	Description
maxWaitingTime	DurationSec	C	0..1	This IE shall contain the estimated maximum wait time (see clauses 4.24.2 and clause 4.25.5 of 3GPP 23.502 [3]).

6.3.6.3.5 Enumeration: UeContextInfoClass

Table 6.3.6.3.5-1: Enumeration UeContextInfoClass

Enumeration value	Description
"TADS"	Defines the UE Context Information for Terminating Domain Selection for IMS Voice over PS.

6.3.6.3 Simple data types and enumerations

6.3.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.3.6.3.2 Simple data types

The simple data types defined in table 6.3.6.3.2-1 shall be supported.

Table 6.3.6.3.2-1: Simple data types

Type Name	Type Definition	Description

6.3.6.4 Binary data

None.

6.3.7 Error Handling

6.3.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.3.7.2 Protocol Errors

Protocol Error Handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.3.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Namf_MT service, and the following application errors listed in Table 6.3.7.3-1 are specific for the Namf_MT service.

Table 6.3.7.3-1: Application errors

Application Error	HTTP status code	Description
NF_CONSUMER_REDIRECT_ONE_TXN	307 Temporary Redirect	The request has been asked to be redirected to a specified target.
UNABLE_TO_PAGE_UE	403 Forbidden	AMF is unable page the UE, temporarily.
CONTEXT_NOT_FOUND	404 Not Found	The related UE is not found in the NF Service Consumer.
UE_NOT_RESPONDING	504 Gateway Timeout	UE is not responding to the request initiated by the network, e.g. Paging.

6.3.8 Feature Negotiation

The feature negotiation mechanism specified in clause 6.6 of 3GPP TS 29.500 [4] shall be used to negotiate the optional features applicable between the AMF and the NF Service Consumer, for the Namf_MT service, if any.

The NF Service Consumer shall indicate the optional features it supports for the Namf_MT service, if any, by including the supportedFeatures attribute in payload of the HTTP Request Message for following service operations:

- EnableUEReachability, as specified in clause 5.4.2.2;

- ProvideDomainSelectionInfo, as specified in clause 5.4.2.3;The AMF shall determine the supported features for the service operations as specified in clause 6.6 of 3GPP TS 29.500 [4] and shall indicate the supported features by including the supportedFeatures attribute in payload of the HTTP response for the service operation.

The syntax of the supportedFeatures attribute is defined in clause 5.2.2 of 3GPP TS 29.571 [6].

The following features are defined for the Namf_MT service.

Table 6.3.8-1: Features of supportedFeatures attribute used by Namf_MT service

Feature Number	Feature	M/O	Description
Feature number: The order number of the feature within the supportedFeatures attribute (starting with 1). Feature: A short name that can be used to refer to the bit and to the feature. M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O"). Description: A clear textual description of the feature.			

6.3.9 Security

As indicated in 3GPP TS 33.501 [27], the access to the Namf_MT API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [28]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [29]) plays the role of the authorization server.

If Oauth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Namf_MT API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [29], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Namf_MT service.

The Namf_MT API defines scopes for OAuth2 authorization as specified in 3GPP TS 33.501 [27]; it defines a single scope consisting on the name of the service (i.e., "namf-mt"), and it does not define any additional scopes at resource or operation level.

6.4 Namf_Location Service API

6.4.1 API URI

The Namf_Location shall use the Namf_ Location API.

The API URI of the Namf_Location API shall be:

{apiRoot}/<apiName>/<apiVersion>/

The request URI used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "namf-loc".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.4.3.

6.4.2 Usage of HTTP

6.4.2.1 General

HTTP/2, as defined in IETF RFC 7540 [19], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

HTTP messages and bodies for the Namf_Location service shall comply with the OpenAPI [23] specification contained in Annex A.

6.4.2.2 HTTP standard headers

6.4.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.4.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [8], shall be used as content type of the HTTP bodies specified in the present specification as indicated in clause 5.4 of 3GPP TS 29.500 [4].
- The Problem Details JSON Object (IETF RFC 7807 [36]). The use of the Problem Details JSON object in a HTTP response body shall be signalled by the content type "application/problem+json".

6.4.2.3 HTTP custom headers

6.4.2.3.1 General

In this release of this specification, no custom headers specific to the Namf_Location service are defined. For 3GPP specific HTTP custom headers used across all service based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.4.3 Resources

6.4.3.1 Overview

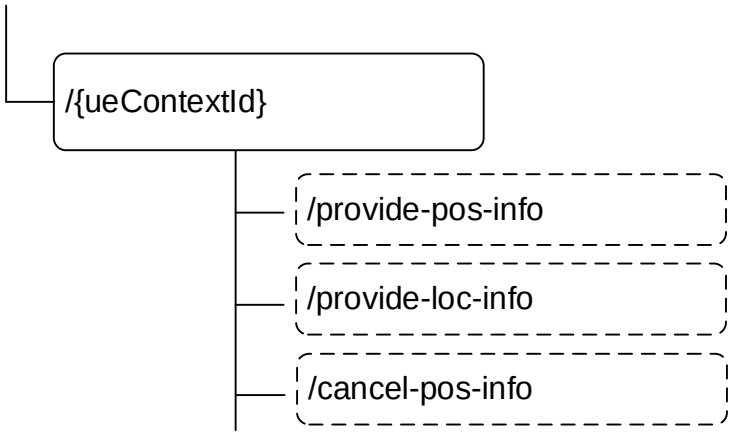

Figure 6.4.3.1-1: Resource URI structure of the Namf_Location Service API

Table 6.4.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.4.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Individual UE context	/provide-pos-info	provide-pos-info (POST)	ProvidePositioningInfo
	/provide-loc-info	provide-loc-info (POST)	ProvideLocationInfo
	/cancel-pos-info	cancel-pos-info (POST)	CancelLocation

6.4.3.2 Resource: Individual UE Context

6.4.3.2.1 Description

This resource represents an individual ueContextId.

This resource is modelled with the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

6.4.3.2.2 Resource Definition

Resource URI:{apiRoot}/namf-loc/<apiVersion>/{ueContextId}

This resource shall support the resource URI variables defined in table 6.4.3.2.2-1.

Table 6.4.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.4.1
apiVersion	string	See clause 6.4.1.
ueContextId	string	Represents the Subscription Permanent Identifier (see 3GPP TS 23.501 [2] clause 5.9.2) pattern: see pattern of type Supi in 3GPP TS 29.571 [6] Or represents the Permanent Equipment Identifier (see 3GPP TS 23.501 [2] clause 5.9.3) pattern: "(imei-[0-9]{15}|imeisv-[0-9]{16}|.+)"

6.4.3.2.3 Resource Standard Methods

There are no standard methods supported on this resource.

6.4.3.2.4 Resource Custom Operations

6.4.3.2.4.1 Overview

Table 6.4.3.2.4.1-1: Custom operations

Operation Name	Custom operaration URI	Mapped HTTP method	Description
provide-pos-info	/{ueContextId}/provide-pos-info	POST	Request the positioning information of the UE. It is used for the ProvidePositioningInfo service operation.
provide-loc-info	/{ueContextId}/provide-loc-info	POST	Request the Network Provided Location Information of the UE.
cancel-pos-info	/{ueContextId}/cancel-pos-info	POST	Cancels periodic or triggered location for the UE.

6.4.3.2.4.2 Operation: provide-pos-info (POST)

6.4.3.2.4.2.1 Description

This ueContextId identifies the individual ueContext resource is composed by UE's SUPI or PEI.

6.4.3.2.4.2.2 Operation Definition

This operation shall support the request data structures specified in table 6.4.3.2.4.2.2-1 and the response data structure and response codes specified in table 6.4.3.2.4.2.2-2.

Table 6.4.3.2.4.2.2-1: Data structures supported by the provide-pos-info operation Request Body

Data type	P	Cardinality	Description
RequestPosInfo	M	1	The information to request the positioning information of the UE.

Table 6.4.3.2.4.2.2-2: Data structures supported by the provide-pos-info operation Response Body

Data type	P	Cardinality	Response codes	Description
ProvidePosInfo	M	1	200 OK	This case represents a successful query of the UE positioning information, the AMF returns the related information in the response.
n/a			204 No Content	Shall return 204 if no information is to be returned
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - USER_UNKNOWN - DETACHED_USER - POSITIONING_DENIED - UNSPECIFIED See table 6.4.7.3-1 for the description of these errors.
ProblemDetails	O	0..1	500 Internal Server Error	The "cause" attribute may be used to indicate one of the following application errors: - POSITIONING_FAILED See table 6.1.7.3-1 for the description of these errors.
ProblemDetails	O	0..1	504 Gateway Timeout	The "cause" attribute may be used to indicate one of the following application errors: - UNREACHABLE_USER - PEER_NOT_RESPONDING See table 6.4.7.3-1 for the description of this error.

6.4.3.2.4.3 Operation: provide-loc-info (POST)

6.4.3.2.4.3.1 Description

This ueContextId identifies the individual ueContext resource is composed by UE's SUPI.

6.4.3.2.4.3.2 Operation Definition

This operation shall support the request data structures specified in table 6.4.3.2.4.3.2-1 and the response data structure and response codes specified in table 6.4.3.2.4.3.2-2.

Table 6.4.3.2.4.3.2-1: Data structures supported by the povideLocInfo operation Request Body

Data type	P	Cardinality	Description
RequestLocInfo	M	1	The information to request the NPLI of the UE.

Table 6.4.3.2.4.3.2-2: Data structures supported by the provide-loc-info operation Response Body

Data type	P	Cardinality	Response codes	Description
ProvideLocInfo	M	1	200 OK	This case represents a successful query of the NPLI of the target UE, the AMF returns the related information in the response.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - UNSPECIFIED See table 6.4.7.3-1 for the description of these errors.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - CONTEXT NOT_FOUND See table 6.4.7.3-1 for the description of these errors.

6.4.3.2.4.4 Operation: cancel-pos-info (POST)

6.4.3.2.4.4.1 Description

This ueContextId identifies the individual ueContext resource and is composed by UE's SUPI.

6.4.3.2.4.4.2 Operation Definition

This operation shall support the request data structures specified in table 6.4.3.2.4.4.2-1 and the response data structure and response codes specified in table 6.4.3.2.4.4.2-2.

Table 6.4.3.2.4.4.2-1: Data structures supported by the cancel-pos-info operation Request Body

Data type	P	Cardinality	Description
CancelPosInfo	M	1	The information to identify the location session to be cancelled.

Table 6.4.3.2.4.4.2-2: Data structures supported by the cancel-pos-info operation Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents successful cancellation of location.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - USER_UNKNOWN - LOCATION_SESSION_UNKNOWN - UNSPECIFIED See table 6.4.7.3-1 for the description of these errors.
ProblemDetails	O	0..1	504 Gateway Timeout	The "cause" attribute may be used to indicate one of the following application errors: - UNREACHABLE_USER - PEER_NOT_RESPONDING See table 6.4.7.3-1 for the description of this error.

6.4.4 Custom Operations without associated resources

There are no custom operations without associated resources supported on Namf_Location service.

6.4.5 Notifications

6.4.5.1 General

This clause provides the definition of the EventNotify notification of the Namf_Location service.

Table 6.4.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Event Notify	{locationNotificationUri}	POST	

6.4.5.2 Event Notify

6.4.5.2.1 Description

This resource represents the callback reference of the NF Service Consumer (e.g. GMLC) to receive LCS event notify.

6.4.5.2.2 Notification Definition

Callback URI: {locationNotificationUri}

See clause 5.5.2.3.1 for the description of how the AMF obtains the Callback URI of the NF Service Consumer (e.g. GMLC).

6.4.5.2.3 Notification Standard Methods

6.4.5.2.3.1 POST

This method sends an LCS event notify to the NF Service Consumer.

This method shall support the request data structures specified in table 6.4.5.2.3.1-1 and the response data structures and response codes specified in table 6.4.5.2.3.1-2.

Table 6.4.5.2.3.1-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
NotifiedPosInfo	M	1	Representation of the LCS event notify.

Table 6.4.5.2.3.1-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful notification of the LCS event.

6.4.6 Data Model

6.4.6.1 General

This clause specifies the application data model supported by the API.

Table 6.4.6.1-1 specifies the data types defined for the Namf_Location service based interface protocol.

Table 6.4.6.1-1: Namf_Location specific Data Types

Data type	Clause defined	Description
RequestPosInfo	6.4.6.2.2	Information within Provide Positioning Information Request
ProvidePosInfo	6.4.6.2.3	Information within Provide Positioning Information Response
NotifiedPosInfo	6.4.6.2.4	Information within EventNotify notification
RequestLocInfo	6.4.6.2.5	Information within Provide Location Information Request
ProvideLocInfo	6.4.6.2.6	Information within Provide Location Information Response
CancelPosInfo	6.4.6.2.7	Information within a Cancel Location Request
LocationType	6.4.6.3.3	Information within Provide Location Response and EventNotify notification
LocationEvent	6.4.6.3.4	Information within EventNotify notification
LocationPrivacyVerResult	6.4.6.3.5	The result of location privacy verification by UE

Table 6.4.6.1-2 specifies data types re-used by the Namf_Location service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Namf_Location service based interface.

Table 6.4.6.1-2: Namf_Location re-used Data Types

Data type	Reference	Comments
Supi	3GPP TS 29.571 [6]	Subscription Permanent Identifier
Gpsi	3GPP TS 29.571 [6]	General Public Subscription Identifier
Pei	3GPP TS 29.571 [6]	Permanent Equipment Identifier
ExternalClientType	3GPP TS 29.572 [25]	LCS Client Type (Emergency, Lawful Interception …)
LocationQoS	3GPP TS 29.572 [25]	LCS QoS (accuracy, response time)
SupportedGADShapes	3GPP TS 29.572 [25]	LCS supported GAD shapes
GeographicArea	3GPP TS 29.572 [25]	Estimate of the location of the UE
AccuracyFulfilmentIndicator	3GPP TS 29.572 [25]	Requested accuracy was fulfilled or not
AgeOfLocationEstimate	3GPP TS 29.572 [25]	Age Of Location Estimate
PositioningMethodAndUsage	3GPP TS 29.572 [25]	Usage of each non-GANSS positioning method
VelocityEstimate	3GPP TS 29.572 [25]	Estimate of the velocity of the target UE
VelocityRequested	3GPP TS 29.572 [25]	Indication of the Velocity requirement
LcsPriority	3GPP TS 29.572 [25]	Priority of the LCS client
GnssPositioningMethodAndUsage	3GPP TS 29.572 [25]	Usage of each GANSS positioning method
CivicAddress	3GPP TS 29.572 [25]	Civic address
BarometricPressure	3GPP TS 29.572 [25]	Barometric Pressure
Altitude	3GPP TS 29.572 [25]	Altitude estimate of the UE
Ecgi	3GPP TS 29.571 [6]	UE EUTRAN cell information
Ncgi	3GPP TS 29.571 [6]	UE NR cell information
SupportedFeatures	3GPP TS 29.571 [6]	Supported Features
RatType	3GPP TS 29.571 [6]	RAT type
TimeZone	3GPP TS 29.571 [6]	Time Zone
DateTime	3GPP TS 29.571 [6]	Date and Time
UserLocation	3GPP TS 29.571 [6]	User Location
LcsServiceType	3GPP TS 29.572 [25]	The LCS service type
LdrType	3GPP TS 29.572 [25]	The type of LDR for deferred location
Uri	3GPP TS 29.571 [6]	URI
LdrReference	3GPP TS 29.572 [25]	LDR Reference Number for deferred location
PeriodicEventInfo	3GPP TS 29.572 [25]	Information for periodic event reporting
AreaEventInfo	3GPP TS 29.572 [25]	Information for area event reporting
MotionEventInfo	3GPP TS 29.572 [25]	Information for motion event reporting
ExternalClientIdentification	3GPP TS 29.515 [46]	External LCS client identification
NFInstanceId	3GPP TS 29.571 [6]	Identification of an NF or AF
CodeWord	3GPP TS 29.515 [46]	Codeword for a 5GC-MT-LR or deferred 5GC-MT-LR
LMFIdentification	3GPP TS 29.572 [25]	Identification of a serving LMF for periodic or triggered location
TerminationCause	3GPP TS 29.572 [25]	Termination cause for a deferred location
UePrivacyRequirements	3GPP TS 29.515 [46]	The location related privacy requirements on UE

6.4.6.2 Structured data types

6.4.6.2.1 Introduction

Structured data types used in Namf_Location service are specified in this clause.

6.4.6.2.2 Type: RequestPosInfo

Table 6.4.6.2.2-1: Definition of type RequestPosInfo

Attribute name	Data type	P	Cardinality	Description
lcsClientType	ExternalClientType	M	1	This IE shall contain the type of LCS client (Emergency, Lawful Interception etc.,.) issuing the location request
lcsLocation	LocationType	M	1	This IE shall contain the type of location measurement requested, such as current location, initial location, last known location, deferred location, etc. (NOTE 2)
supi	Supi	C	0..1	If the SUPI is available, this IE shall be present.
gpsi	Gpsi	C	0..1	If the GPSI is available, this IE shall be present.
priority	LcsPriority	O	0..1	If present, this IE shall contain the priority of the LCS client issuing the positioning request.
lcsQoS	LocationQoS	O	0..1	If present, this IE shall contain the quality of service requested, such as the accuracy of the positioning measurement and the response time of the positioning operation
velocityRequested	VelocityRequested	O	0..1	If present, this IE shall contain an indication of whether or not the Velocity of the target UE is requested.
lcsSupportedGADShapes	SupportedGADShapes	O	0..1	If present, this IE shall contain one GAD shape supported by the LCS client.
additionalSuppGADShapes	array(SupportedGADShapes)	C	1..N	Shall be absent if lcsSupportedGADShapes is absent. Shall be present if the LCS client supports more than one GAD shape.
locationNotificationUri	Uri	O	0..1	The callback URI on which location change event notification is reported.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.4.8 is supported.
oldGuami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).
pei	Pei	C	0..1	This IE shall be present if supi and gpsi are not available.
lcsServiceType	LcsServiceType	O	0..1	This IE contains the LCS service type for an external client. (NOTE 1)
ldrType	LdrType	C	0..1	This IE contains the type of LDR for a deferred location request. This IE shall be present when lcsLocation is set to "DEFERRED_LOCATION".
hgmlcCallBackURI	Uri	C	0..1	This IE contrains the callback URI of the H-GMLC for a deferred location request. This IE shall be present when lcsLocation is set to "DEFERRED_LOCATION".
ldrReference	LdrReference	C	0..1	This IE contains the LDR Reference Number for a deferred location request This IE shall be present when lcsLocation is set to "DEFERRED_LOCATION".
periodicEventInfo	PeriodicEventInfo	C	0..1	This IE contains information for periodic event reporting for a deferred location request. This IE shall be present when ldrType is set to "PERIODIC".
areaEventInfo	AreaEventInfo	C	0..1	This IE contains information for area event reporting for a deferred location request. This IE shall be present when ldrType is set to "ENTERING_INTO_AREA", "LEAVING_FROM_AREA" or "BEING_INSIDE_AREA".
motionEventInfo	MotionEventInfo	C	0..1	This IE contains information for motion event reporting for a deferred location request. This IE shall be present when ldrType is set to "MOTION".
externalClientIdentification	ExternalClientIdentification	O	0..1	This IE provides the external LCS client identification (e.g. the name of the LCS client). (NOTE 1)

afID	NfInstanceId	O	0..1	This IE provides the identification of an AF that initiated the location request. (NOTE 1)
codeWord	CodeWord	O	0..1	This IE provides a codeword for a location request which is provided by an external Client or AF and is sent to and verified by a target UE as part of privacy verification. (NOTE 1)
uePrivacyRequirements	UePrivacyRequirements	O	0..1	If present, the IE provides the indication of location related notification or verification for the target UE, the indication of codeword check in UE
NOTE 1: At least one of these IEs should be present when uePrivacyCallSessionUnrelatedClass indicates notification and/or verification for the target UE. NOTE 2: If the lcsLocation IE is set to value "NOTIFICATION_VERIFICATION_ONLY", then the lcsServiceAuthInfo attribute in the uePrivacyRequirements IE, if present, shall be set to either "NOTIFICATION_ONLY" or "NOTIFICATION_AND_VERIFICATION_ONLY".				

6.4.6.2.3 Type: ProvidePosInfo

Table 6.4.6.2.3-1: Definition of type ProvidePosInfo

Attribute name	Data type	P	Cardinality	Description
locationEstimate	GeographicArea	O	0..1	If present, this IE shall contain an estimate of the location of the UE in universal coordinates and the accuracy of the estimate.
accuracyFulfilmentIndicator	AccuracyFulfilmentIndicator	O	0..1	If present, this IE shall contain an indication of whether the requested accuracy (as indicated in the LcsQoS in the request message) was fulfilled or not.
ageOfLocationEstimate	AgeOfLocationEstimate	O	0..1	If present, this IE shall contain an indication of how long ago the location estimate was obtained.
velocityEstimate	VelocityEstimate	O	0..1	If present, this IE shall contain an estimate of the velocity of the target UE, composed by horizontal speed, vertical speed, and their respective uncertainty.
positioningDataList	array(PositioningMethodAndUsage)	O	0..9	If present, this IE shall indicate the usage of each non- GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.
gnssPositioningDataList	array(GnssPositioningMethodAndUsage)	O	0..9	If present, this IE shall indicate the usage of each GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.
ecgi	Ecgi	O	0..1	If present, this IE shall contain the current EUTRAN cell location of the target UE as delivered by the 5G-AN.
ncgi	Ncgi	O	0..1	If present, this IE shall contain the current NR cell location of the target UE as delivered by the 5G-AN.
targetServingNode	NfInstanceId	O	0..1	If present, this IE shall contain the address of the target side serving node for handover of an IMS Emergency Call.
civicAddress	CivicAddress	O	0..1	If present, this IE contains a location estimate for the target UE expressed as a Civic address.
barometricPressure	BarometricPressure	O	0..1	If present, this IE contains the barometric pressure measurement as reported by the target UE.
altitude	Altitude	O	0..1	If present, this IE indicates the altitude of the positioning estimate.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.4.8 is supported.
servingLMFIdentification	LMFIdentification	O	0..1	If present, this IE contains the identification of a serving LMF for periodic or triggered location
locationPrivacyVerResult	LocationPrivacyVerResult	O	0..1	If present, this IE contains the result of location privacy verification by UE (NOTE)
NOTE: The IE may be included to indicate the result of location privacy verification by UE to (H)GMLC when a location request with notification and privacy verification only indication is sent to the serving AMF by (H)GMLC during location request procedure.				

6.4.6.2.4 Type: NotifiedPosInfo

Table 6.4.6.2.4-1: Definition of type NotifiedPosInfo

Attribute name	Data type	P	Cardinality	Description
locationEvent	LocationEvent	M	1	This IE shall contain the type of event that caused the location procedure to be initiated.
supi	Supi	C	0..1	This IE shall contain the SUPI if available (see NOTE 1).
gpsi	Gpsi	C	0..1	This IE shall contain the GPSI if available (see NOTE 1).
pei	Pei	C	0..1	This IE shall contain the PEI if available (see NOTE 1).
locationEstimate	GeographicArea	O	0..1	If present, this IE shall contain an estimate of the location of the UE in universal coordinates and the accuracy of the estimate.
ageOfLocationEstimate	AgeOfLocationEstimate	O	0..1	If present, this IE shall contain an indication of how long ago the location estimate was obtained.
velocityEstimate	VelocityEstimate	O	0..1	If present, this IE shall contain an estimate of the velocity of the target UE, composed by horizontal speed, vertical speed, and their respective uncertainty.
positioningDataList	array(PositioningMethodAndUsage)	O	0..9	If present, this IE shall indicate the usage of each non-GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.
gnssPositioningDataList	array(GnssPositioningMethodAndUsage)	O	0..9	If present, this IE shall indicate the usage of each GANSS positioning method that was attempted to determine the location estimate, either successfully or unsuccessfully.
ecgi	Ecgi	O	0..1	If present, this IE shall contain the current EUTRAN cell location of the target UE as delivered by the 5G-AN.
ncgi	Ncgi	O	0..1	If present, this IE shall contain the current NR cell location of the target UE as delivered by the 5G-AN.
servingNode	NfInstanceId	O	0..1	If present, this IE shall contain the address of the serving node. For handover of an IMS Emergency Call, this IE shall contain the address of the target side serving node. For mobility of a UE with periodic or triggered location, this IE shall contain the address of the new serving node, if available.
civicAddress	CivicAddress	O	0..1	If present, this IE contains a location estimate for the target UE expressed as a Civic address.
barometricPressure	BarometricPressure	O	0..1	If present, this IE contains the barometric pressure measurement as reported by the target UE.
altitude	Altitude	O	0..1	If present, this IE indicates the altitude of the positioning estimate.
hgmlcCallBackURI	Uri	C	0..1	This IE contains the callback URI of the H-GMLC This IE shall be included for a locationEvent related to deferred location when the consumer NF is not the H-GMLC.
ldrReference	LdrReference	C	0..1	This IE contains an LDR Reference. This IE shall be included for a locationEvent related to deferred location.

servingLMFIdentification	LMFIdentification	C	0..1	This IE contains the identification of a serving LMF and shall be included for a locationEvent related to deferred location with periodic or triggered location if a serving LMF is used.
terminationCause	TerminationCause	C	0..1	This IE indicates a reason for termination and shall be included for a locationEvent related to deferred location if deferred location has been terminated.
NOTE 1: At least one of these IEs shall be present in the message.				

6.4.6.2.5 Type: RequestLocInfo

Table 6.4.6.2.5-1: Definition of type RequestLocInfo

Attribute name	Data type	P	Cardinality	Description
req5gsLoc	boolean	C	0..1	This IE shall be present and set to "true", if 5GS location information is requested in NPLI. When present, the IE shall be set as following: - true: the location of the UE is requested - false (default): the location of the UE is not requested
reqCurrentLoc	boolean	C	0..1	This IE may be present if 5GS location information is requested in NPLI. When present, the IE shall be set as following: - true: the current location of the UE is requested - false (default): the current location of the UE is not requested
reqRatType	boolean	C	0..1	This IE shall be present and set to "true", if the RAT Type of the UE is requested in NPLI. When present, the IE shall be set as following: - true: the RAT type of the UE is requested - false (default): the RAT type of the UE is not requested
reqTimeZone	boolean	C	0..1	This IE shall be present and set to "true, if the local timezone of the UE is requested in NPLI. When present, the IE shall be set as following: - true: the local timezone of the UE is requested - false (default): the local timezone of the UE is not requested.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.4.8 is supported.
oldGuami	Guami	C	0..1	This IE shall be present during an AMF planned removal procedure when the NF Service Consumer initiates a request towards the target AMF, for a UE associated to an AMF that is unavailable (see clause 5.21.2.2 of 3GPP TS 23.501 [2]).

6.4.6.2.6 Type: ProvideLocInfo

Table 6.4.6.2.6-1: Definition of type ProvideLocInfo

Attribute name	Data type	P	Cardinality	Description
currentLoc	boolean	C	0..1	This IE shall be present, if the 5GS location information is requested by the NF Service consumer. When present, this IE shall be set as following: - true: the current location of the UE is returned - false: the last known location of the UE is returned.
location	UserLocation	O	0..1	If present, this IE contains the location information of the UE.
geoInfo	GeographicArea	O	0..1	If present, this IE shall contain the geographical information of the UE.
locationAge	AgeOfLocationEstimate	O	0..1	If present, this IE shall contain the age of the location information.
ratType	RatType	O	0..1	If present, this IE shall contain the current RAT type of the UE.
timezone	TimeZone	O	0..1	If present, this IE shall contain the local time zone of the UE.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.4.8 is supported.

6.4.6.2.7 Type: CancelPosInfo

Table 6.4.6.2.7-1: Definition of type CancelPosInfo

Attribute name	Data type	P	Cardinality	Description
supi	Supi	M	1	SUPI
hgmlcCallBackURI	Uri	M	1	Callback URI of the H-GMLC
ldrReference	LdrReference	M	1	LDR Reference
servingLMFIdentification	LMFIdentification	C	0..1	Serving LMF identification. This IE shall be included if available.
supportedFeatures	SupportedFeatures	C	0..1	This IE shall be present if at least one optional feature defined in clause 6.4.8 is supported.

6.4.6.3 Simple data types and enumerations

6.4.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.4.6.3.2 Simple data types

The simple data types defined in table 6.4.6.3.2-1 shall be supported.

Table 6.4.6.3.2-1: Simple data types

Type Name	Type Definition	Description

6.4.6.3.3 Enumeration: LocationType

The enumeration LocationType represents the type of location measurement requested.

Table 6.4.6.3.3-1: Enumeration LocationType

Enumeration value	Description
"CURRENT_LOCATION"	
"CURRENT_OR_LAST_KNOWN_LOCATION"	
"INITIAL_LOCATION"	
"NOTIFICATION_VERIFICATION_ONLY"	This value indicates that notification or verification of location by the target UE is required but a location estimate shall not be obtained.
"DEFERRED_LOCATION"	Deferred Location Request

6.4.6.3.4 Enumeration: LocationEvent

The enumeration LocationEvent represents the type of location measurement requested.

Table 6.4.6.3.4-1: Enumeration LocationEvent

Enumeration value	Description
"EMERGENCY_CALL_ORIGINATION"	Emergency session initiation
"EMERGENCY_CALL_RELEASE"	Emergency session termination
"EMERGENCY_CALL_HANDOVER"	Handover of an Emergency session
"ACTIVATION_OF_DEFERRED_LOCATION"	Confirmation of activation of periodic or triggered location in the target UE
"UE_MOBILITY_FOR_DEFERRED_LOCATION"	Mobility of the target UE to a different NF
"CANCELLATION_OF_DEFERRED_LOCATION"	Cancellation of a deferred location request

6.4.6.3.5 Enumeration: LocationPrivacyVerResult

The enumeration LocationPrivacyVerResult represents the type of the result of location privacy verification by UE.

Table 6.4.6.3.5-1: Enumeration LocationPrivacyVerResult

Enumeration value	Description
"LOCATION_ALLOWED"	Location is allowed by UE
"LOCATION_NOT_ALLOWED"	Location is not allowed by UE
"RESPONSE_TIME_OUT"	UE response times out

6.4.7 Error Handling

6.4.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.4.7.2 Protocol Errors

Protocol Error Handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.4.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.501 [5] may also be used for the Namf_Location service, and the following application errors listed in Table 6.4.7.3-1 are specific for the Namf_Location service.

Table 6.4.7.3-1: Application errors

Application Error	HTTP status code	Description
USER_UNKNOWN	403 Forbidden	The user is unknown.
DETACHED_USER	403 Forbidden	The user is detached in the AMF.
POSITIONING_DENIED	403 Forbidden	The positioning procedure was denied.
UNSPECIFIED	403 Forbidden	The request is rejected due to unspecified reasons.
LOCATION_SESSION_UNKNOWN	403 Forbidden	The location session is unknown.
CONTEXT_NOT_FOUND	404 Not Found	The requested UE Context does not exist in the AMF.
POSITIONING_FAILED	500 Internal Server Error	The positioning procedure failed.
UNREACHABLE_USER	504 Gateway Timeout	The user could not be reached in order to perform positioning procedure.
PEER_NOT_RESPONDING	504 Gateway Timeout	No response is received from a remote peer, e.g. from the LMF.

6.4.8 Feature Negotiation

The feature negotiation mechanism specified in clause 6.6 of 3GPP TS 29.500 [4] shall be used to negotiate the optional features applicable between the AMF and the NF Service Consumer, for the Namf_Location service, if any.

The NF Service Consumer shall indicate the optional features it supports for the Namf_Location service, if any, by including the supportedFeatures attribute in payload of the HTTP Request Message for following service operations:

- ProvidePositioningInfo, as specified in clause 5.5.2.2;
- ProvideLocationInfo, as specified in clause 5.5.2.4;
- CancelLocation, as specified in clause 5.5.2.5

The AMF shall determine the supported features for the service operations as specified in clause 6.6 of 3GPP TS 29.500 [4] and shall indicate the supported features by including the supportedFeatures attribute in payload of the HTTP response for the service operation.

The syntax of the supportedFeatures attribute is defined in clause 5.2.2 of 3GPP TS 29.571 [6].

The following features are defined for the Namf_Location service.

Table 6.1.8-1: Features of supportedFeatures attribute used by Namf_Location service

Feature Number	Feature	M/O	Description
Feature number: The order number of the feature within the supportedFeatures attribute (starting with 1). Feature: A short name that can be used to refer to the bit and to the feature. M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O"). Description: A clear textual description of the feature.			

6.4.9 Security

As indicated in 3GPP TS 33.501 [27], the access to the Namf_Location API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [28]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [29]) plays the role of the authorization server.

If Oauth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Namf_Location API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [29], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Namf_Location service.

The Namf_Location API defines scopes for OAuth2 authorization as specified in 3GPP TS 33.501 [27]; it defines a single scope consisting on the name of the service (i.e., "namf-loc"), and it does not define any additional scopes at resource or operation level.

Annex A (normative): OpenAPI specification

A.1 General

This Annex specifies the API definition of the service provided by AMF in this document. The APIs are defined by OpenAPI 3.0.0 specifications in YAML format, following guidelines in 3GPP TS 29.501 [5].

The APIs for specified for following services:

- Namf_Communication Service
- Namf_EventExposure Service
- Namf_MT Service
- Namf_Location Service

This Annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE : The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository hosted in ETSI Forge, that uses the GitLab software version control system (see 3GPP TS 29.501 [5] clause 5.3.1 and 3GPP TR 21.900 [7] clause 5B).

A.2 Namf_Communication API

```
openapi: 3.0.0
info:
  version: 1.1.1
  title: Namf_Communication
  description: |
    AMF Communication Service
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
security:
  - {}
  - oAuth2ClientCredentials:
      - namf-comm
externalDocs:
  description: 3GPP TS 29.518 V16.5.0; 5G System; Access and Mobility Management Services
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.518/'
servers:
  - url: '{apiRoot}/namf-comm/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause clause 4.4 of 3GPP TS 29.501
paths:
  /ue-contexts/{ueContextId}:
    put:
      summary: Namf_Communication CreateUEContext service Operation
      tags:
        - Individual ueContext (Document)
      operationId: CreateUEContext
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
```

```
            pattern: '^(5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}|imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-
.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
        content:
          multipart/related:  # message with binary body part(s)
            schema:
              type: object
              properties: # Request parts
                jsonData:
                  $ref: '#/components/schemas/UeContextCreateData'
                binaryDataN2Information:
                  type: string
                  format: binary
                binaryDataN2InformationExt1:
                  type: string
                  format: binary
                binaryDataN2InformationExt2:
                  type: string
                  format: binary
                binaryDataN2InformationExt3:
                  type: string
                  format: binary
                binaryDataN2InformationExt4:
                  type: string
                  format: binary
                binaryDataN2InformationExt5:
                  type: string
                  format: binary
                binaryDataN2InformationExt6:
                  type: string
                  format: binary
                binaryDataN2InformationExt7:
                  type: string
                  format: binary
                binaryDataN2InformationExt8:
                  type: string
                  format: binary
                binaryDataN2InformationExt9:
                  type: string
                  format: binary
                binaryDataN2InformationExt10:
                  type: string
                  format: binary
                binaryDataN2InformationExt11:
                  type: string
                  format: binary
                binaryDataN2InformationExt12:
                  type: string
                  format: binary
                binaryDataN2InformationExt13:
                  type: string
                  format: binary
                binaryDataN2InformationExt14:
                  type: string
                  format: binary
                binaryDataN2InformationExt15:
                  type: string
                  format: binary
                binaryDataN2InformationExt16:
                  type: string
                  format: binary
            encoding:
              jsonData:
                contentType:  application/json
              binaryDataN2Information:
                contentType:  application/vnd.3gpp.ngap
                headers:
                  Content-Id:
                    schema:
                      type: string
              binaryDataN2InformationExt1:
                contentType:  application/vnd.3gpp.ngap
                headers:
                  Content-Id:
                    schema:
                      type: string
              binaryDataN2InformationExt2:
                contentType:  application/vnd.3gpp.ngap
```

```
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt3:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt4:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt5:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt6:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt7:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt8:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt9:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt10:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt11:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt12:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt13:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt14:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt15:
  contentType:  application/vnd.3gpp.ngap
```

```
              headers:
                Content-Id:
                  schema:
                    type: string
            binaryDataN2InformationExt16:
              contentType:  application/vnd.3gpp.ngap
              headers:
                Content-Id:
                  schema:
                    type: string
      required: true
    callbacks:
      onN2MessageNotify:
        '{$request.body#/n2NotifyUri}':
         post:
           summary: Namf_Communication N2 Info Notify (UE Specific) service Operation
           tags:
             - N2 Info Notify
           operationId: N2InfoNotify
           requestBody:
             description: UE Specific N2 Information Notification
             content:
               application/json:
                 schema:
                   $ref: '#/components/schemas/N2InformationNotification'
           responses:
             '200':
               description: N2 Information Notification Response.
               content:
                 application/json:
                   schema:
                     $ref: '#/components/schemas/N2InfoNotificationRspData'
                 multipart/related:  # message with binary body part(s)
                   schema:
                     type: object
                     properties: # Request parts
                       jsonData:
                         $ref: '#/components/schemas/N2InfoNotificationRspData'
                       binaryDataN2Information:
                         type: string
                         format: binary
                   encoding:
                     jsonData:
                       contentType:  application/json
                     binaryDataN2Information:
                       contentType:  application/vnd.3gpp.ngap
                       headers:
                         Content-Id:
                           schema:
                             type: string
             '204':
               description: Expected response to a successful callback processing
             '400':
               $ref: 'TS29571_CommonData.yaml#/components/responses/400'
             '403':
               $ref: 'TS29571_CommonData.yaml#/components/responses/403'
             '411':
               $ref: 'TS29571_CommonData.yaml#/components/responses/411'
             '413':
               $ref: 'TS29571_CommonData.yaml#/components/responses/413'
             '415':
               $ref: 'TS29571_CommonData.yaml#/components/responses/415'
             '429':
               $ref: 'TS29571_CommonData.yaml#/components/responses/429'
             '500':
               $ref: 'TS29571_CommonData.yaml#/components/responses/500'
             '503':
               $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    responses:
      '201':
        description: UE context successfully created.
        headers:
          Location:
            description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/namf-comm/<apiVersion>/ue-contexts/{ueContextId}'
            required: true
            schema:
              type: string
```

```
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UeContextCreatedData'
          multipart/related:  # message with binary body part(s)
            schema:
              type: object
              properties: # Request parts
                jsonData:
                  $ref: '#/components/schemas/UeContextCreatedData'
                binaryDataN2Information:
                  type: string
                  format: binary
                binaryDataN2InformationExt1:
                  type: string
                  format: binary
                binaryDataN2InformationExt2:
                  type: string
                  format: binary
                binaryDataN2InformationExt3:
                  type: string
                  format: binary
                binaryDataN2InformationExt4:
                  type: string
                  format: binary
                binaryDataN2InformationExt5:
                  type: string
                  format: binary
                binaryDataN2InformationExt6:
                  type: string
                  format: binary
                binaryDataN2InformationExt7:
                  type: string
                  format: binary
                binaryDataN2InformationExt8:
                  type: string
                  format: binary
                binaryDataN2InformationExt9:
                  type: string
                  format: binary
                binaryDataN2InformationExt10:
                  type: string
                  format: binary
                binaryDataN2InformationExt11:
                  type: string
                  format: binary
                binaryDataN2InformationExt12:
                  type: string
                  format: binary
                binaryDataN2InformationExt13:
                  type: string
                  format: binary
                binaryDataN2InformationExt14:
                  type: string
                  format: binary
                binaryDataN2InformationExt15:
                  type: string
                  format: binary
            encoding:
              jsonData:
                contentType:  application/json
              binaryDataN2Information:
                contentType:  application/vnd.3gpp.ngap
                headers:
                  Content-Id:
                    schema:
                      type: string
              binaryDataN2InformationExt1:
                contentType:  application/vnd.3gpp.ngap
                headers:
                  Content-Id:
                    schema:
                      type: string
              binaryDataN2InformationExt2:
                contentType:  application/vnd.3gpp.ngap
                headers:
                  Content-Id:
                    schema:
```

```
        type: string
binaryDataN2InformationExt3:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt4:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt5:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt6:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt7:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt8:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt9:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt10:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt11:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt12:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt13:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt14:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
        type: string
binaryDataN2InformationExt15:
  contentType:  application/vnd.3gpp.ngap
  headers:
    Content-Id:
      schema:
```

```
                    type: string
        '400':
          description: Bad Request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeContextCreateError'
        '403':
          description: Forbidden
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeContextCreateError'
            multipart/related:  # message with binary body part(s)
              schema:
                type: object
                properties: # Response parts
                  jsonData:
                    $ref: '#/components/schemas/UeContextCreateError'
                  binaryDataN2Information:
                    type: string
                    format: binary
              encoding:
                jsonData:
                  contentType:  application/json
                binaryDataN2Information:
                  contentType:  application/vnd.3gpp.ngap
                  headers:
                    Content-Id:
                      schema:
                        type: string
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          description: Internal Server Error
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeContextCreateError'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
  /ue-contexts/{ueContextId}/release:
    post:
      summary: Namf_Communication ReleaseUEContext service Operation
      tags:
        - Individual ueContext (Document)
      operationId: ReleaseUEContext
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}|imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-
.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UEContextRelease'
        required: true
      responses:
        '204':
          description: UE Context successfully released
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
  /ue-contexts/{ueContextId}/assign-ebi:
    post:
      summary: Namf_Communication EBI Assignment service Operation
      tags:
        - Individual ueContext (Document)
      operationId: EBIAssignment
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}|imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-
.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AssignEbiData'
        required: true
      responses:
        '200':
          description: EBI Assignment successfully performed.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AssignedEbiData'
        '400':
          description: Bad Request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AssignEbiError'
        '403':
          description: Forbidden
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AssignEbiError'
        '409':
          description: Conflict
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AssignEbiError'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          description: Internal Server Error
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AssignEbiError'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
```

```
          description: Unexpected error
  /ue-contexts/{ueContextId}/transfer:
    post:
      summary: Namf_Communication UEContextTransfer service Operation
      tags:
        - Individual ueContext (Document)
      operationId: UEContextTransfer
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}|imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-
.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UeContextTransferReqData'
          multipart/related:  # message with binary body part(s)
            schema:
              type: object
              properties: # Request parts
                jsonData:
                  $ref: '#/components/schemas/UeContextTransferReqData'
                binaryDataN1Message:
                  type: string
                  format: binary
            encoding:
              jsonData:
                contentType:  application/json
              binaryDataN1Message:
                contentType:  application/vnd.3gpp.5gnas
                headers:
                  Content-Id:
                    schema:
                      type: string
        required: true
      responses:
        '200':
          description: UE context transfer successfully initiated.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeContextTransferRspData'
            multipart/related:  # message with binary body part(s)
              schema:
                type: object
                properties: # Request parts
                  jsonData:
                    $ref: '#/components/schemas/UeContextTransferRspData'
                  binaryDataN2Information:
                    type: string
                    format: binary
                  binaryDataN2InformationExt1:
                    type: string
                    format: binary
              encoding:
                jsonData:
                  contentType:  application/json
                binaryDataN2Information:
                  contentType:  application/vnd.3gpp.ngap
                  headers:
                    Content-Id:
                      schema:
                        type: string
                binaryDataN2InformationExt1:
                  contentType:  application/vnd.3gpp.ngap
                  headers:
                    Content-Id:
                      schema:
                        type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
```

```
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
  /ue-contexts/{ueContextId}/transfer-update:
    post:
      summary: Namf_Communication RegistrationStatusUpdate service Operation
      tags:
        - Individual ueContext (Document)
      operationId: RegistrationStatusUpdate
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}|imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-
.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UeRegStatusUpdateReqData'
        required: true
      responses:
        '200':
          description: UE context transfer status successfully updated.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeRegStatusUpdateRspData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  /ue-contexts/{ueContextId}/n1-n2-messages:
    post:
      summary: Namf_Communication N1N2 Message Transfer (UE Specific) service Operation
      tags:
        - n1N2Message collection (Document)
      operationId: N1N2MessageTransfer
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
```

```
            pattern: '^(imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-.+|imei-[0-9]{15}|imeisv-[0-9]{16}|cid-
.{1,255}|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/N1N2MessageTransferReqData'
          multipart/related:  # message with binary body part(s)
            schema:
              type: object
              properties: # Request parts
                jsonData:
                  $ref: '#/components/schemas/N1N2MessageTransferReqData'
                binaryDataN1Message:
                  type: string
                  format: binary
                binaryDataN2Information:
                  type: string
                  format: binary
                binaryMtData:
                  type: string
                  format: binary
            encoding:
              jsonData:
                contentType:  application/json
              binaryDataN1Message:
                contentType:  application/vnd.3gpp.5gnas
                headers:
                  Content-Id:
                    schema:
                      type: string
              binaryDataN2Information:
                contentType:  application/vnd.3gpp.ngap
                headers:
                  Content-Id:
                    schema:
                      type: string
              binaryMtData:
                contentType:  application/vnd.3gpp.5gnas
                headers:
                  Content-Id:
                    schema:
                      type: string
        required: true
      responses:
        '202':
          description: N1N2 Message Transfer accepted.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/N1N2MessageTransferRspData'
          headers:
            Location:
              description: 'The URI of the resource located on the AMF to which the status of the
N1N2 message transfer is held'
              required: true
              schema:
                type: string
        '200':
          description: N1N2 Message Transfer successfully initiated.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/N1N2MessageTransferRspData'
        '307':
          description: Temporary Redirect
          content:
            application/problem+json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
          headers:
            Location:
              description: 'The URI of the resource located on the target NF Service Consumer (e.g.
AMF) to which the request is redirected'
              required: true
              schema:
                type: string
        '400':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '409':
          description: Conflicts
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/N1N2MessageTransferError'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        '504':
          description: Gateway Timeout
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/N1N2MessageTransferError'
      default:
        description: Unexpected error
    callbacks:
      onN1N2TransferFailure:
        '{$request.body#/n1n2FailureTxfNotifURI}':
          post:
            summary: Namf_Communication N1N2Transfer Failure Notification service Operation
            tags:
              - N1N2 Transfer Failure Notification
            operationId: N1N2TransferFailureNotification
            requestBody:
              description: N1N2Transfer Failure Notification
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/N1N2MsgTxfrFailureNotification'
            responses:
              '204':
                description: Expected response to a successful callback processing
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  /ue-contexts/{ueContextId}/n1-n2-messages/subscriptions:
    post:
      summary: Namf_Communication N1N2 Message Subscribe (UE Specific) service Operation
      tags:
        - N1N2 Subscriptions Collection for Individual UE Contexts (Document)
      operationId: N1N2MessageSubscribe
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}|imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-
.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
```

```
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UeN1N2InfoSubscriptionCreateData'
        required: true
      responses:
        '201':
          description: N1N2 Message Subscription successfully created.
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/namf-comm/<apiVersion>/{ueContextId}/ue-contexts/n1-n2-
messages/subscriptions/{subscriptionId}'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeN1N2InfoSubscriptionCreatedData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
      callbacks:
        onN1N2MessageNotify:
          '{$request.body#/n1NotifyCallbackUri}':
            post:
              summary: Namf_Communication N1 Message Notify service Operation
              tags:
                - N1 Message Notify
              operationId: N1MessageNotify
              requestBody:
                description: N1 Message Notification
                content:
                  multipart/related:  # message with binary body part(s)
                    schema:
                      type: object
                      properties: # Request parts
                        jsonData:
                          $ref: '#/components/schemas/N1MessageNotification'
                        binaryDataN1Message:
                          type: string
                          format: binary
                    encoding:
                      jsonData:
                        contentType:  application/json
                      binaryDataN1Message:
                        contentType:  application/vnd.3gpp.5gnas
                        headers:
                          Content-Id:
                            schema:
                              type: string
              responses:
                '204':
                  description: Expected response to a successful callback processing
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '403':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
                '411':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
```

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                '429':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
            '{$request.body#/n2NotifyCallbackUri}':
              post:
                summary: Namf_Communication N2 Info Notify (UE Specific) service Operation
                tags:
                  - N2 Info Notify
                operationId: N2InfoNotify
                requestBody:
                  description: UE Specific N2 Information Notification
                  content:
                    multipart/related:  # message with binary body part(s)
                      schema:
                        type: object
                        properties: # Request parts
                          jsonData:
                            $ref: '#/components/schemas/N2InformationNotification'
                          binaryDataN1Message:
                            type: string
                            format: binary
                          binaryDataN2Information:
                            type: string
                            format: binary
                      encoding:
                        jsonData:
                          contentType:  application/json
                        binaryDataN1Message:
                          contentType:  application/vnd.3gpp.5gnas
                          headers:
                            Content-Id:
                              schema:
                                type: string
                        binaryDataN2Information:
                          contentType:  application/vnd.3gpp.ngap
                          headers:
                            Content-Id:
                              schema:
                                type: string
                responses:
                  '204':
                    description: Expected response to a successful callback processing
                  '400':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                  '411':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/411'
                  '413':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
                  '415':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
                  '429':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
                  '500':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
                  '503':
                    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  /ue-contexts/{ueContextId}/n1-n2-messages/subscriptions/{subscriptionId}:
    delete:
      summary: Namf_Communication N1N2 Message UnSubscribe (UE Specific) service Operation
      tags:
        - N1N2 Individual Subscription (Document)
      operationId: N1N2MessageUnSubscribe
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(5g-guti-[0-9]{5,6}[0-9a-fA-F]{14}|imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-
.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
        - name: subscriptionId
          in: path
          description: Subscription Identifier
          required: true
```

```
        schema:
          type: string
    responses:
      '204':
        description: N1N2 Message Subscription successfully removed.
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
/non-ue-n2-messages/transfer:
  post:
    summary: Namf_Communication Non UE N2 Message Transfer service Operation
    tags:
      - Non UE N2Messages collection (Document)
    operationId: NonUeN2MessageTransfer
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/N2InformationTransferReqData'
        multipart/related:  # message with binary body part(s)
          schema:
            type: object
            properties: # Request parts
              jsonData:
                $ref: '#/components/schemas/N2InformationTransferReqData'
              binaryDataN2Information:
                type: string
                format: binary
          encoding:
            jsonData:
              contentType:  application/json
            binaryDataN2Information:
              contentType:  application/vnd.3gpp.ngap
              headers:
                Content-Id:
                  schema:
                    type: string
      required: true
    responses:
      '200':
        description: Non UE N2 Message Transfer successfully initiated.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/N2InformationTransferRspData'
      '400':
        description: Bad Request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/N2InformationTransferError'
      '403':
        description: Forbidden
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/N2InformationTransferError'
      '404':
        description: Not Found
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/N2InformationTransferError'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
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        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          description: Internal Server Error
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/N2InformationTransferError'
        '503':
          description: Service Unavailable
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/N2InformationTransferError'
        default:
          description: Unexpected error
  /non-ue-n2-messages/subscriptions:
    post:
      summary: Namf_Communication Non UE N2 Info Subscribe service Operation
      tags:
        - Non UE N2Messages Subscriptions collection (Document)
      operationId: NonUeN2InfoSubscribe
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NonUeN2InfoSubscriptionCreateData'
        required: true
      responses:
        '201':
          description: Non UE N2 Info Subscription successfully created.
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/namf-comm/<apiVersion>/non-ue-n2-
messages/subscriptions/{n2NotifySubscriptionId}'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NonUeN2InfoSubscriptionCreatedData'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
      callbacks:
        onN2InfoNotify:
          '{$request.body#/n2NotifyCallbackUri}':
            post:
              summary: Namf_Communication Non UE N2 Info Notify service Operation
              tags:
                - Non UE N2 Info Notify
              operationId: NonUeN2InfoNotify
              requestBody:
                description: Non UE N2 Information Notification
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/N2InformationNotification'
                  multipart/related:  # message with binary body part(s)
```

```
                  schema:
                    type: object
                    properties: # Request parts
                      jsonData:
                        $ref: '#/components/schemas/N2InformationNotification'
                      binaryDataN2Information:
                        type: string
                        format: binary
                  encoding:
                    jsonData:
                      contentType:  application/json
                    binaryDataN2Information:
                      contentType:  application/vnd.3gpp.ngap
                      headers:
                        Content-Id:
                          schema:
                            type: string
            responses:
              '204':
                description: Expected response to a successful callback processing
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  /non-ue-n2-messages/subscriptions/{n2NotifySubscriptionId}:
    delete:
      summary: Namf_Communication Non UE N2 Info UnSubscribe service Operation
      tags:
        - Non UE N2 Message Notification Individual Subscription (Document)
      operationId: NonUeN2InfoUnSubscribe
      parameters:
        - name: n2NotifySubscriptionId
          in: path
          description: N2 info Subscription Identifier
          required: true
          schema:
            type: string
      responses:
        '204':
          description: Non UE N2 INfo Subscription successfully removed.
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  /subscriptions:
    post:
      summary: Namf_Communication AMF Status Change Subscribe service Operation
      tags:
        - subscriptions collection (Document)
      operationId: AMFStatusChangeSubscribe
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SubscriptionData'
        required: true
      responses:
        '201':
          description: N1N2 Message Subscription successfully created.
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/namf-comm/<apiVersion>/subscriptions/{subscriptionId}'
              required: true
```

```
            schema:
              type: string
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SubscriptionData'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
    callbacks:
      onAmfStatusChange:
        '{$request.body#/amfStatusUri}':
          post:
            summary: Amf Status Change Notify service Operation
            tags:
              - Amf Status Change Notify
            operationId: AmfStatusChangeNotify
            requestBody:
              description: Amf Status Change Notification
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/AmfStatusChangeNotification'
            responses:
              '204':
                description: Expected response to a successful callback processing
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  /subscriptions/{subscriptionId}:
    delete:
      summary: Namf_Communication AMF Status Change UnSubscribe service Operation
      tags:
        - individual subscription (Document)
      operationId: AMFStatusChangeUnSubscribe
      parameters:
        - name: subscriptionId
          in: path
          description: AMF Status Change Subscription Identifier
          required: true
          schema:
            type: string
      responses:
        '204':
          description: N1N2 Message Subscription successfully removed.
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
```

```
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
  put:
    summary: Namf_Communication AMF Status Change Subscribe Modify service Operation
    tags:
      - individual subscription (Document)
    operationId: AMFStatusChangeSubscribeModfy
    parameters:
      - name: subscriptionId
        in: path
        description: AMF Status Change Subscription Identifier
        required: true
        schema:
          type: string
    requestBody:
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SubscriptionData'
      required: true
    responses:
      '202':
        description: N1N2 Message Subscription successfully updated.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SubscriptionData'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
    callbacks:
      OnAmfStatusChange:
        '{$request.body#/amfStatusUri}':
          post:
            summary: Amf Status Change Notify service Operation
            tags:
              - Amf Status Change Notify
            operationId: AmfStatusChangeNOtify
            requestBody:
              description: Amf Status Change Notification
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/AmfStatusChangeNotification'
            responses:
              '204':
                description: Expected response to a successful callback processing
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
```

```
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            namf-comm: Access to the Namf_Communication API
  schemas:
#
# STRUCTURED DATA TYPES
#
    SubscriptionData:
      type: object
      properties:
        amfStatusUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        guamiList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
          minItems: 1
      required:
        - amfStatusUri
    AmfStatusChangeNotification:
      type: object
      properties:
        amfStatusInfoList:
          type: array
          items:
            $ref: '#/components/schemas/AmfStatusInfo'
          minItems: 1
      required:
        - amfStatusInfoList
    AmfStatusInfo:
      type: object
      properties:
        guamiList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
          minItems: 1
        statusChange:
          $ref: '#/components/schemas/StatusChange'
        targetAmfRemoval:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AmfName'
        targetAmfFailure:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AmfName'
      required:
        - guamiList
        - statusChange
    AssignEbiData:
      type: object
      properties:
        pduSessionId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
        arpList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Arp'
          minItems: 1
        releasedEbiList:
          type: array
          items:
            $ref: '#/components/schemas/EpsBearerId'
          minItems: 1
        oldGuami:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
      required:
        - pduSessionId
    AssignedEbiData:
      type: object
```

```
    properties:
      pduSessionId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
      assignedEbiList:
        type: array
        items:
          $ref: 'TS29502_Nsmf_PDUSession.yaml#/components/schemas/EbiArpMapping'
        minItems: 0
      failedArpList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Arp'
        minItems: 1
      releasedEbiList:
        type: array
        items:
          $ref: '#/components/schemas/EpsBearerId'
        minItems: 1
    required:
      - pduSessionId
      - assignedEbiList
  AssignEbiFailed:
    type: object
    properties:
      pduSessionId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
      failedArpList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Arp'
        minItems: 1
    required:
      - pduSessionId
  UEContextRelease:
    type: object
    properties:
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      unauthenticatedSupi:
        type: boolean
        default: false
      ngapCause:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NgApCause'
    required:
      - ngapCause
  N2InformationTransferReqData:
    type: object
    properties:
      taiList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Tai'
        minItems: 1
      ratSelector:
        $ref: '#/components/schemas/RatSelector'
      globalRanNodeList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
        minItems: 1
      n2Information:
        $ref: '#/components/schemas/N2InfoContainer'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - n2Information
  NonUeN2InfoSubscriptionCreateData:
    type: object
    properties:
      globalRanNodeList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
        minItems: 1
      anTypeList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
```

```
        minItems: 1
      n2InformationClass:
        $ref: '#/components/schemas/N2InformationClass'
      n2NotifyCallbackUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      nfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - n2InformationClass
      - n2NotifyCallbackUri
  NonUeN2InfoSubscriptionCreatedData:
    type: object
    properties:
      n2NotifySubscriptionId:
        type: string
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      n2InformationClass:
        $ref: '#/components/schemas/N2InformationClass'
    required:
      - n2NotifySubscriptionId
  UeN1N2InfoSubscriptionCreateData:
    type: object
    properties:
      n2InformationClass:
        $ref: '#/components/schemas/N2InformationClass'
      n2NotifyCallbackUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      n1MessageClass:
        $ref: '#/components/schemas/N1MessageClass'
      n1NotifyCallbackUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      nfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      oldGuami:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
  UeN1N2InfoSubscriptionCreatedData:
    type: object
    properties:
      n1n2NotifySubscriptionId:
        type: string
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - n1n2NotifySubscriptionId
  N2InformationNotification:
    type: object
    properties:
      n2NotifySubscriptionId:
        type: string
      n2InfoContainer:
        $ref: '#/components/schemas/N2InfoContainer'
      toReleaseSessionList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
        minItems: 1
      lcsCorrelationId:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CorrelationID'
      notifyReason:
        $ref: '#/components/schemas/N2InfoNotifyReason'
      smfChangeInfoList:
        type: array
        items:
          $ref: '#/components/schemas/SmfChangeInfo'
        minItems: 1
      ranNodeId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
      initialAmfName:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AmfName'
      anN2IPv4Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      anN2IPv6Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
```

```
      guami:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
      notifySourceNgRan:
        type: boolean
        default: false
    required:
      - n2NotifySubscriptionId
  N2InfoContainer:
    type: object
    properties:
      n2InformationClass:
        $ref: '#/components/schemas/N2InformationClass'
      smInfo:
        $ref: '#/components/schemas/N2SmInformation'
      ranInfo:
        $ref: '#/components/schemas/N2RanInformation'
      nrppaInfo:
        $ref: '#/components/schemas/NrppaInformation'
      pwsInfo:
        $ref: '#/components/schemas/PwsInformation'
      v2xInfo:
        $ref: '#/components/schemas/V2xInformation'
    required:
      - n2InformationClass
  N1MessageNotification:
    type: object
    properties:
      n1NotifySubscriptionId:
        type: string
      n1MessageContainer:
        $ref: '#/components/schemas/N1MessageContainer'
      lcsCorrelationId:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CorrelationID'
      registrationCtxtContainer:
        $ref: '#/components/schemas/RegistrationContextContainer'
      newLmfIdentification:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
      guami:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
      cIoT5GSOptimisation:
        type: boolean
        default: false
    required:
      - n1MessageContainer
  N1MessageContainer:
    type: object
    properties:
      n1MessageClass:
        $ref: '#/components/schemas/N1MessageClass'
      n1MessageContent:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RefToBinaryData'
      nfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      serviceInstanceId:
        type: string
    required:
      - n1MessageClass
      - n1MessageContent
  N1N2MessageTransferReqData:
    type: object
    properties:
      n1MessageContainer:
        $ref: '#/components/schemas/N1MessageContainer'
      n2InfoContainer:
        $ref: '#/components/schemas/N2InfoContainer'
      mtData:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RefToBinaryData'
      skipInd:
        type: boolean
        default: false
      lastMsgIndication:
        type: boolean
      pduSessionId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
      lcsCorrelationId:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CorrelationID'
      ppi:
        $ref: '#/components/schemas/Ppi'
```

```
      arp:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Arp'
      5qi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/5Qi'
      n1n2FailureTxfNotifURI:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      smfReallocationInd:
        type: boolean
        default: false
      areaOfValidity:
        $ref: '#/components/schemas/AreaOfValidity'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      oldGuami:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
      maAcceptedInd:
        type: boolean
        default: false
      extBufSupport:
        type: boolean
        default: false
      targetAccess:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'

    N1N2MessageTransferRspData:
      type: object
      properties:
        cause:
          $ref: '#/components/schemas/N1N2MessageTransferCause'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - cause
    RegistrationContextContainer:
      type: object
      properties:
        ueContext:
          $ref: '#/components/schemas/UeContext'
        localTimeZone:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/TimeZone'
        anType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
        anN2ApId:
          type: integer
        ranNodeId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
        initialAmfName:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AmfName'
        userLocation:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
        rrcEstCause:
          type: string
          pattern: '^[0-9a-fA-F]+$'
        ueContextRequest:
          type: boolean
          default:  false
        initialAmfN2ApId:
          type: integer
        anN2IPv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        anN2IPv6Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        allowedNssai:
          $ref: 'TS29531_Nnssf_NSSelection.yaml#/components/schemas/AllowedNssai'
        configuredNssai:
          type: array
          items:
            $ref: 'TS29531_Nnssf_NSSelection.yaml#/components/schemas/ConfiguredSnssai'
          minItems: 1
        rejectedNssaiInPlmn:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
          minItems: 1
        rejectedNssaiInTa:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
```

```
        minItems: 1
    required:
      - ueContext
      - anType
      - anN2ApId
      - ranNodeId
      - initialAmfName
      - userLocation
  AreaOfValidity:
    type: object
    properties:
      taiList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Tai'
        minItems: 0
    required:
      - taiList
  UeContextTransferReqData:
    type: object
    properties:
      reason:
        $ref: '#/components/schemas/TransferReason'
      accessType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
      plmnId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      regRequest:
        $ref: '#/components/schemas/N1MessageContainer'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - reason
      - accessType
  UeContextTransferRspData:
    type: object
    properties:
      ueContext:
        $ref: '#/components/schemas/UeContext'
      ueRadioCapability:
        $ref: '#/components/schemas/N2InfoContent'
      ueNbiotRadioCapability:
        $ref: '#/components/schemas/N2InfoContent'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - ueContext
  UeContext:
    type: object
    properties:
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      supiUnauthInd:
        type: boolean
      gpsiList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        minItems: 1
      pei:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
      udmGroupId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfGroupId'
      ausfGroupId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfGroupId'
      pcfGroupId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfGroupId'
      routingIndicator:
        type: string
      groupList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        minItems: 1
      drxParameter:
        $ref: '#/components/schemas/DrxParameter'
      subRfsp:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RfspIndex'
```

```
usedRfsp:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/RfspIndex'
subUeAmbr:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/Ambr'
smsfId:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
seafData:
  $ref: '#/components/schemas/SeafData'
5gMmCapability:
  $ref: '#/components/schemas/5GMmCapability'
pcfId:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
pcfSetId:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
pcfAmpServiceSetId:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/NfServiceSetId'
pcfUepServiceSetId:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/NfServiceSetId'
pcfBinding:
  $ref: '#/components/schemas/SbiBindingLevel'
pcfAmPolicyUri:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
amPolicyReqTriggerList:
  type: array
  items:
    $ref: '#/components/schemas/PolicyReqTrigger'
  minItems: 1
pcfUePolicyUri:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
uePolicyReqTriggerList:
  type: array
  items:
    $ref: '#/components/schemas/PolicyReqTrigger'
  minItems: 1
hpcfId:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
restrictedRatList:
  type: array
  items:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
  minItems: 1
forbiddenAreaList:
  type: array
  items:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Area'
  minItems: 1
serviceAreaRestriction:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/ServiceAreaRestriction'
restrictedCoreNwTypeList:
  type: array
  items:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/CoreNetworkType'
  minItems: 1
eventSubscriptionList:
  type: array
  items:
    $ref: 'TS29518_Namf_EventExposure.yaml#/components/schemas/AmfEventSubscription'
  minItems: 1
mmContextList:
  type: array
  items:
    $ref: '#/components/schemas/MmContext'
  minItems: 1
  maxItems: 2
sessionContextList:
  type: array
  items:
    $ref: '#/components/schemas/PduSessionContext'
  minItems: 1
traceData:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/TraceData'
serviceGapExpiryTime:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
stnSr:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/StnSr'
cMsisdn:
  $ref: 'TS29571_CommonData.yaml#/components/schemas/CMsisdn'
msClassmark2:
```

```
        $ref: '#/components/schemas/MSClassmark2'
      supportedCodecList:
        type: array
        items:
          $ref: '#/components/schemas/SupportedCodec'
        minItems: 1
      smallDataRateStatusInfos:
        type: array
        items:
          $ref: '#/components/schemas/SmallDataRateStatusInfo'
        minItems: 1
      restrictedPrimaryRatList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
        minItems: 1
      restrictedSecondaryRatList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
        minItems: 1
      v2xContext:
        $ref: '#/components/schemas/V2xContext'
      lteCatMInd:
        type: boolean
        default: false
      moExpDataCounter:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/MoExpDataCounter'
      cagData:
        $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/CagData'
      managementMdtInd:
        type: boolean
        default: false
      immediateMdtConf:
        $ref: '#/components/schemas/ImmediateMdtConf'
  N2SmInformation:
    type: object
    properties:
      pduSessionId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
      n2InfoContent:
        $ref: '#/components/schemas/N2InfoContent'
      sNssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      homePlmnSnssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      subjectToHo:
        type: boolean
    required:
      - pduSessionId
  N2InfoContent:
    type: object
    properties:
      ngapMessageType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      ngapIeType:
        $ref: '#/components/schemas/NgapIeType'
      ngapData:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RefToBinaryData'
    required:
      - ngapData
  NrppaInformation:
    type: object
    properties:
      nfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      nrppaPdu:
        $ref: '#/components/schemas/N2InfoContent'
      serviceInstanceId:
        type: string
    required:
      - nfId
      - nrppaPdu
  PwsInformation:
    type: object
    properties:
      messageIdentifier:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint16'
```

```
      serialNumber:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint16'
      pwsContainer:
        $ref: '#/components/schemas/N2InfoContent'
      bcEmptyAreaList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
        minItems: 1
      sendRanResponse:
        type: boolean
        default: false
      omcId:
        $ref: '#/components/schemas/OmcIdentifier'
    required:
      - messageIdentifier
      - serialNumber
      - pwsContainer
  N1N2MsgTxfrFailureNotification:
    type: object
    properties:
      cause:
        $ref: '#/components/schemas/N1N2MessageTransferCause'
      n1n2MsgDataUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    required:
      - cause
      - n1n2MsgDataUri
  N1N2MessageTransferError:
    type: object
    properties:
      error:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      errInfo:
        $ref: '#/components/schemas/N1N2MsgTxfrErrDetail'
    required:
      - error
  N1N2MsgTxfrErrDetail:
    type: object
    properties:
      retryAfter:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      highestPrioArp:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Arp'
      maxWaitingTime:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
  N2InformationTransferRspData:
    type: object
    properties:
      result:
        $ref: '#/components/schemas/N2InformationTransferResult'
      pwsRspData:
        $ref: '#/components/schemas/PWSResponseData'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - result
  MmContext:
    type: object
    properties:
      accessType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
      nasSecurityMode:
        $ref: '#/components/schemas/NasSecurityMode'
      epsNasSecurityMode:
        $ref: '#/components/schemas/EpsNasSecurityMode'
      nasDownlinkCount:
        $ref: '#/components/schemas/NasCount'
      nasUplinkCount:
        $ref: '#/components/schemas/NasCount'
      ueSecurityCapability:
        $ref: '#/components/schemas/UeSecurityCapability'
      s1UeNetworkCapability:
        $ref: '#/components/schemas/S1UeNetworkCapability'
      allowedNssai:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
```

```
        minItems: 1
      nssaiMappingList:
        type: array
        items:
          $ref: '#/components/schemas/NssaiMapping'
        minItems: 1
      allowedHomeNssai:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        minItems: 1
      nsInstanceList:
        type: array
        items:
          $ref: 'TS29531_Nnssf_NSSelection.yaml#/components/schemas/NsiId'
        minItems: 1
      expectedUEbehavior:
        $ref: '#/components/schemas/ExpectedUeBehavior'
      plmnAssiUeRadioCapId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnAssiUeRadioCapId'
      manAssiUeRadioCapId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ManAssiUeRadioCapId'
      ucmfDicEntryId:
        type: string
      n3IwfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
      wagfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
      tngfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
      anN2ApId:
        type: integer
      nssaaStatusList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NssaaStatus'
        minItems: 1
      pendingNssaiMappingList:
        type: array
        items:
          $ref: '#/components/schemas/NssaiMapping'
        minItems: 1
    required:
      - accessType
  SeafData:
    type: object
    properties:
      ngKsi:
        $ref: '#/components/schemas/NgKsi'
      keyAmf:
        $ref: '#/components/schemas/KeyAmf'
      nh:
        type: string
        pattern: '^[A-Fa-f0-9]+$'
      ncc:
        type: integer
        minimum: 0
        maximum: 7
      keyAmfChangeInd:
        type: boolean
      keyAmfHDerivationInd:
        type: boolean
    required:
      - ngKsi
      - keyAmf
  NasSecurityMode:
    type: object
    properties:
      integrityAlgorithm:
        $ref: '#/components/schemas/IntegrityAlgorithm'
      cipheringAlgorithm:
        $ref: '#/components/schemas/CipheringAlgorithm'
    required:
      - integrityAlgorithm
      - cipheringAlgorithm
  PduSessionContext:
    type: object
    properties:
```

```
      pduSessionId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
      smContextRef:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      sNssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      dnn:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      accessType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
      additionalAccessType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
      allocatedEbiList:
        type: array
        items:
          $ref: 'TS29502_Nsmf_PDUSession.yaml#/components/schemas/EbiArpMapping'
        minItems: 1
      hsmfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      hsmfSetId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
      hsmfServiceSetId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfServiceSetId'
      smfBinding:
        $ref: '#/components/schemas/SbiBindingLevel'
      vsmfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      vsmfSetId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
      vsmfServiceSetId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfServiceSetId'
      vsmfBinding:
        $ref: '#/components/schemas/SbiBindingLevel'
      ismfId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      ismfSetId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfSetId'
      ismfServiceSetId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfServiceSetId'
      ismfBinding:
        $ref: '#/components/schemas/SbiBindingLevel'
      nsInstance:
        $ref: 'TS29531_Nnssf_NSSelection.yaml#/components/schemas/NsiId'
      smfServiceInstanceId:
        type: string
      maPduSession:
        type: boolean
        default: false
      cnAssistedRanPara:
        $ref: 'TS29502_Nsmf_PDUSession.yaml#/components/schemas/CnAssistedRanPara'
    required:
      - pduSessionId
      - smContextRef
      - sNssai
      - dnn
      - accessType
  NssaiMapping:
    type: object
    properties:
      mappedSnssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      hSnssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    required:
      - mappedSnssai
      - hSnssai
  UeRegStatusUpdateReqData:
    type: object
    properties:
      transferStatus:
        $ref: '#/components/schemas/UeContextTransferStatus'
      toReleaseSessionList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
        minItems: 1
      pcfReselectedInd:
        type: boolean
```

```
      smfChangeInfoList:
        type: array
        items:
          $ref: '#/components/schemas/SmfChangeInfo'
        minItems: 1
    required:
      - transferStatus
  UeRegStatusUpdateRspData:
    type: object
    properties:
      regStatusTransferComplete:
        type: boolean
    required:
      - regStatusTransferComplete
  AssignEbiError:
    type: object
    properties:
      error:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      failureDetails:
        $ref: '#/components/schemas/AssignEbiFailed'
    required:
      - error
      - failureDetails
  UeContextCreateData:
    type: object
    properties:
      ueContext:
        $ref: '#/components/schemas/UeContext'
      targetId:
        $ref: '#/components/schemas/NgRanTargetId'
      sourceToTargetData:
        $ref: '#/components/schemas/N2InfoContent'
      pduSessionList:
        type: array
        items:
          $ref: '#/components/schemas/N2SmInformation'
        minItems: 1
      mmeControlFteid:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
      n2NotifyUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      ueRadioCapability:
        $ref: '#/components/schemas/N2InfoContent'
      ngapCause:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NgApCause'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - ueContext
      - targetId
      - sourceToTargetData
      - pduSessionList
  UeContextCreatedData:
    type: object
    properties:
      ueContext:
        $ref: '#/components/schemas/UeContext'
      targetToSourceData:
        $ref: '#/components/schemas/N2InfoContent'
      pduSessionList:
        type: array
        items:
          $ref: '#/components/schemas/N2SmInformation'
        minItems: 1
      failedSessionList:
        type: array
        items:
          $ref: '#/components/schemas/N2SmInformation'
        minItems: 1
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      pcfReselectedInd:
        type: boolean
    required:
      - ueContext
      - targetToSourceData
      - pduSessionList
```

```
    UeContextCreateError:
      type: object
      properties:
        error:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
        ngapCause:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NgApCause'
        targetToSourceFailureData:
          $ref: '#/components/schemas/N2InfoContent'
      required:
        - error
    NgRanTargetId:
      type: object
      properties:
        ranNodeId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GlobalRanNodeId'
        tai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Tai'
      required:
        - ranNodeId
        - tai
    PWSResponseData:
      type: object
      properties:
        ngapMessageType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        serialNumber:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint16'
        messageIdentifier:
          type: integer
        unknownTaiList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Tai'
          minItems: 1
      required:
        - ngapMessageType
        - serialNumber
        - messageIdentifier
    PWSErrorData:
      type: object
      properties:
        namfCause:
          type: integer
      required:
        - namfCause
    N2InformationTransferError:
      type: object
      properties:
        error:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
        pwsErrorInfo:
          $ref: '#/components/schemas/PWSErrorData'
      required:
        - error
    NgKsi:
      type: object
      properties:
        tsc:
          $ref: '#/components/schemas/ScType'
        ksi:
          type: integer
          minimum: 0
          maximum: 6
      required:
        - tsc
        - ksi
    KeyAmf:
      type: object
      properties:
        keyType:
          $ref: '#/components/schemas/KeyAmfType'
        keyVal:
          type: string
      required:
        - keyType
        - keyVal
    ExpectedUeBehavior:
```

```
      type: object
      properties:
        expMoveTrajectory:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
          minItems: 1
        validityTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      required:
        - expMoveTrajectory
        - validityTime
    N2RanInformation:
      type: object
      properties:
        n2InfoContent:
          $ref: '#/components/schemas/N2InfoContent'
      required:
        - n2InfoContent
    N2InfoNotificationRspData:
      type: object
      properties:
        n2InfoContent:
          $ref: '#/components/schemas/N2InfoContent'
    SmallDataRateStatusInfo:
      type: object
      properties:
        Snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        Dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        SmallDataRateStatus:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SmallDataRateStatus'
      required:
        - Snssai
        - Dnn
        - SmallDataRateStatus
    SmfChangeInfo:
      type: object
      properties:
        pduSessionIdList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
          minItems: 1
        smfChangeInd:
          $ref: '#/components/schemas/SmfChangeIndication'
      required:
        - pduSessionIdList
        - smfChangeInd

    V2xContext:
      type: object
      properties:
        nrV2xServicesAuth:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NrV2xAuth'
        lteV2xServicesAuth:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/LteV2xAuth'
        nrUeSidelinkAmbr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        lteUeSidelinkAmbr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        Pc5QoSPara:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Pc5QoSPara'

    V2xInformation:
      type: object
      properties:
        n2Pc5Pol:
          $ref: '#/components/schemas/N2InfoContent'

    ImmediateMdtConf:
      type: object
      properties:
        jobType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/JobType'
        measurementLteList:
          type: array
```

```
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/MeasurementLteForMdt'
          minItems: 1
        measurementNrList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/MeasurementNrForMdt'
          minItems: 1
        reportingTriggerList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ReportingTrigger'
          minItems: 1
        reportInterval:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ReportIntervalMdt'
        reportAmount:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ReportAmountMdt'
        eventThresholdRsrp:
          type: integer
          minimum: 0
          maximum: 97
        eventThresholdRsrq:
          type: integer
          minimum: 0
          maximum: 34
        collectionPeriodRmmLte:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/CollectionPeriodRmmLteMdt'
        measurementPeriodLte:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MeasurementPeriodLteMdt'
        areaScope:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AreaScope'
        positioningMethod:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PositioningMethodMdt'
        mdtAllowedPlmnIdList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
          minItems: 1
          maxItems: 16
      required:
        - jobType

    EpsNasSecurityMode:
      type: object
      properties:
        integrityAlgorithm:
          $ref: '#/components/schemas/EpsNasIntegrityAlgorithm'
        cipheringAlgorithm:
          $ref: '#/components/schemas/EpsNasCipheringAlgorithm'
      required:
        - integrityAlgorithm
        - cipheringAlgorithm

#
# SIMPLE DATA TYPES
#
    EpsBearerId:
      type: integer
      minimum: 0
      maximum: 15
    Ppi:
      type: integer
      minimum: 0
      maximum: 7
    NasCount:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
    5GMmCapability:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
    UeSecurityCapability:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
    S1UeNetworkCapability:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
    DrxParameter:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
    OmcIdentifier:
      type: string
    MSClassmark2:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'
```

```
    SupportedCodec:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Bytes'

#
# ENUMERATIONS
#
    StatusChange:
      anyOf:
      - type: string
        enum:
          - AMF_UNAVAILABLE
          - AMF_AVAILABLE
      - type: string
    N2InformationClass:
      anyOf:
      - type: string
        enum:
          - SM
          - NRPPa
          - PWS
          - PWS-BCAL
          - PWS-RF
          - RAN
          - V2X
      - type: string
    N1MessageClass:
      anyOf:
      - type: string
        enum:
          - 5GMM
          - SM
          - LPP
          - SMS
          - UPDP
          - LCS
      - type: string
    N1N2MessageTransferCause:
      anyOf:
      - type: string
        enum:
          - ATTEMPTING_TO_REACH_UE
          - N1_N2_TRANSFER_INITIATED
          - WAITING_FOR_ASYNCHRONOUS_TRANSFER
          - UE_NOT_RESPONDING
          - N1_MSG_NOT_TRANSFERRED
          - UE_NOT_REACHABLE_FOR_SESSION
          - TEMPORARY_REJECT_REGISTRATION_ONGOING
          - TEMPORARY_REJECT_HANDOVER_ONGOING
      - type: string
    UeContextTransferStatus:
      anyOf:
      - type: string
        enum:
          - TRANSFERRED
          - NOT_TRANSFERRED
      - type: string
    N2InformationTransferResult:
      anyOf:
      - type: string
        enum:
          - N2_INFO_TRANSFER_INITIATED
      - type: string
    CipheringAlgorithm:
      anyOf:
      - type: string
        enum:
          - NEA0
          - NEA1
          - NEA2
          - NEA3
      - type: string
    IntegrityAlgorithm:
      anyOf:
      - type: string
        enum:
          - NIA0
          - NIA1
          - NIA2
```

```
        - NIA3
    - type: string
  SmsSupport:
    anyOf:
    - type: string
      enum:
        - 3GPP
        - NON_3GPP
        - BOTH
        - NONE
    - type: string
  ScType:
    anyOf:
    - type: string
      enum:
        - NATIVE
        - MAPPED
    - type: string
  KeyAmfType:
    anyOf:
    - type: string
      enum:
        - KAMF
        - KPRIMEAMF
    - type: string
  TransferReason:
    anyOf:
    - type: string
      enum:
        - INIT_REG
        - MOBI_REG
        - MOBI_REG_UE_VALIDATED
    - type: string
  PolicyReqTrigger:
    anyOf:
    - type: string
      enum:
        - LOCATION_CHANGE
        - PRA_CHANGE
        - SARI_CHANGE
        - RFSP_INDEX_CHANGE
        - ALLOWED_NSSAI_CHANGE
    - type: string
  RatSelector:
    anyOf:
    - type: string
      enum:
        - E-UTRA
        - NR
    - type: string
  NgapIeType:
    anyOf:
    - type: string
      enum:
        - PDU_RES_SETUP_REQ
        - PDU_RES_REL_CMD
        - PDU_RES_MOD_REQ
        - HANDOVER_CMD
        - HANDOVER_REQUIRED
        - HANDOVER_PREP_FAIL
        - SRC_TO_TAR_CONTAINER
        - TAR_TO_SRC_CONTAINER
        - TAR_TO_SRC_FAIL_CONTAINER
        - RAN_STATUS_TRANS_CONTAINER
        - SON_CONFIG_TRANSFER
        - NRPPA_PDU
        - UE_RADIO_CAPABILITY
        - RIM_INFO_TRANSFER
        - SECONDARY_RAT_USAGE
        - PC5_QOS_PARA
        - EARLY_STATUS_TRANS_CONTAINER
    - type: string
  N2InfoNotifyReason:
    anyOf:
    - type: string
      enum:
        - HANDOVER_COMPLETED
    - type: string
```

```
    SmfChangeIndication:
      anyOf:
      - type: string
        enum:
          - CHANGED
          - REMOVED
      - type: string
    SbiBindingLevel:
      anyOf:
      - type: string
        enum:
          - NF_INSTANCE_BINDING
          - NF_SET_BINDING
          - NF_SERVICE_SET_BINDING
      - type: string

    EpsNasCipheringAlgorithm:
      anyOf:
      - type: string
        enum:
          - EEA0
          - EEA1
          - EEA2
          - EEA3
      - type: string

    EpsNasIntegrityAlgorithm:
      anyOf:
      - type: string
        enum:
          - EIA0
          - EIA1
          - EIA2
          - EIA3
      - type: string
```

A.3 Namf_EventExposure API

```
openapi: 3.0.0
info:
  version: 1.1.1
  title: Namf_EventExposure
  description: |
    AMF Event Exposure Service
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
security:
  - {}
  - oAuth2ClientCredentials:
      - namf-evts
externalDocs:
  description: 3GPP TS 29.518 V16.5.0; 5G System; Access and Mobility Management Services
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.518/'
servers:
  - url: '{apiRoot}/namf-evts/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause clause 4.4 of 3GPP TS 29.501
paths:
  /subscriptions:
    post:
      summary: Namf_EventExposure Subscribe service Operation
      tags:
        - Subscriptions collection (Document)
      operationId: CreateSubscription
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AmfCreateEventSubscription'
        required: true
      responses:
```

```
        '201':
          description: Subsription Created
          headers:
            Location:
              description: 'Contains the URI of the newly created resource, according to the
structure: {apiRoot}/namf-evts/<apiVersion>/subscriptions/{subscriptionId}'
              required: true
              schema:
                type: string
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AmfCreatedEventSubscription'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
      callbacks:
        onEventReport:
          '{$request.body#/subscription/eventNotifyUri}':
            post:
              summary: Event Notificaiton Delivery
              requestBody:
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AmfEventNotification'
                required: true
              responses:
                '204':
                  description: Successful acknowledgement
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '411':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
                default:
                  description: Unexpected error
        onSubscriptionIdChangeEvtReport:
          '{$request.body#/subscription/subsChangeNotifyUri}':
            post:
              summary: Event Notificaiton Delivery For Subscription Id Change
              requestBody:
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AmfEventNotification'
                required: true
              responses:
                '204':
                  description: Successful acknowledgement
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '411':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
```

```
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                description: Unexpected error
  /subscriptions/{subscriptionId}:
    patch:
      summary: Namf_EventExposure Subscribe Modify service Operation
      tags:
        - Individual subscription (Document)
      operationId: ModifySubscription
      parameters:
        - name: subscriptionId
          in: path
          required: true
          description: Unique ID of the subscription to be modified
          schema:
            type: string
      requestBody:
        content:
          application/json-patch+json:
            schema:
              oneOf:
                - $ref: '#/components/schemas/AmfUpdateEventSubscriptionItem'
                - $ref: '#/components/schemas/AmfUpdateEventOptionItem'
        required: true
      responses:
        '200':
          description: Subsription modified successfully
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AmfUpdatedEventSubscription'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
    delete:
      summary: Namf_EventExposure Unsubscribe service Operation
      tags:
        - Individual subscription (Document)
      operationId: DeleteSubscription
      parameters:
        - name: subscriptionId
          in: path
          required: true
          description: Unique ID of the subscription to be deleted
          schema:
            type: string
      responses:
        '204':
          description: Subsription deleted successfully
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '404':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            namf-evts: Access to the Namf_EventExposure API
  schemas:
    AmfEventSubscription:
      type: object
      properties:
        eventList:
          type: array
          items:
            $ref: '#/components/schemas/AmfEvent'
          minItems: 1
        eventNotifyUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        notifyCorrelationId:
          type: string
        nfId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        subsChangeNotifyUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        subsChangeNotifyCorrelationId:
          type: string
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        groupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        pei:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
        anyUE:
          type: boolean
        options:
          $ref: '#/components/schemas/AmfEventMode'
      required:
        - eventList
        - eventNotifyUri
        - notifyCorrelationId
        - nfId
    AmfEvent:
      type: object
      properties:
        type:
          $ref: '#/components/schemas/AmfEventType'
        immediateFlag:
          type: boolean
          default: false
        areaList:
          type: array
          items:
            $ref: '#/components/schemas/AmfEventArea'
          minItems: 1
        locationFilterList:
          type: array
          items:
            $ref: '#/components/schemas/LocationFilter'
          minItems: 1
```

```
      refId:
        $ref: 'TS29503_Nudm_EE.yaml#/components/schemas/ReferenceId'
      trafficDescriptorList:
        type: array
        items:
          $ref: '#/components/schemas/TrafficDescriptor'
        minItems: 1
      reportUeReachable:
        type: boolean
        default: false
      reachabilityFilter:
        $ref: '#/components/schemas/ReachabilityFilter'
      maxReports:
        type: integer
    required:
      - type
  AmfEventNotification:
    type: object
    properties:
      notifyCorrelationId:
        type: string
      subsChangeNotifyCorrelationId:
        type: string
      reportList:
        type: array
        items:
          $ref: '#/components/schemas/AmfEventReport'
        minItems: 1
  AmfEventReport:
    type: object
    properties:
      type:
        $ref: '#/components/schemas/AmfEventType'
      state:
        $ref: '#/components/schemas/AmfEventState'
      timeStamp:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      subscriptionId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      anyUe:
        type: boolean
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      areaList:
        type: array
        items:
          $ref: '#/components/schemas/AmfEventArea'
        minItems: 1
      refId:
        $ref: 'TS29503_Nudm_EE.yaml#/components/schemas/ReferenceId'
      gpsi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      pei:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
      location:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
      timezone:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/TimeZone'
      accessTypeList:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
        minItems: 1
      rmInfoList:
        type: array
        items:
          $ref: '#/components/schemas/RmInfo'
        minItems: 1
      cmInfoList:
        type: array
        items:
          $ref: '#/components/schemas/CmInfo'
        minItems: 1
      reachability:
        $ref: '#/components/schemas/UeReachability'
      commFailure:
        $ref: '#/components/schemas/CommunicationFailure'
      lossOfConnectReason:
```

```
        $ref: '#/components/schemas/LossOfConnectivityReason'
      numberOfUes:
        type: integer
      5gsUserStateList:
        type: array
        items:
          $ref: '#/components/schemas/5GsUserStateInfo'
        minItems: 1
      typeCode:
        type: string
        pattern: '^imeitac-[0-9]{8}$'
      registrationNumber:
        type: integer
      maxAvailabilityTime:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      ueIdExt:
        type: array
        items:
          $ref: '#/components/schemas/UEIdExt'
        minItems: 1
    required:
      - type
      - state
      - timeStamp
  AmfEventMode:
    type: object
    properties:
      trigger:
        $ref: '#/components/schemas/AmfEventTrigger'
      maxReports:
        type: integer
      expiry:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      repPeriod:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      sampRatio:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
    required:
      - trigger
  AmfEventState:
    type: object
    properties:
      active:
        type: boolean
      remainReports:
        type: integer
      remainDuration:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
    required:
      - active
  RmInfo:
    type: object
    properties:
      rmState:
        $ref: '#/components/schemas/RmState'
      accessType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
    required:
      - rmState
      - accessType
  CmInfo:
    type: object
    properties:
      cmState:
        $ref: '#/components/schemas/CmState'
      accessType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
    required:
      - cmState
      - accessType
  CommunicationFailure:
    type: object
    properties:
      nasReleaseCode:
        type: string
      ranReleaseCode:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NgApCause'
  AmfCreateEventSubscription:
```

```
    type: object
    properties:
      subscription:
        $ref: '#/components/schemas/AmfEventSubscription'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      oldGuami:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
    required:
      - subscription
  AmfCreatedEventSubscription:
    type: object
    properties:
      subscription:
        $ref: '#/components/schemas/AmfEventSubscription'
      subscriptionId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      reportList:
        type: array
        items:
          $ref: '#/components/schemas/AmfEventReport'
        minItems: 1
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - subscription
      - subscriptionId
  AmfUpdateEventSubscriptionItem:
    type: array
    items:
      type: object
      properties:
        op:
          type: string
          enum:
            - add
            - remove
            - replace
        path:
          type: string
          pattern: '\/eventList\/[0-]$|\/eventList\/[1-9][0-9]*$'
        value:
          $ref: '#/components/schemas/AmfEvent'
      required:
        - op
        - path
    minItems: 1
  AmfUpdateEventOptionItem:
    type: object
    properties:
      op:
        type: string
        enum:
          - replace
      path:
        type: string
        pattern: '\/options\/expiry$'
      value:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    required:
      - op
      - path
      - value
  AmfUpdatedEventSubscription:
    type: object
    properties:
      subscription:
        $ref: '#/components/schemas/AmfEventSubscription'
      reportList:
        type: array
        items:
          $ref: '#/components/schemas/AmfEventReport'
        minItems: 1
    required:
      - subscription
  AmfEventArea:
    type: object
    properties:
```

```
    presenceInfo:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PresenceInfo'
    ladnInfo:
      $ref: '#/components/schemas/LadnInfo'
    sNssai:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    nsiId:
      $ref: 'TS29531_Nnssf_NSSelection.yaml#/components/schemas/NsiId'
LadnInfo:
  type: object
  properties:
    ladn:
      type: string
    presence:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PresenceState'
  required:
    - ladn
5GsUserStateInfo:
  type: object
  properties:
    5gsUserState:
      $ref: '#/components/schemas/5GsUserState'
    accessType:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
  required:
    - 5gsUserState
    - accessType
TrafficDescriptor:
  type: object
  properties:
    dnn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
    sNssai:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    dddTrafficDescriptorList:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DddTrafficDescriptor'
      minItems: 1
UEIdExt:
  type: object
  properties:
    supi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    gpsi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
5gGuti:
  type: string
AmfEventType:
  anyOf:
  - type: string
    enum:
      - LOCATION_REPORT
      - PRESENCE_IN_AOI_REPORT
      - TIMEZONE_REPORT
      - ACCESS_TYPE_REPORT
      - REGISTRATION_STATE_REPORT
      - CONNECTIVITY_STATE_REPORT
      - REACHABILITY_REPORT
      - COMMUNICATION_FAILURE_REPORT
      - UES_IN_AREA_REPORT
      - SUBSCRIPTION_ID_CHANGE
      - SUBSCRIPTION_ID_ADDITION
      - LOSS_OF_CONNECTIVITY
      - 5GS_USER_STATE_REPORT
      - AVAILABILITY_AFTER_DDN_FAILURE
      - TYPE_ALLOCATION_CODE_REPORT
      - FREQUENT_MOBILITY_REGISTRATION_REPORT
  - type: string
AmfEventTrigger:
  anyOf:
  - type: string
    enum:
      - ONE_TIME
      - CONTINUOUS
      - PERIODIC
  - type: string
LocationFilter :
```

```
      anyOf:
      - type: string
        enum:
          - TAI
          - CELL_ID
          - N3IWF
          - UE_IP
          - UDP_PORT
          - TNAP_ID
          - GLI
          - TWAP_ID
      - type: string
    UeReachability:
      anyOf:
      - type: string
        enum:
          - UNREACHABLE
          - REACHABLE
          - REGULATORY_ONLY
      - type: string
    RmState:
      anyOf:
      - type: string
        enum:
          - REGISTERED
          - DEREGISTERED
      - type: string
    CmState:
      anyOf:
      - type: string
        enum:
          - IDLE
          - CONNECTED
      - type: string
    5GsUserState:
      anyOf:
      - type: string
        enum:
          - DEREGISTERED
          - REGISTERED_NOT_REACHABLE_FOR_PAGING
          - REGISTERED_REACHABLE_FOR_PAGING
          - CONNECTED_NOT_REACHABLE_FOR_PAGING
          - CONNECTED_REACHABLE_FOR_PAGING
          - NOT_PROVIDED_FROM_AMF
      - type: string
    LossOfConnectivityReason:
      anyOf:
      - type: string
        enum:
          - DEREGISTERED
          - MAX_DETECTION_TIME_EXPIRED
          - PURGED
      - type: string

    ReachabilityFilter:
      anyOf:
      - type: string
        enum:
          - UE_REACHABILITY_STATUS_CHANGE
          - UE_REACHABLE_DL_TRAFFIC
      - type: string
```

A.4 Namf_MT

```
openapi: 3.0.0
info:
  version: 1.1.0
  title: Namf_MT
  description: |
    AMF Mobile Terminated Service
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
security:
  - {}
  - oAuth2ClientCredentials:
```

```
      - namf-mt
externalDocs:
  description: 3GPP TS 29.518 V16.4.0; 5G System; Access and Mobility Management Services
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.518/'
servers:
  - url: '{apiRoot}/namf-mt/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause clause 4.4 of 3GPP TS 29.501
paths:
  '/ue-contexts/{ueContextId}':
    get:
      summary: Namf_MT Provide Domain Selection Info service Operation
      tags:
        - ueContext (Document)
      operationId: Provide Domain Selection Info
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-.+|.+)$'
        - name: info-class
          in: query
          description: UE Context Information Class
          schema:
            $ref: '#/components/schemas/UeContextInfoClass'
        - name: supported-features
          in: query
          description: Supported Features
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        - name: old-guami
          in: query
          description: Old GUAMI
          content:
            application/json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
      responses:
        '200':
          description: Requested UE Context Information returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeContextInfo'
        '307':
          description: Temporary Redirect
          content:
            application/problem+json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
          headers:
            Location:
              description: 'The URI of the resource located on the target NF Service Consumer (e.g.
AMF) to which the request is redirected'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '414':
          $ref: 'TS29571_CommonData.yaml#/components/responses/414'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
```

```
  /ue-contexts/{ueContextId}/ue-reachind:
    put:
      summary: Namf_MT EnableUEReachability service Operation
      tags:
        - ueReachInd (Document)
      operationId: EnableUeReachability
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EnableUeReachabilityReqData'
        required: true
      responses:
        '200':
          description: UE has become reachable as desired
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/EnableUeReachabilityRspData'
        '307':
          description: Temporary Redirect
          content:
            application/problem+json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
          headers:
            Location:
              description: 'The URI of the resource located on the target NF Service Consumer (e.g.
AMF) to which the request is redirected'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          description: Forbidden
          content:
            application/problem+json:
              schema:
                $ref: '#/components/schemas/ProblemDetailsEnableUeReachability'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        '504':
          description: Gateway Timeout
          content:
            application/problem+json:
              schema:
                $ref: '#/components/schemas/ProblemDetailsEnableUeReachability'
        default:
          description: Unexpected error
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            namf-mt: Access to the Namf_MT API
```

```
  schemas:
    EnableUeReachabilityReqData:
      type: object
      properties:
        reachability:
          $ref: 'TS29518_Namf_EventExposure.yaml#/components/schemas/UeReachability'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        oldGuami:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
        extBufSupport:
          type: boolean
          default: false
      required:
        - reachability
    EnableUeReachabilityRspData:
      type: object
      properties:
        reachability:
          $ref: 'TS29518_Namf_EventExposure.yaml#/components/schemas/UeReachability'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - reachability
    UeContextInfo:
      type: object
      properties:
        supportVoPS:
          type: boolean
        supportVoPSn3gpp:
          type: boolean
        lastActTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        accessType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
        ratType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    ProblemDetailsEnableUeReachability:
      allOf:
      - $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
      - $ref: '#/components/schemas/AdditionInfoEnableUeReachability'
    AdditionInfoEnableUeReachability:
      type: object
      properties:
        maxWaitingTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
    UeContextInfoClass:
      anyOf:
      - type: string
        enum:
          - TADS
      - type: string
```

A.5 Namf_Location

```
openapi: 3.0.0
info:
  version: 1.1.1
  title: Namf_Location
  description: |
    AMF Location Service
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
security:
  - {}
  - oAuth2ClientCredentials:
      - namf-loc
externalDocs:
  description: 3GPP TS 29.518 V16.5.0; 5G System; Access and Mobility Management Services
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.518/'
servers:
  - url: '{apiRoot}/namf-loc/v1'
    variables:
      apiRoot:
```

```
        default: https://example.com
        description: apiRoot as defined in clause clause 4.4 of 3GPP TS 29.501
paths:
  /{ueContextId}/provide-pos-info:
    post:
      summary: Namf_Location ProvidePositioningInfo service Operation
      tags:
        - Individual UE context (Document)
      operationId: ProvidePositioningInfo
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/RequestPosInfo'
        required: true
      responses:
        '200':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ProvidePosInfo'
        '204':
           description: Successful accept of location request with no information returned.
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        '504':
          $ref: 'TS29571_CommonData.yaml#/components/responses/504'
        default:
          description: Unexpected error
      callbacks:
        onUELocationNotification:
          '{$request.body#/locationNotificationUri}':
            post:
              requestBody:
                description: UE Location Event Notification
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/NotifiedPosInfo'
              responses:
                '204':
                  description: Expected response to a successful callback processing
                '400':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
                '403':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
                '411':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
                '500':
```

```
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  /{ueContextId}/provide-loc-info:
    post:
      summary: Namf_Location ProvideLocationInfo service Operation
      tags:
        - Individual UE context (Document)
      operationId: ProvideLocationInfo
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-.+|imei-[0-9]{15}|imeisv-[0-9]{16}|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/RequestLocInfo'
        required: true
      responses:
        '200':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ProvideLocInfo'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error

  /{ueContextId}/cancel-pos-info:
    post:
      summary: Namf_Location CancelLocation service operation
      tags:
        - Individual UE context (Document)
      operationId: CancelLocation
      parameters:
        - name: ueContextId
          in: path
          description: UE Context Identifier
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15}|nai-.+|gli-.+|gci-.+|.+)$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/CancelPosInfo'
        required: true
      responses:
        '204':
          description: Expected response to a successful cancellation
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
```

```
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        '504':
          $ref: 'TS29571_CommonData.yaml#/components/responses/504'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            namf-loc: Access to the Namf_Location API
  schemas:
    RequestPosInfo:
      type: object
      properties:
        lcsClientType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/ExternalClientType'
        lcsLocation:
          $ref: '#/components/schemas/LocationType'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        priority:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LcsPriority'
        lcsQoS:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LocationQoS'
        velocityRequested:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityRequested'
        lcsSupportedGADShapes:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/SupportedGADShapes'
        additionalLcsSuppGADShapes:
          type: array
          items:
            $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/SupportedGADShapes'
          minItems: 1
        locationNotificationUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        oldGuami:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
        pei:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
        lcsServiceType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LcsServiceType'
        ldrType:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrType'
        hgmlcCallBackURI:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        ldrReference:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrReference'
        periodicEventInfo:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PeriodicEventInfo'
        areaEventInfo:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AreaEventInfo'
        motionEventInfo:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/MotionEventInfo'
```

```
      externalClientIdentification:
        $ref: 'TS29515_Ngmlc_Location.yaml#/components/schemas/ExternalClientIdentification'
      afID:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      codeWord:
        $ref: 'TS29515_Ngmlc_Location.yaml#/components/schemas/CodeWord'
      uePrivacyRequirements:
        $ref: 'TS29515_Ngmlc_Location.yaml#/components/schemas/UePrivacyRequirements'
    required:
      - lcsClientType
      - lcsLocation
  ProvidePosInfo:
    type: object
    properties:
      locationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
      accuracyFulfilmentIndicator:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AccuracyFulfilmentIndicator'
      ageOfLocationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
      velocityEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityEstimate'
      positioningDataList:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PositioningMethodAndUsage'
        minItems: 0
        maxItems: 9
      gnssPositioningDataList:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GnssPositioningMethodAndUsage'
        minItems: 0
        maxItems: 9
      ecgi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ecgi'
      ncgi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ncgi'
      targetServingNode:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      civicAddress:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
      barometricPressure:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/BarometricPressure'
      altitude:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/Altitude'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      servingLMFIdentification:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
      locationPrivacyVerResult:
        $ref: '#/components/schemas/LocationPrivacyVerResult'
  NotifiedPosInfo:
    type: object
    properties:
      locationEvent:
        $ref: '#/components/schemas/LocationEvent'
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      gpsi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      pei:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Pei'
      locationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
      ageOfLocationEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
      velocityEstimate:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/VelocityEstimate'
      positioningDataList:
        type: array
        items:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/PositioningMethodAndUsage'
        minItems: 0
        maxItems: 9
      gnssPositioningDataList:
        type: array
        items:
```

```
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GnssPositioningMethodAndUsage'
        minItems: 0
        maxItems: 9
      ecgi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ecgi'
      ncgi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ncgi'
      servingNode:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
      civicAddress:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/CivicAddress'
      barometricPressure:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/BarometricPressure'
      altitude:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/Altitude'
      hgmlcCallBackURI:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      ldrReference:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrReference'
      servingLMFIdentification:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
      terminationCause:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/TerminationCause'
    required:
      - locationEvent
  RequestLocInfo:
    type: object
    properties:
      req5gsLoc:
        type: boolean
        default: false
      reqCurrentLoc:
        type: boolean
        default: false
      reqRatType:
        type: boolean
        default: false
      reqTimeZone:
        type: boolean
        default: false
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  ProvideLocInfo:
    type: object
    properties:
      currentLoc:
        type: boolean
      location:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
      geoInfo:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
      locationAge:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/AgeOfLocationEstimate'
      ratType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
      timezone:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/TimeZone'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      oldGuami:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
  CancelPosInfo:
    type: object
    properties:
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      hgmlcCallBackURI:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      ldrReference:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LdrReference'
      servingLMFIdentification:
        $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LMFIdentification'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - supi
      - hgmlcCallBackURI
      - ldrReference
```

```
    LocationType:
      anyOf:
      - type: string
        enum:
          - CURRENT_LOCATION
          - CURRENT_OR_LAST_KNOWN_LOCATION
          - INITIAL_LOCATION
          - NOTIFICATION_VERIFICATION_ONLY
          - DEFERRED_LOCATION
      - type: string
    LocationEvent:
      anyOf:
      - type: string
        enum:
          - EMERGENCY_CALL_ORIGINATION
          - EMERGENCY_CALL_RELEASE
          - EMERGENCY_CALL_HANDOVER
          - ACTIVATION_OF_DEFERRED_LOCATION
          - UE_MOBILITY_FOR_DEFERRED_LOCATION
          - CANCELLATION_OF_DEFERRED_LOCATION
      - type: string

    LocationPrivacyVerResult:
      anyOf:
      - type: string
        enum:
          - LOCATION_ALLOWED
          - LOCATION_NOT_ALLOWED
          - RESPONSE_TIME_OUT
      - type: string
```

Annex B (Informative): HTTP Multipart Messages

B.1 Example of HTTP multipart message

B.1.1 General

This clause provides a (partial) example of HTTP multipart message. The example does not aim to be a complete representation of the HTTP message, e.g. additional information or headers can be included.

This Annex is informative and the normative descriptions in this specification prevail over the description in this Annex if there is any difference.

B.1.2 Example HTTP multipart message with N2 Information binary data

```
POST /example.com/namf-comm/v1/ue-contexts/{ueContextId}/n1-n2-messages HTTP/2
Content-Type: multipart/related; boundary=----Boundary
Content-Length: xyz

------Boundary
Content-Type: application/json

{
    "n2InfoContainer": {
      "n2InformationClass": "SM",
      "smInfo": {
        "pduSessionId": 5,
        "n2InfoContent": {
          "ngapIeType": "PDU_RES_SETUP_REQ",
          "ngapData": {
            "contentId": "n2msg"
          }
        }
      }
    },
    "pduSessionId": 5
}
------Boundary
Content-Type: application/vnd.3gpp.ngap
Content-Id: n2msg

{ … N2 Information binary data …}
------Boundary
```

Annex C (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-10	CT4#80	C4-175297				TS Skeleton	0.1.0
2017-10	CT4#80	C4-175397				Implementation of pCRs agreed at CT4#80.	0.2.0
2017-12	CT4#81	C4-176441				Implementation of pCRs agreed at CT4#81, including C4-176285, C4-176290, C4-176291, C4-176292, C4-176293, C4-176375, C4-176376, C4-176378, C4-176379, C4-176380 and C4-176404.	0.3.0
2018-01	CT4#82	C4-181393				Implementation of pCRs agreed at CT4#82, including C4-181090, C4-181091, C4-181258, C4-181259, C4-181260, C4-181269, C4-181270, C4-181311, C4-181312, C4-181313, C4-181314, C4-181352, C4-181353 and C4-181354	0.4.0
2018-03	CT4#83	C4-182437				Implementation of pCRs agreed at CT4#83, including C4-182287, C4-182288, C4-182290, C4-182292, C4-182293, C4-182350, C4-182353, C4-182355, C4-182358, C4-182367, C4-182385, C4-182403, C4-182414, C4-182415	0.5.0
2018-03	CT#79	CP-180033				Presented for information	1.0.0
2018-04	CT4#84	C4-183518				Implementation of pCRs agreed at CT4#84, including C4-183048, C4-183054, C4-183055, C4-183064, C4-183073, C4-183074, C4-183161, C4-183166, C4-183171, C4-183345, C4-183347, C4-183351, C4-183354, C4-183356, C4-183357, C4-183359, C4-183360, C4-183361, C4-183362, C4-183406, C4-183407, C4-183408, C4-183409, C4-183410, C4-183411, C4-183412, C4-183413, C4-183414, C4-183415, C4-183417, C4-183434, C4-183435, C4-183436, C4-183437, C4-183439, C4-183445, C4-183460, C4-183461, C4-183462, C4-183463, C4-183464, C4-183493, C4-183494, C4-183495, C4-183502	1.1.0
2018-05	CT4#85	C4-184629				Implementation of pCRs agreed at CT4#85, including: C4-184390, C4-184391, C4-184562, C4-184393, C4-184561, C4-184395, C4-194052, C4-184396, C4-184399, C4-184404, C4-184405, C4-184407, C4-184102, C4-184408, C4-184104, C4-184410, C4-184412, C4-184413, C4-184569, C4-184563, C4-184124, C4-184418, C4-184565, C4-184127, C4-184566, C4-184129, C4-184421, C4-184131, C4-184426, C4-184427, C4-184428, C4-184429, C4-184430, C4-184431, C4-184432, C4-184433, C4-184434, C4-184435, C4-184436, C4-184437, C4-184151, C4-184481, C4-184154, C4-184515, C4-184516, C4-184568, C4-184485, C4-184486, C4-184487, C4-184488	1.2.0
2018-06	CT#80	CP-181107				Presented for approval	2.0.0
2018-06	CT#80					Approved in CT#80	15.0.0
2018-09	CT#81	CP-182062	0001	2	F	RAT Selector for PWS	15.1.0
2018-09	CT#81	CP-182062	0002	3	F	AM Policy Triggers in MM Context	15.1.0
2018-09	CT#81	CP-182062	0003	1	F	Update UE context and MM context as per latest stage 2 agreements	15.1.0
2018-09	CT#81	CP-182062	0004	1	F	Corrections to EBI Assignment	15.1.0
2018-09	CT#81	CP-182062	0005	1	F	Clarify Max number of reports and Max duration of reporting in alignment with stage 2	15.1.0
2018-09	CT#81	CP-182062	0006		F	N1/N2 Message Transfer Temporary Reject	15.1.0
2018-09	CT#81	CP-182062	0008		F	Remove AN Type from N1/N2 Message Transfer Request	15.1.0
2018-09	CT#81	CP-182165	0009	2	F	Update SeafData as per agreements in SA3	15.1.0
2018-09	CT#81	CP-182062	0010	1	F	Include TimeStamp in AMF Event Notification	15.1.0
2018-09	CT#81	CP-182062	0011		F	Provide Domain Selection Info	15.1.0
2018-09	CT#81	CP-182062	0012	1	F	RAN UE NGAP ID in RegistrationContextContainer	15.1.0
2018-09	CT#81	CP-182062	0013	1	F	NG-RAN TargetID in RegistrationContextContainer	15.1.0
2018-09	CT#81	CP-182062	0014	3	F	BackUp AMF Info	15.1.0
2018-09	CT#81	CP-182062	0015		F	Description of N1N2TransferFailureNotification Operation	15.1.0
2018-09	CT#81	CP-182062	0016	1	F	Add Quotes for Runtime Expression	15.1.0
2018-09	CT#81	CP-182062	0017		F	Callback URI for N2InfoNotify during N2 based handover	15.1.0
2018-09	CT#81	CP-182062	0018	1	F	Resolve Editor's Note on regular expression pattern	15.1.0
2018-09	CT#81	CP-182095	0019	4	F	Location Service ProvideLocationInfo	15.1.0
2018-09	CT#81	CP-182062	0020	2	F	Location Service ProvidePositioningInfo	15.1.0
2018-09	CT#81	CP-182062	0021	2	F	N1N2MessageTransfer Rejection due to SAR	15.1.0
2018-09	CT#81	CP-182062	0022	3	F	N2 Content Type Definition	15.1.0
2018-09	CT#81	CP-182062	0023		F	Selected TAI in NgRanTargetId	15.1.0
2018-09	CT#81	CP-182062	0024	2	F	Skip Indicator	15.1.0
2018-09	CT#81	CP-182062	0025	1	F	UEContextTransfer Integrity Check Failure	15.1.0
2018-09	CT#81	CP-182068	0026	1	B	Add support for 5G Trace	15.1.0
2018-09	CT#81	CP-182094	0027	3	F	NgApCause Definition	15.1.0
2018-09	CT#81	CP-182062	0028	1	F	N1N2 Transfer Failure Notification	15.1.0
2018-09	CT#81	CP-182062	0029		F	N2 Container Data Type During Handover	15.1.0
2018-09	CT#81	CP-182175	0031	1	F	Correction to RegistrationCompleteNotify	15.1.0
2018-09	CT#81	CP-182062	0032	3	F	N1N2MessageTransfer and Notify for PCF	15.1.0
2018-09	CT#81	CP-182166	0033	3	F	Regular expression pattern for UeContextId parameter in OpenAPI	15.1.0

2018-09	CT#81	CP-182062	0036	2	F	Presence Reporting Area	15.1.0
2018-09	CT#81	CP-182062	0037	1	F	Notification Correlation Id for subscription correlation Id change	15.1.0
2018-09	CT#81	CP-182062	0038	1	F	Default Subscription for Notification to LMF	15.1.0
2018-09	CT#81	CP-182062	0039	1	F	LCS Correlation Identifier in N2Notify	15.1.0
2018-09	CT#81	CP-182062	0040	1	F	Mobility Restriction	15.1.0
2018-09	CT#81	CP-182062	0041		F	Not Allowed Slice	15.1.0
2018-09	CT#81	CP-182062	0042	1	F	UE-AMBR	15.1.0
2018-09	CT#81	CP-182062	0044	1	F	Array Attributes	15.1.0
2018-09	CT#81	CP-182062	0045	2	F	Default Response Codes	15.1.0
2018-09	CT#81	CP-182062	0046		F	AMF service operations	15.1.0
2018-09	CT#81	CP-182048	0047	2	F	Passing NSSF information in N1MessageNotification	15.1.0
2018-09	CT#81	CP-182062	0049	3	F	Clarification on location information in immediate report	15.1.0
2018-09	CT#81	CP-182062	0050	1	F	Resource Figures	15.1.0
2018-09	CT#81	CP-182062	0051		F	Correct reference for Event Report Information	15.1.0
2018-09	CT#81	CP-182062	0052		F	Consistent use of "Correlation Id"	15.1.0
2018-09	CT#81	CP-182062	0053	1	F	API version number update	15.1.0
2018-09	CT#81	CP-182062	0054	1	F	Custom Operation Name Correction for EBI Assignment	15.1.0
2018-09	CT#81	CP-192096	0055		F	Correction of CorrelationId Reference in OpenAPI	15.1.0
2018-12	CT#82	CP-183020	56	1	F	Editorial Corrections	15.2.0
2018-12	CT#82	CP-183020	57		F	Usage for EnableUEReachability Service Operation	15.2.0
2018-12	CT#82	CP-183020	58	1	F	Update to SeafData	15.2.0
2018-12	CT#82	CP-183232	60	4	F	Transfer UE Radio Capability between AMFs	15.2.0
2018-12	CT#82	CP-183020	61	2	F	Notification of the change of the PCF	15.2.0
2018-12	CT#82	CP-183020	62	1	F	Information in N1MessageNotify	15.2.0
2018-12	CT#82	CP-183020	63		F	Event Exposure	15.2.0
2018-12	CT#82	CP-183020	64		F	Correct the references	15.2.0
2018-12	CT#82	CP-183020	65	5	F	Subscription lifetime	15.2.0
2018-12	CT#82	CP-183020	67		F	Corrections to TADS Query API	15.2.0
2018-12	CT#82	CP-183020	69	5	F	Transfer of Group Id Suscriptions	15.2.0
2018-12	CT#82	CP-183020	70	1	F	Attributes corrections for RegistrationContextContainer and MmContext	15.2.0
2018-12	CT#82	CP-183020	71	1	F	Correction on tables	15.2.0
2018-12	CT#82	CP-183020	72		F	Mandatory Status Code Correction	15.2.0
2018-12	CT#82	CP-183020	74	1	F	N2InfoNotify correction for Handover Confirm	15.2.0
2018-12	CT#82	CP-183020	75	1	F	Naming convention of provideLocInfo and providePosInfo	15.2.0
2018-12	CT#82	CP-183020	76	2	F	OpenAPI specification alignments	15.2.0
2018-12	CT#82	CP-183020	77	1	F	Remove Duplicated Common Application Errors	15.2.0
2018-12	CT#82	CP-183020	78		F	Required routingId	15.2.0
2018-12	CT#82	CP-183020	79	1	F	Resource URIs Alignment	15.2.0
2018-12	CT#82	CP-183020	80		F	Seaf data type correction	15.2.0
2018-12	CT#82	CP-183020	81		F	UeContextId Pattern Complement	15.2.0
2018-12	CT#82	CP-183020	82		F	Use RefToBinaryData from common data types	15.2.0
2018-12	CT#82	CP-183020	83	3	F	Range Definition in OpenAPI	15.2.0
2018-12	CT#82	CP-183020	84		F	sessionId in N1N2MessageTransferReqData	15.2.0
2018-12	CT#82	CP-183020	85	1	F	New rejection cause for UE in CM-IDLE state	15.2.0
2018-12	CT#82	CP-183151	86	8	F	Notifying Subscription ID Change	15.2.0
2018-12	CT#82	CP-183020	87	1	F	SMF Reallocation requested Indication	15.2.0
2018-12	CT#82	CP-183020	88	1	F	Paging Policy Indicator	15.2.0
2018-12	CT#82	CP-183020	89	1	F	EPS bearer identity	15.2.0
2018-12	CT#82	CP-183020	90	1	F	29518 CR cardinality	15.2.0
2018-12	CT#82	CP-183020	92	1	F	Editorial Correction to PduSessionContext	15.2.0
2018-12	CT#82	CP-183020	93	1	F	Global RAN Node ID in RegistrationContextContainer	15.2.0
2018-12	CT#82	CP-183154	97	2	F	Update of Subscription Lifetime	15.2.0
2018-12	CT#82	CP-183020	98	1	F	EBI Allocation Rejection Cause	15.2.0
2018-12	CT#82	CP-183020	100	2	F	UE Context Transfer during initial registration via another access type	15.2.0
2018-12	CT#82	CP-183020	101	1	F	RAN Status Transfer Transparent Container in N2 based handover	15.2.0
2018-12	CT#82	CP-183020	103	1	F	NgapIeType for X2 and N2 based handover	15.2.0
2018-12	CT#82	CP-183020	104		F	Update of N1N2 Message Operations	15.2.0
2018-12	CT#82	CP-183020	105	1	F	Clarify the handling of EBI assignment	15.2.0
2018-12	CT#82	CP-183020	106		F	Align Usage of Tags	15.2.0
2018-12	CT#82	CP-183020	107	1	F	Altitude in Provide Positioning Information	15.2.0
2018-12	CT#82	CP-183020	108		F	AmfStatusChangeSubcribe Modify in Resource Table	15.2.0
2018-12	CT#82	CP-183020	109	1	F	API Root	15.2.0
2018-12	CT#82	CP-183020	110	1	F	Case Convention	15.2.0
2018-12	CT#82	CP-183020	111	1	F	Clarification of ProvideLocInfo when CM-CONNECTED	15.2.0
2018-12	CT#82	CP-183020	118	1	F	N1 N2 Message for Positioning	15.2.0
2018-12	CT#82	CP-183020	119	3	F	N3GPP DDN handling when UE CM-IDLE on N3GPP	15.2.0
2018-12	CT#82	CP-183020	121	1	F	Alignment on TADS Query	15.2.0
2018-12	CT#82	CP-183020	122	1	F	Configuration Transfer procedure over N14	15.2.0
2018-12	CT#82	CP-183020	123		F	N1N2MessageTransfer Request message	15.2.0

2018-12	CT#82	CP-183020	124	2	F	UDM group Id	15.2.0
2018-12	CT#82	CP-183020	125		F	Warning Request Transfer Procedure	15.2.0
2018-12	CT#82	CP-183020	126	1	F	Location Header	15.2.0
2018-12	CT#82	CP-183020	127		F	Remove duplicate references	15.2.0
2018-12	CT#82	CP-183020	128	1	F	429 Response Codes	15.2.0
2018-12	CT#82	CP-183020	129		F	API Version	15.2.0
2018-12	CT#82	CP-183020	130	1	F	Oauth2 correction	15.2.0
2018-12	CT#82	CP-183191	131		F	Editorial Correction to AMF Event Type Enumeration	15.2.0
2018-12	CT#82	CP-183229	132		F	Correction to OpenAPI definition of UeContextTransferRspData	15.2.0
2019-03	CT#83	CP-190025	133	1	F	OpenAPI correction for HTTP method of EnableUEReachability	15.3.0
2019-03	CT#83	CP-190025	134		F	PDU sessions not accepted by target AMF in N2 based handover	15.3.0
2019-03	CT#83	CP-190025	135	1	F	Sending Secondary RAT usage over N14 during N2 handover with AMF change	15.3.0
2019-03	CT#83	CP-190025	136		F	SM Context URI in UE context	15.3.0
2019-03	CT#83	CP-190025	137	2	F	UE policy delivery and control	15.3.0
2019-03	CT#83	CP-190025	138		F	Correct Event Exposure Service Description	15.3.0
2019-03	CT#83	CP-190025	139	2	F	Simplify N1N2MessageTransfer when UE is in CM-IDLE	15.3.0
2019-03	CT#83	CP-190025	140	2	F	Update EBIAssignment Service Operation to Align with Stage 2	15.3.0
2019-03	CT#83	CP-190025	141	1	F	Corrections to the HTTP methods and URI	15.3.0
2019-03	CT#83	CP-190025	143	1	F	Correction to Reponse Code for Positioning Failed	15.3.0
2019-03	CT#83	CP-190025	144	1	F	Essential Clairfication on Event Subscription Creation	15.3.0
2019-03	CT#83	CP-190025	145	1	F	OpenAPI Syntax Correction	15.3.0
2019-03	CT#83	CP-190025	146	1	F	Reference Id	15.3.0
2019-03	CT#83	CP-190025	148	1	F	SMF Service Instance during AMF change	15.3.0
2019-03	CT#83	CP-190025	149	1	F	GMLC URI for Namf_Location EventNotify	15.3.0
2019-03	CT#83	CP-190025	150	1	F	Correction of keyAmfChangeInd	15.3.0
2019-03	CT#83	CP-190025	151	1	F	N2SmInformation in UeContextCreateData & UeContextCreatedData	15.3.0
2019-03	CT#83	CP-190025	153		F	API version update	15.3.0
2019-06	CT#84	CP-191036	154		F	ngapCause in UeContextCreatedData	15.4.0
2019-06	CT#84	CP-191036	160		F	Correction N1 N2 Message Transfer when CM-IDLE	15.4.0
2019-06	CT#84	CP-191036	161		F	Correction on CR0021 implementation	15.4.0
2019-06	CT#84	CP-191036	162		F	Event Notify Failure Response	15.4.0
2019-06	CT#84	CP-191036	164		F	UE Identities for Event Notification	15.4.0
2019-06	CT#84	CP-191036	155	1	F	Content Type	15.4.0
2019-06	CT#84	CP-191036	163	1	F	LPP Handling	15.4.0
2019-06	CT#84	CP-191036	165	1	F	AMF Event Alignment	15.4.0
2019-06	CT#84	CP-191036	166	1	F	Missing Loss Of Connectivity Event	15.4.0
2019-06	CT#84	CP-191036	171	2	F	Storage of OpenAPI specification files	15.4.0
2019-06	CT#84	CP-191036	172	1	F	Location header in redirect response	15.4.0
2019-06	CT#84	CP-191036	173	1	F	LMF Service Instance Id for N1N2MessageTransfer	15.4.0
2019-06	CT#84	CP-191036	174		F	Remove Subscribed-Data-Report event type and SARI data type	15.4.0
2019-06	CT#84	CP-191036	175	1	F	Correction in PwsInformation Parameter	15.4.0
2019-06	CT#84	CP-191036	177	1	F	Copyright Note in OpenAPI Spec	15.4.0
2019-06	CT#84	CP-191036	178	1	F	Correction on EBI in PDU session context	15.4.0
2019-06	CT#84	CP-191036	179	1	F	Major API version	15.4.0
2019-06	CT#84	CP-191036	181	1	F	Status code of Namf_EventExposure Unsubscrive service operation	15.4.0
2019-06	CT#84	CP-191036	187		F	3GPP TS 29.518 API version update	15.4.0
2019-06	CT#84	CP-191046	182	2	F	Corrections of the references to retrieve Callback URI from NRF for N1and N2 notifications	16.0.0
2019-06	CT#84	CP-191049	159	2	B	Updates to CreateUEContext for eNS Support	16.0.0
2019-06	CT#84	CP-191054	168	3	B	Update N2InformationNotification for I-SMF insertion, change and removal	16.0.0
2019-06	CT#84	CP-191050	184	3	B	Add NB-IoT specific UE Radio Access Capability in UE context	16.0.0
2019-06	CT#84	CP-191050	185	1	B	Update to the UEContextTransfer service for adding Gap timer	16.0.0
2019-06	CT#84	CP-191048	186		B	3GPP TS 29.518 API version update	16.0.0
2019-09	CT#85	CP-192110	0189	2	A	Wrong Cardinality of lcsSupportedGADShapes in RequestPosInfo	16.1.0
2019-09	CT#85	CP-192128	0190	1	F	Correction for ngapMessageType	16.1.0
2019-09	CT#85	CP-192128	0191	1	F	NonUeN2InfoUnscribe for PWS	16.1.0
2019-09	CT#85	CP-192188	0193	1	B	Transfer 5G SRVCC Parameters between AMFs	16.1.0
2019-09	CT#85	CP-192193	0194	1	B	CreateUEContext – I-SMF and SM Context ID Information	16.1.0
2019-09	CT#85	CP-192110	0197	1	A	Use of ARP value for Priority Paging	16.1.0
2019-09	CT#85	CP-192193	0198	1	B	Correction of the smfChangeIndication	16.1.0
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2019-09	CT#85	CP-192128	0201	1	F	5GS User State retrieval	16.1.0
2019-09	CT#85	CP-192128	0202	1	F	Forwarding UL N2 message to target AMF during AMF planned removal procedure	16.1.0
2019-09	CT#85	CP-192128	0203	1	F	MT SMS to UE in RRC INACTIVE state with NG-RAN paging failure	16.1.0
2019-09	CT#85	CP-192128	0205		F	Corrections to Mapped Service Operations of Namf_Communication service	16.1.0
2019-09	CT#85	CP-192110	0208	1	A	Missing Location header	16.1.0

2019-09	CT#85	CP-192110	0210	1	A	Missing status codes	16.1.0
2019-09	CT#85	CP-192134	0211		B	Transfer Information of MA PDU Session between AMFs	16.1.0
2019-09	CT#85	CP-192110	0214	3	A	OpenAPI Correction on Location Header	16.1.0
2019-09	CT#85	CP-192128	0215		F	Error response of the EBIAssignment	16.1.0
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2019-09	CT#85	CP-192132	0223	2	B	Small Data Rate Control Status	16.1.0
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2019-09	CT#85	CP-192120	0227		F	3GPP TS 29.518 API version update	16.1.0
2019-10						Corrupted references fixed	16.1.1
2019-12	CT#86	CP-193051	0229	1	B	Target Access type in N1N2MessageTransfer Request for a MA PDU session	16.2.0
2019-12	CT#86	CP-193036	0230		F	egiList and ncgiList in N2InformationTransferReqData not needed	16.2.0
2019-12	CT#86	CP-193056	0231		B	Event exposure between AMF and SMF	16.2.0
2019-12	CT#86	CP-193051	0233	1	B	MA PDU session accepted indication	16.2.0
2019-12	CT#86	CP-193031	0235	1	A	Source AMF NGAP ID	16.2.0
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2019-12	CT#86	CP-193049	0253	1	F	Correction on MT Enable UE Reachability	16.2.0
2019-12	CT#86	CP-193063	0254		F	Excluding security context in the UE context	16.2.0
2019-12	CT#86	CP-193049	0255	1	B	Adding Rate Control attributes to N1N2messageTransferReq data type	16.2.0
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2019-12	CT#86	CP-193036	0260	2	F	Add Corresponding OpenAPI descriptions in clause 5.1	16.2.0
2019-12	CT#86	CP-193164	0261	2	B	Updating support for subscription-based access restriction	16.2.0
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2019-12	CT#86	CP-193122	0266	2	B	NF/NF Service Set ID in UE Context Transfer	16.2.0
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