ETSI TS 129 508 V17.16.0 (2025-06)

5G;
5G System;
Session Management Event Exposure Service;
Stage 3
(3GPP TS 29.508 version 17.16.0 Release 17)

Reference
RTS/TSGC-0329508vhg0

Keywords
5G

ETSI

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 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI IPR online database.

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM**® and the GSM logo are trademarks registered and owned by the GSM Association.

Legal Notice

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

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found at 3GPP to ETSI numbering cross-referencing.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

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

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 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.

1 Scope

The present specification provides the stage 3 definition of the Session Management Event Exposure Service (Nsmf_EventExposure) of the 5G System.

The stage 2 definition and procedures of the Session Management Event Exposure Service are contained in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [6]. The 5G System Architecture is defined in 3GPP TS 23.501 [2].

Stage 3 call flows for policy and charging control use cases are provided in 3GPP TS 29.513 [7].

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

The Session Management Event Exposure Service is provided by the Session Management Function (SMF). This service exposes events related to PDU Sessions observed at the SMF.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

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

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

[7] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

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

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

[10] OpenAPI: "OpenAPI Specification Version 3.0.0", https://spec.openapis.org/oas/v3.0.0.

[11] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

[12] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[13] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[14] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

[15] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

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

[19] 3GPP TR 21.900: "Technical Specification Group working methods".

[20] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[21] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[22] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[23] 3GPP TS 29.244: "Interface between the Control Plane and the User Plane of EPC Nodes".

[24] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AF	Application Function
AMBR	Aggregate Maximum Bit Rate
AMF	Access and Mobility Management Function
API	Application Programming Interface
DCCF	Data Collection Coordination Function
DDD	Downlink Data Delivery
DNAI	DN Access Identifier
DNN	Data Network Name
EAS	Edge Application Server
FQDN	Fully Qualified Domain Name
GPSI	Generic Public Subscription Identifier
GUAMI	Globally Unique AMF Identifier
HTTP	Hypertext Transfer Protocol
H-SMF	Home SMF
I-SMF	Intermediate SMF
JSON	JavaScript Object Notation
NEF	Network Exposure Function
NF	Network Function
NID	Network Identifier
NRF	Network Repository Function
NSSAI	Network Slice Selection Assistance Information
NWDAF	Network Data Analytics Function
PCF	Policy Control Function
PRA	Presence Reporting Area
QFI	QoS Flow Identifier
SMCC	Session Management Congestion Control
SMCCE	Session Management Congestion Control Experience
SMF	Session Management Function
SNPN	Stand-alone Non-Public Network
SUPI	Subscription Permanent Identifier
S-NSSAI	Single Network Slice Selection Assistance Information
UDM	Unified Data Management

UPF	User Plane Function
V-SMF	Visited SMF

4 Session Management Event Exposure Service

4.1 Service Description

4.1.1 Overview

The Session Management Event Exposure Service, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [6], is provided by the Session Management Function (SMF).

This service:

- allows consumer NF service consumers to subscribe and unsubscribe for events on a PDU session; and
- notifies consumer NF service consumers with a corresponding subscription about observed events on the PDU session.

The types of observed events applicable for (H-)SMF include:

- UP path change (e.g. addition and/or removal of PDU session anchor);
- access type change;
- RAT type change;
- PLMN change;
- PDU session release;
- PDU session establishment;
- Downlink data delivery status (for non-roaming);
- UE IP address/prefix change;
- QFI allocation;
- QoS monitoring;
- SM congestion control experience for PDU Session;
- Dispersion;
- WLAN information for PDU Session; and/or
- Redundant transmission experience for PDU Session.

The types of observed events applicable for V-SMF include:

- Downlink data delivery status.

The types of observed events applicable for I-SMF include:

- Downlink data delivery status.

4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Policy and Charging related 5G architecture is also described in 3GPP TS 29.513 [7].

The Session Management Event Exposure Service (Nsmf_EventExposure) is part of the Nsmf service-based interface exhibited by the Session Management Function (SMF).

The known NF service consumers of the Nsmf_EventExposure service are:

- Network Exposure Function (NEF),
- Access and Mobility Management Function (AMF),
- Application Function (AF),
- Unified Data Management (UDM),
- Network Data Analytics Function (NWDAF), and
- Data Collection Coordination Function (DCCF).

The PCF accesses the Session Management Event Exposure Service at the SMF via the N7 Reference point.

NOTE: The PCF can implicitly subscribe on behalf of the AF and NEF to the UP_PATH_CH event and/or the QOS_MON event by including the information on AF subscription within the PCC rule.

The AMF accesses the Session Management Event Exposure Service at the SMF via the N11 Reference point.

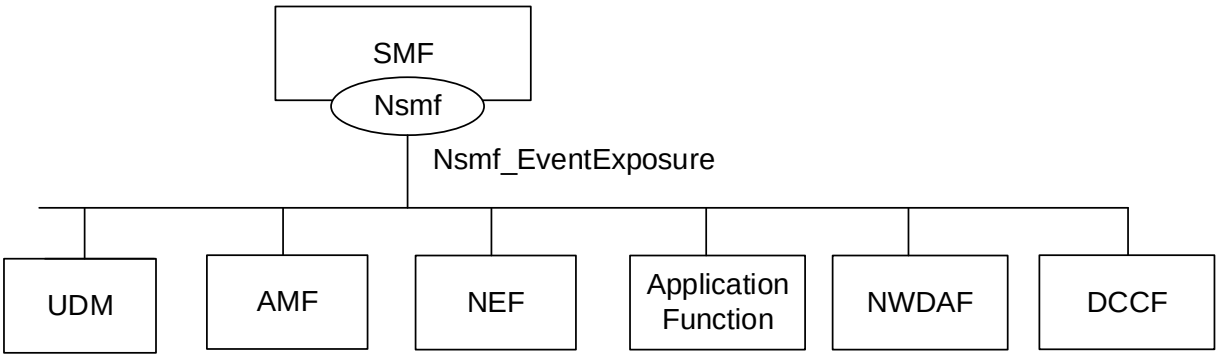

Figure 4.1.2-1: Reference Architecture for the Nsmf_EventExposure Service; SBI representation

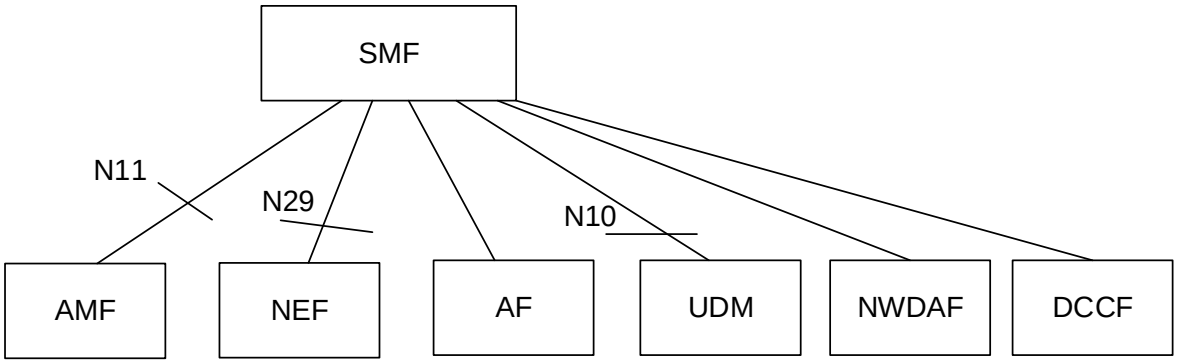

Figure 4.1.2-2: Reference Architecture for the Nsmf_EventExposure Service: reference point representation

4.1.3 Network Functions

4.1.3.1 Session Management Function (SMF)

The Session Management function (SMF) provides:

- Session Management e.g. Session establishment, modification and release;
- UE IP address allocation & management;
- Selection and control of UP function;
- Termination of interfaces towards Policy control functions; and
- Control part of policy enforcement and QoS.

4.1.3.2 NF Service Consumers

The Network Exposure Function (NEF);

- provides means to securely expose the services and capabilities provided by 3GPP network functions to e.g. 3rd parties or internal exposure.

The Access and Mobility Management function (AMF) provides:

- Registration management;
- Connection management;
- Reachability management; and
- Mobility Management.

The Application Function (AF)

- interacts with the 3GPP Core Network to provide services.

The Unified Data Management (UDM).

- has access to subscriber information, can determine the SMF serving a user based on that data, and can then subscribe to event notifications for a user (e.g. when triggered by the NEF).

The Network Data Analytics Function (NWDAF)

- collects data based on event subscription provided by AMF, SMF, PCF, UDM, AF (directly or via NEF) and OAM;
- retrieves information about NFs;
- performs on demand provision of analytics to NF service consumers, as indicated in clause 6, 3GPP TS 23.288 [21].

The Data Collection Coordination Function (DCCF)

- coordinates the collection and distribution of data and analytics.

4.2 Service Operations

4.2.1 Introduction

Table 4.2.1-1: Operations of the Nsmf_EventExposure Service

Service operation name	Description	Initiated by
Notify	Report UE PDU session related event(s) to the NF service consumer which has subscribed to the event report service.	(H-)SMF, V-SMF, I-SMF
Subscribe	This service operation is used by an NF service consumer to subscribe for event notifications on a specified PDU session, or for all PDU Sessions of one UE, a group of UE(s) or any UE, or to modify a subscription.	NF service consumers (e.g. AMF, NEF, AF, UDM, NWDAF, DCCF)
UnSubscribe	This service operation is used by an NF service consumer to unsubscribe from event notifications.	NF service consumers (e.g. AMF, NEF, AF, UDM, NWDAF, DCCF)
AppRelocationInfo	This service operation is used by an NF service consumer to acknowledge the notification from the SMF regarding UE PDU Session related event(s)	NF service consumers (e.g. NEF, AF)

4.2.2 Nsmf_EventExposure_Notify Service Operation

4.2.2.1 General

The Nsmf_EventExposure_Notify service operation enables the SMF (i.e. (H-)SMF, V-SMF and/or I-SMF) to send notifications to NF service consumers upon the occurrence of a previously subscribed event on the related PDU session.

The following procedure using the Nsmf_EventExposure_Notify service operation is supported:

- notification about subscribed events.

4.2.2.2 Notification about subscribed events

The present "notification about subscribed events" procedure is performed by the SMF when any of the subscribed events occur.

The following applies with respect to the detection of subscribed events:

- If:
  - the SMF supports the "DownlinkDataDeliveryStatus" feature,
  - the event "downlink data delivery status" is subscribed,
  - the traffic descriptors of the downlink data source have been provided for that subscription, and
  - the SMF is informed that the UE corresponding to that subscription is unreachable,
    - if the data is buffered at the UPF, then the SMF shall interact with the UPF to notify that the UPF buffers the downlink packets. The SMF shall include the traffic descriptor of the subscriptions in the PDR with a higher priority if the PCC is not applied to the PDUsession or derive the PDR from the PCC rule received from the PCF as defined in clause 4.2.4.27 of 3GPP TS 29.512 [14] if the PCC is applied to the PDU session and request the UPF to report when there are corresponding buffered downlink packets or discarded packets in the UPF as defined in clause 5.28.1 of 3GPP TS 29.244 [23]. When receiving the report from the UPF, the SMF shall determine whether that subscribed event with delivery status "DISCARDED" or "BUFFERED" occurred. The SMF shall determine that subscribed event with delivery status "TRANSMITTED" occurred by the fact that the related PDU session becomes ACTIVE.
    - if the data is buffered at the SMF, the SMF shall determine whether that subscribed event occurred by comparing the downlink packets with the traffic descriptors received in the corresponding event

subscription. If the SMF decides to buffer the packets, the subscribed event with delivery status "BUFFERED" occurred. If the SMF decides to discard the packets, the subscribed event with delivery status "DISCARDED" occurred. The SMF shall determine that subscribed event with delivery status "TRANSMITTED" occurred by the fact that the related PDU session becomes ACTIVE.

Figure 4.2.2.2-1 illustrates the notification about subscribed events.

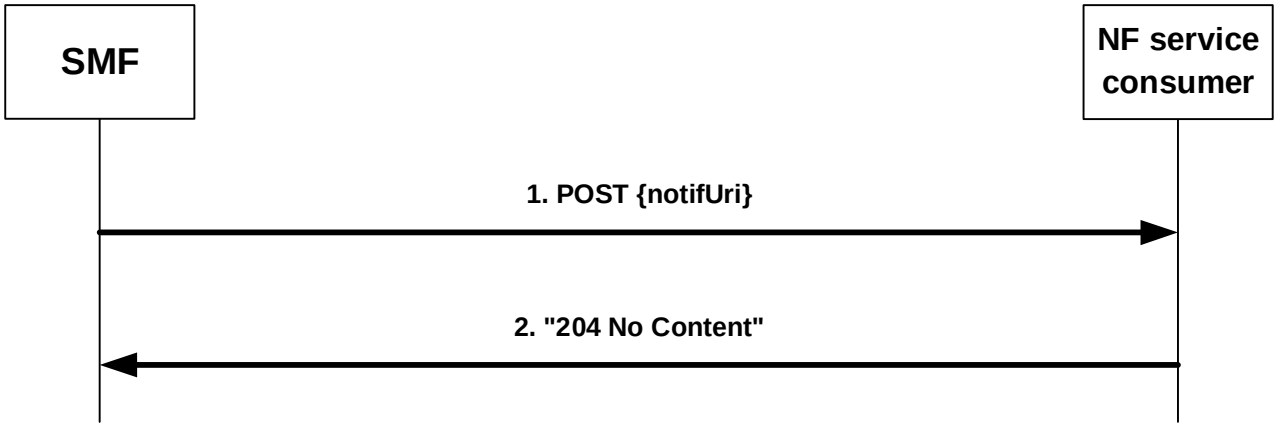

Figure 4.2.2.2-1: Notification about subscribed events

If the SMF observes PDU Session related event(s) for which an NF service consumer has subscribed, the SMF shall send an HTTP POST request with "{notifUri}", as previously provided by the NF service consumer within the corresponding subscription, as URI and NsmfEventExposureNotification data structure as request body that shall include:

- Notification correlation ID provided by the NF service consumer during the subscription, or as provided by the PCF for implicit subscription of UP path change as defined in clause 4.2.6.2.6.2 of 3GPP TS 29.512 [14], or as provided by the PCF for implicit subscription of QoS Monitoring as defined in clause 4.2.3.25 of 3GPP TS 29.512 [14], as "notifId" attribute; and
- information about the observed event(s) within the "eventNotifs" attribute that shall contain for each observed event an "EventNotification" data structure that shall include:
  1. the Event Trigger as "event" attribute;
  2. for a UP path change notification:
     a) type of notification ("EARLY" or "LATE") as "dnaiChgType" attribute;
     b) source DNAI and/or target DNAI as "sourceDnai" attribute and "targetDnai" attribute if DNAI is changed, respectively (NOTE 3); and
     c) if the PDU Session type is IP, for the source DNAI IP address/prefix of the UE as "sourceUeIpv4Addr" attribute or "sourceUeIpv6Prefix" attribute; and
     d) if the PDU Session type is IP, for the target DNAI IP address/prefix of the UE as "targetUeIpv4Addr" attribute or "targetUeIpv6Prefix" attribute;
     e) if available (NOTE 3), for the source DNAI, N6 traffic routing information related to the UE as "sourceTraRouting" attribute;
     f) if available (NOTE 3), for the target DNAI, N6 traffic routing information related to the UE as "targetTraRouting" attribute; and
     g) if the PDU Session type is Ethernet, the MAC address of the UE in the "ueMac" attribute;

NOTE 1: UP path change notification, i.e. DNAI change notification and/or N6 traffic routing information change notification, can be the result of an implicit subscription of the PCF on behalf of the NEF/AF as part of setting PCC rule(s) via the Npcf_SMPolicyControl service (see clause 4.2.6.2.6.2 of 3GPP TS 29.512 [14]).

NOTE 2: If the DNAI is not changed while the N6 traffic routing information change, the source DNAI and target DNAI are not provided.

NOTE 3: The change from the UP path status where no DNAI applies to a status where a DNAI applies indicates the activation of the related AF request and therefore only the target DNAI and N6 traffic routing information is provided in the event notification; the change from the UP path status where a DNAI applies to a status where no DNAI applies indicates the de-activation of the related AF request and therefore only the source DNAI and N6 traffic routing information is provided in the event notification.

3. for a UE IP address change:

   a) added new UE IP address or prefix as "adIpv4Addr" attribute or "adIpv6Prefix" attribute, respectively; and/or

   b) released UE IP address or prefix as "reIpv4Addr" attribute or "reIpv6Prefix" attribute, respectively;

4. for an access type change:

   a) new access type as "accType" attribute;

5. for a PLMN Change:

   a) new PLMN as "plmnId" attribute;

6. for a PDU Session Release:

   a) ID of the released PDU session as "pduSeId" attribute;

   b) DNN of the release PDU session as "dnn" attribute, if the "PduSessionStatus" feature is supported;

   c) The type of the release PDU session as "pduSessType" attribute, if the "PduSessionStatus" feature is supported;

   d) UE IPv4 address as "ipv4Addr" attribute and/or IPv6 information (IPv6 prefix(es) or IPv6 address(es)) as "ipv6Prefixes" or "ipv6Addrs" attributes, if the released PDU session type is IP and the "PduSessionStatus" feature is supported; and

   e) S-NSSAI of the release PDU session as "snssai" attribute, if the "EneNA" feature is supported and "snssai" attribute is present in the subscribed "NsmfEventExposure" data type;

7. the time at which the event was observed encoded as "timeStamp" attribute;

8. the SUPI as the "supi" attribute if the subscription applies to a group of UE(s) or any UE;

9. if available, the GPSI as the "gpsi" attribute if the subscription applies to a group of UE(s) or any UE;

10. for a Downlink Data Delivery Status, if the "DownlinkDataDeliveryStatus" feature is supported:

    a) the downlink data delivery status as "dddStatus" attribute;

    b) the downlink data descriptors impacted by the downlink data delivery status change within the "dddTraDescriptor" attribute; and

    c) for downlink data delivery status "BUFFERED". the estimated maximum waiting time as "maxWaitTime" attribute;

11. for a Communication Failure, if the "CommunicationFailure" feature is supported:

    a) the detailed communication failure information (e.g. 5G SM cause) as "commFailure" attribute; and

12. for QoS Monitoring, if the "QoSMonitoring" feature is supported:

    a) the uplink packet delays within the "ulDelays" attribute; or

    b) the downlink packet delays within the "dlDelays" attribute; or

    c) the round trip packet delays within the "rtDelays" attribute; or

d) if the feature "PacketDelayFailureReport" is supported, the packet delay measurement failure indicator within the "pdmf" attribute;

NOTE 4: QoS Monitoring notification can be the result of an implicit subscription of the PCF on behalf of the NEF/AF as part of setting PCC rule(s) via the Npcf_SMPolicyControl service (see clause 4.2.3.25 of 3GPP TS 29.512 [14]).

NOTE 5: The UPF reports one UL, DL and/or round-trip packet delay measurement for each periodic and/or event-triggered report as described in 3GPP TS 29.244 [23]. i.e, the SMF can include only one element within the "ulDelays", "dlDelays", and/or "rtDelays" array(s), each one with the received report from the UPF for the UL, DL and/or round trip delay(s).

13. for a PDU Session Establishment, if the "PduSessionStatus" feature is supported:

    a) ID of the established PDU session as "pduSeId" attribute;

    b) DNN of the release PDU session as "dnn" attribute;

    c) The type of the release PDU session as "pduSessType" attribute;

    d) UE IPv4 address as "ipv4Addr" attribute and/or IPv6 information (IPv6 prefix(es) or IPv6 address(es)) as "ipv6Prefixes" or "ipv6Addrs" attributes if available at PDU session establishment; and

    e) S-NSSAI of the established PDU session as "snssai" attribute, if the "EneNA" feature is supported and "snssai" attribute is present in the subscribed "NsmfEventExposure" data type;

14. for a QFI allocation, if the "QfiAllocation" feature is supported:

    a) QFI of the allocated QoS Flow ID for the application as "qfi" attribute;

    b) DNN of the allocated PDU session as "dnn" attribute;

    c) Slice of the allocated PDU session as "snssai" attribute;

    d) The description of the application traffic as "appId", "fDescs" or "ethfDescs" attribute; and

    e) ID of the allocated PDU session as "pduSeId" attribute if the subscription was for a UE, a group of UEs, or any UE, and not for a specific PDU Session;

15. for an RAT type change, if the "EneNA" feature is supported:

    a) new RAT type as "ratType" attribute;

16. for a SM congestion control experience for PDU Session, if the "SMCCE" feature is supported:

    a) DNN of the PDU session as "dnn" attribute if DNN based SMCC is applied

    or Slice of the allocated PDU session as "snssai" attribute if S-NSSAI based SMCC is applied;

    b) Time window representing a start time and a stop time of the data collection period as "timeWindow" attribute;

    c) The information of the SM NAS requests from UE as "smNasFromUe" attribute; and

    d) The information of the SM NAS messages from SMF with backoff timer as "smNasFromSmf" attribute;

17. for transactions dispersion collection, if the Dispersion feature is supported:

    a) The transactions dispersion information collected as "transacInfos" attribute; and

    b) The UE IP address as "ueIpAddr" attribute if it is available and requested in the subscription;

18. for redundant transmission experience of PDU Session, if the "RedundantTransmissionExp" feature is supported:

    a) DNN associated with URLLC service for the PDU session as "dnn" attribute; and

    b) UP with redundant transmission setup as "upRedTrans" attribute;

19. for WLAN information on PDU Session, if the "WlanPerformance" feature is supported:

    a) SSID or BSSID that the PDU session is related to as "ssId" or "bssId" attribute; and

    b) start time or end time of the PDU Session for WLAN as "startWlan" or "endWlan" attribute;

20. for obtaining the UPF information, if the "ServiceExperience" and/or "DnPerformance" feature is supported:

    a) the information of the UPF serving the UE provided as "upfInfo" attribute.

21. for obtaining the User Plane status information, if the "UeCommunication" feature is supported:

    a) the information about the User Plane status provided as "pduSessInfos" attribute.

- an URI for further AF acknowledgement in the "ackUri" attribute if the SMF determines to wait for the AF acknowledgement before activating the new UP path associated with the new DNAI.

NOTE 6: Based on the indication of AF acknowledgment to be expected in the PCC rules received from the PCF and local configuration, the SMF may determine to wait for the AF acknowledgement before activating the new UP path associated with the new DNAI.

Upon the reception of an HTTP POST request with "{notifUri}" as URI and an NsmfEventExposureNotification data structure as request body, the NF service consumer shall send an HTTP "204 No Content" response for a successful processing.

If errors occur when processing the HTTP POST request, the NF service consumer shall send the HTTP error response as specified in clause 5.7.

If the feature "ES3XX" is not supported and,

- if the NF service consumer is not able to handle the Notification but another unknown NF service consumer could possibly handle the notification, it shall reply with an HTTP "404 Not found" error response.

NOTE 7: An AMF as NF service consumer can change.

- if the SMF becomes aware that a new NF service consumer is requiring notifications (e.g. via the "404 Not found" response, or via Namf_Communication service AMFStatusChange Notifications, see 3GPP TS 29.518 [13], or via link level failures or via the Nnrf_NFDiscovery Service (using the service name and GUAMI obtained during the creation of the subscription) to discover the other AMFs within the AMF set) specified in 3GPP TS 29.510 [12]), and the SMF knows alternate or backup IPv4 Address(es), IPv6 Address(es) or FQDN(s) where to send Notifications (e.g. via "altNotifIpv4Addrs", "altNotifIpv6Addrs" or "altNotifFqdns" attributes received when the subscription was created), the SMF shall exchange the authority part of the Notification URI with one of those addresses and shall use that URI in any subsequent communication. If the SMF received a "404 Not found" response, the SMF should resend the failed notification to that URI.

If the feature "ES3XX" is supported, and the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4] and,

- if the SMF receives a "307 Temporary Redirect" response, the SMF shall resend the failed event notification request using the received URI in the Location header field as Notification URI. Subsequent event notifications, triggered after the failed one, shall be sent to the Notification URI provided by the NF service consumer during the corresponding subscription creation/update; or

- if the SMF receives a "308 Permanent Redirect" response, the SMF shall resend the failed event notification request and send the subsequent event notification using the received URI in the Location header field as Notification URI.

If the SMF in the VPLMN needs to send an event notification to the NEF in the HPLMN, it may normalize the event based on roaming agreements when required before provisioning the event report to the NEF of the HPLMN.

4.2.3 Nsmf_EventExposure_Subscribe Service Operation

4.2.3.1 General

This service operation is used by an NF service consumer to subscribe to event notifications on a specific PDU Session, or for all PDU Sessions of one UE, group of UE(s) or any UE, or to modify an existing subscription.

The following procedures using the Nsmf_EventExposure_Subscribe service operation are supported:

- creating a new subscription;
- modifying an existing subscription.

4.2.3.2 Creating a new subscription

Figure 4.2.3.2-1 illustrates the creation of a subscription.

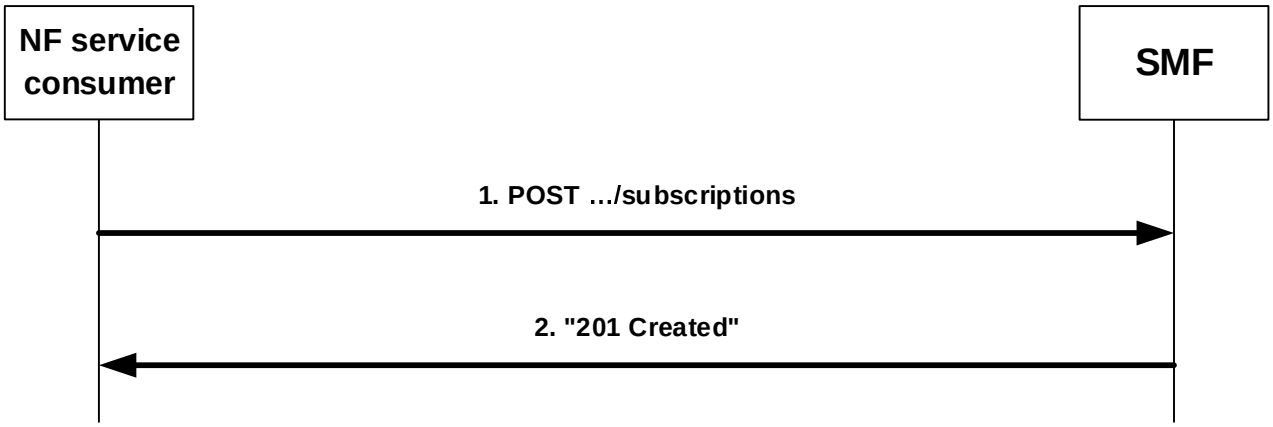

Figure 4.2.3.2-1: Creation of a subscription

To subscribe to event notifications, the NF service consumer shall send an HTTP POST request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions" as Resource URI and the NsmfEventExposure data structure as request body that shall include:

- if the subscription applies to events related to a single PDU session for a UE, the PDU Session ID of that PDU session as "pduSeId" attribute and the UE identification as "supi" or "gpsi" attribute;
- if the subscription applies to events not related to a single PDU session, identification of UEs to which the subscription applies via:
  a) identification of a single UE by SUPI as "supi" attribute or GPSI as "gpsi" attribute;
  b) identification of a group of UE(s) via a "groupId" attribute; or
  c) identification of any UE via the "anyUeInd" attribute set to true;

NOTE 1: The identification of any UE does not apply for local breakout roaming scenarios where the SMF is located in the VPLMN and the NF service consumer is located in the HPLMN.

- an URI where to receive the requested notifications as "notifUri" attribute;
- a Notification Correlation Identifier provided by the NF service consumer for the requested notifications as "notifId" attribute; and
- if the NF service consumer is an AMF, the GUAMI encoded as "guami" attribute:
- a description of the subscribed events as "eventSubs" attribute that for each event shall include:
  a) an event identifier as "event" attribute; and

b) for event "UP_PATH_CH", whether the subscription is for early, late, or early and late notifications of UP path reconfiguration in the "dnaiChgType" attribute;

c) for event "DDDS", the traffic descriptor(s) of the downlink data source in the "dddTraDescriptors" attribute;

and that may include:

a) for event "DDDS", the subscribed delivery statuses in the "dddStati" attribute;

b) for event "QFI_ALLOC" or "DISPERSION", the application identifiers in the "appIds" attribute;

c) for event "SMCC_EXP", the data collection target period in the "targetPeriod" attribute;

d) for event "DISPERSION", the UE IP Address in the "ueIpAddr" attribute, the indication of transaction dispersion collection in the "transacDispInd" attribute and the requested transaction metrics in the "transacMetrics" attribute;

e) for event "WLAN_INFO", the data collection target period in the "targetPeriod" attribute; and/or;

f) for event "RED_TRANS_EXP", the data collection target period in the "targetPeriod" attribute.

The NsmfEventExposure data structure as request body may also include:

- if the NF service consumer is an AMF:

  a) the name of a service produced by the AMF that expects to receive the notifications about subscribed events encoded as "serviceName" attribute;

  b) Alternate or backup IPv4 Address(es) where to send Notifications encoded as "altNotifIpv4Addrs" attribute;

  c) Alternate or backup IPv6 Address(es) where to send Notifications encoded as "altNotifIpv6Addrs" attribute;

  d) Alternate or backup FQDN(s) where to send Notifications encoded as "altNotifFqdns" attribute;

- A Data Network Name as "dnn" attribute;
- A single Network Slice Selection Assistance Information as "snssai" attribute;
- Immediate reporting flag as "ImmeRep" attribute;
- event notification method (periodic, one time, on event detection) as "notifMethod" attribute;
- Maximum Number of Reports as "maxReportNbr" attribute;
- Monitoring Duration as "expiry" attribute;
- Repetition Period for periodic reporting as "repPeriod" attribute;
- sampling ratio as "sampRatio" attribute;
- partitioning criteria for partitioning the UEs before performing sampling as "partitionCriteria" attribute if the EneNA feature is supported; and/or
- group reporting guard time as "grpRepTime" attribute; and/or
- a notification flag as "notifFlag" attribute if the EneNA feature is supported.

Upon the reception of an HTTP POST request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions" as Resource URI and NsmfEventExposure data structure as request body, the SMF shall:

- create a new subscription;
- assign a subscription correlation ID;
- select an expiry time that is equal to or less than the expiry time potentially received in the request;
- store the subscription;

- send an HTTP "201 Created" response with NsmfEventExposure data structure as response body and a Location header field containing the URI of the created individual subscription resource, i.e. "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}";

- if the feature "ERIR" is not supported, and if the "ImmeRep" attribute is included and set to true in the request, the SMF shall immediately notify the NF service consumer of the current available value(s) using the Nsmf_EventExposure_Notify service operation, as defined in clause 4.2.2.1;

- if the feature "ERIR" is supported, and if the "ImmeRep" attribute is included and set to true, the SMF may immediately notify the NF service consumer with the current available value(s) for the subscribed event(s) within the HTTP "201 Created" response as shown in figure 4.2.3.2-1, step 2. The "NsmfEventExposure" data type in the response may include the corresponding event(s) notification within the "eventNotifs" attribute.

- if the sampling ratio attribute, as "sampRatio", is included in the subscription without a "partitionCriteria" attribute, the SMF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs. If the "partitionCriteria" attribute is additionally included, then the SMF shall first partition the UEs according to the value of the "partitionCriteria" attribute and then select a random subset of UEs from each partition according to the sampling ratio and only report the event(s) related to the selected subsets of UEs;

- when the group reporting guard time attribute, as "grpRepTime", is included in the subscription, the SMF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then the SMF shall notify the NF service consumer using the Nsmf_EventExposure_Notify service operation, as described in clause 4.2.2.2; and

- if the "notifFlag" attribute is included and set to "DEACTIVATE" in the request, the SMF shall mute the event notification and store the available events.

If the SMF received an GUAMI, the SMF may subscribe to GUAMI changes using the AMFStatusChange service operation of the Namf_Communication service specified in 3GPP TS 29.518 [13], and it may use the Nnrf_NFDiscovery Service specified in 3GPP TS 29.510 [12] (using the obtained GUAMI and possibly service name) to query the other AMFs within the AMF set.

4.2.3.3 Modifying an existing subscription

Figure 4.2.3.3-1 illustrates the modification of an existing subscription.

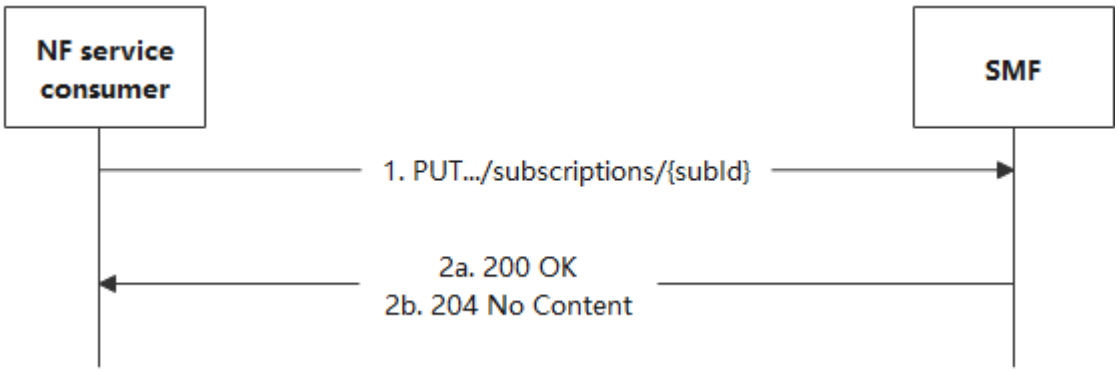

Figure 4.2.3.3-1: Modification of an existing subscription

To modify an existing subscription to event notifications, the NF service consumer shall send an HTTP PUT request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}" as Resource URI, where "{subId}" is the subscription correlation ID of the existing subscription, and NsmfEventExposure data structure as request body as described in clause 4.2.3.2.

NOTE 1: An alternate NF service consumer than the one that requested the generation of the subscription resource can send the PUT. For instance, an AMF as NF service consumer can change.

NOTE 2: The "notifUri" attribute within the NsmfEventExposure data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

When the "notifFlag" attribute is included, and set to "DEACTIVATE" in the request, the SMF shall mute the event notification and store the available events; if it is set to "RETRIEVAL" in the request, the SMF shall send the stored events to the NF service consumer, mute the event notification again and store available events; if it is set to "ACTIVATE" and the event notifications are muted (due to a previously received "DECATIVATE" value), the SMF shall unmute the event notification, i.e. start sending again notifications for available events.

When the "ImmeRep" attribute set to true is included in the subscription and the subscribed event(s) are available:

- if the feature "ERIR" is not supported, the SMF shall immediately notify the NF service consumer with the current available value(s) for the subscribed event(s) using the Nsmf_EventExposure_Notify service operation, as described in clause 4.2.2.1.

- if the feature "ERIR" is supported, the SMF may immediately notify the NF service consumer with the current available value(s) for the subscribed event(s) within the HTTP "200 OK" response as shown in figure 4.2.3.3-1, step 2a. The "NsmfEventExposure" data type may include the corresponding event(s) notification within the "eventNotifs" attribute.

NOTE 3: Only the newly added event(s) needs to be reported during the subscription update.

If the "sampRatio" attribute is included in the request without a "partitionCriteria" attribute, the SMF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs. If the "partitionCriteria" attribute is additionally included, then the SMF shall first partition the UEs according to the value of the "partitionCriteria" attribute and then select a random subset of UEs from each partition according to the sampling ratio and only report the event(s) related to the selected subsets of UEs.

When the "grpRepTime" attribute is included in the request, the SMF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then the SMF shall notify the NF service consumer using the Nsmf_EventExposure_Notify service operation, as described in clause 4.2.2.2.

When the "expiry" attribute is included in the request, the SMF shall select an expiry time that is equal to or less than the expiry time received in the request.

Upon the reception of an HTTP PUT request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}" as Resource URI and NsmfEventExposure data structure as request body, if the received HTTP request is successfully processed and accepted, the SMF shall:

- update the concerned subscription; and

- send an HTTP "200 OK" response with a response body containing a representation of the updated subscription in the NsmfEventExposure data structure or send a HTTP "204 No Content".

If errors occur when processing the HTTP PUT request, the SMF shall send an HTTP error response as specified in clause 5.7.

If the feature "ES3XX" is supported, and the SMF determines the received HTTP PUT request needs to be redirected, the SMF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

4.2.4 Nsmf_EventExposure_UnSubscribe Service Operation

4.2.4.1 General

This service operation is used by an NF service consumer to unsubscribe from event notifications.

The following procedure using the Nsmf_EventExposure_UnSubscribe service operation is supported:

- unsubscription from event notifications.

4.2.4.2 Unsubscription from event notifications

Figure 4.2.4.2-1 illustrates the unsubscription from event notifications.

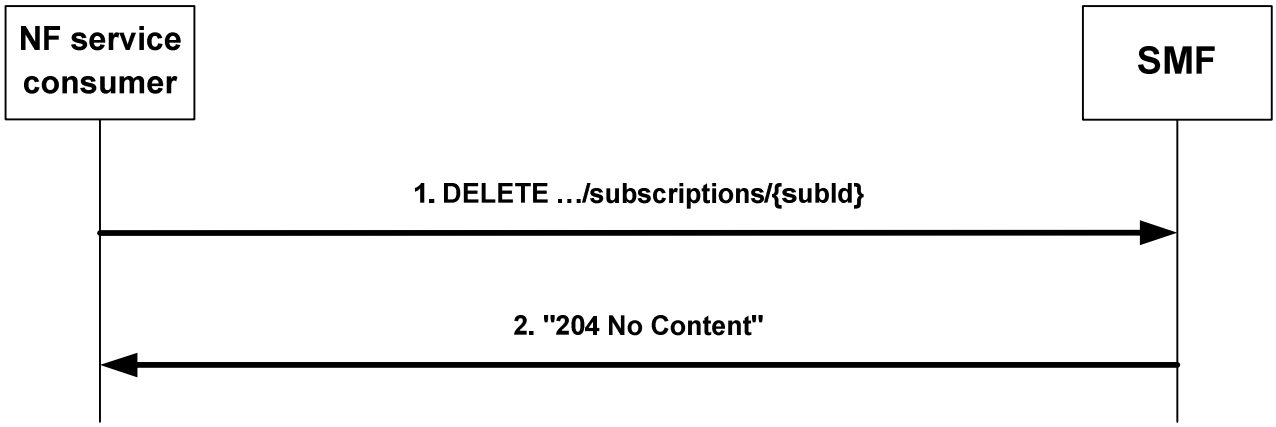

Figure 4.2.4.2-1: Unsubscription from event notifications

To unsubscribe from event notifications, the NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}" as Resource URI, where "{subId}" is the subscription correlation ID of the existing subscription that is to be deleted.

Upon the reception of the HTTP DELETE request with: "{apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}" as Resource URI, if the received HTTP request is successfully processed and accepted, the SMF shall:

- remove the corresponding subscription; and
- send an HTTP "204 No Content" response.

If errors occur when processing the HTTP DELETE request, the SMF shall send an HTTP error response as specified in clause 5.7.

If the feature "ES3XX" is supported, and the SMF determines the received HTTP DELETE request needs to be redirected, the SMF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

4.2.5 Nsmf_EventExposure_AppRelocationInfo Service Operation

4.2.5.1 General

The Nsmf_EventExposure_AppRelocationInfo service operation enables the NF service consumer to acknowledge the notification of subscribed events on the related PDU session from the SMF.

The following procedure using the Nsmf_EventExposure_AppRelocationInfo service operation is supported:

- acknowledgement of notification about subscribed events.

4.2.5.2 Acknowledgement of Notification about subscribed events

Figure 4.2.5.2-1 illustrates the acknowledgement of notification about subscribed events.

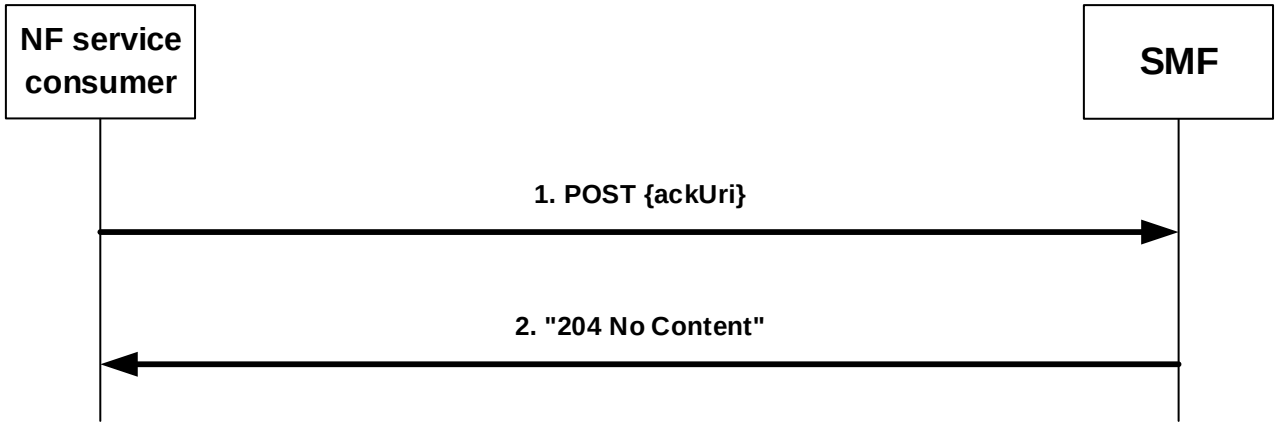

Figure 4.2.5.2-1: Acknowledgement of Notification about subscribed events

In order to acknowledge the SMF of the application relocation information after the handling of a notification about UP path change event, an NF service consumer shall send an HTTP POST request to the callback URI "{ackUri}" as previously provided by the SMF in an attribute within the NsmfEventExposureNotification data during UP path change notification procedure as defined in clause 4.2.2.2.

The request body contains the AckOfNotify data structure that shall include:

- Notification correlation ID provided by the SMF during UP path change notification, as "notifId" attribute;
- an identifier of UE (i.e. SUPI or GPSI), if available and the subscription does not applies to a group of UE(s) or any UE; and
- information about the AF acknowledgement within the "ackResult" attribute that shall contain result status of the application relocation as "afStatus" attribute. If the "afStatus" attribute sets to "SUCCESS", the N6 traffic routing information associated to the target DNAI may be included as "trafficRoute" attribute and, if the "ULBuffering" feature is supported, an indication that buffering of uplink traffic to the target DNAI is needed may be included as "upBuffInd" attribute and, if the feature "EASIPreplacement" is supported, EAS IP replacement information may be included as "easIpReplaceInfos" attribute. If the application relocation is not completed on time, the "afStatus" attribute shall set to the corresponding failure cause.

Upon the reception of an HTTP POST request with AckOfNotify data structure as request body, the SMF shall send an HTTP "204 No Content" response for a succesfull processing.

If errors occur when processing the HTTP POST request, the SMF shall send an HTTP error response as specified in clause 5.7.

If the feature "ES3XX" is supported, and the SMF determines the received HTTP POST request needs to be redirected, the SMF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5 Nsmf_EventExposure API

5.1 Introduction

The Session Management Event Exposure Service shall use the Nsmf_EventExposure API.

The API URI of the Nsmf_EventExposure API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the SMF 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 "nsmf-event-exposure".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.3.

5.2 Usage of HTTP

5.2.1 General

HTTP/2, IETF RFC 7540 [8], 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].

The OpenAPI [10] specification of HTTP messages and content bodies for the Nsmf_EventExposure is contained in Annex A.

5.2.2 HTTP standard headers

5.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

5.2.2.2 Content type

JSON, IETF RFC 8259 [9], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [18].

5.2.3 HTTP custom headers

The Nsmf_EventExposure API shall support HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] and may support HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4].

In this Release of the specification, no specific custom headers are defined for the Nsmf_EventExposure API.

5.3 Resources

5.3.1 Resource Structure

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 5.3.1-1 depicts the resource URIs structure for the Nsmf_EventExposure API.

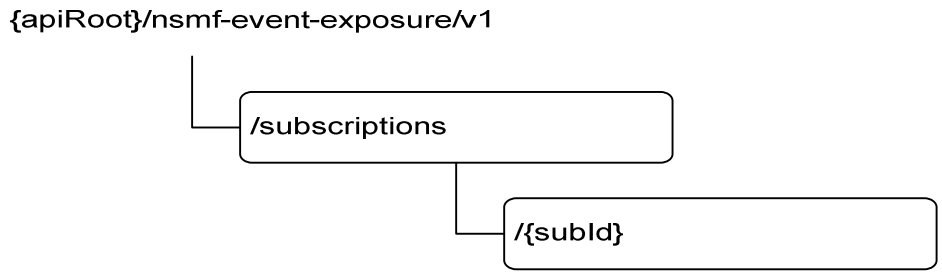

Figure 5.3.1-1: Resource URI structure of the Nsmf_EventExposure API

Table 5.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
SMF Notification Subscriptions	/subscriptions	POST	Create a new Individual SMF Notification Subscription resource.
Individual SMF Notification Subscription	/subscriptions/{subId}	GET	Read an Individual SMF Notification Subscription resource.
		PUT	Modify an existing Individual SMF Notification Subscription resource.
		DELETE	Delete an Individual SMF Notification Subscription resource and cancel the related subscription.

5.3.2 Resource: SMF Notification Subscriptions

5.3.2.1 Description

The SMF Notification Subscriptions resource represents the collection of subscriptions to the SMF event exposure service at a given SMF.

5.3.2.2 Resource definition

Resource URI: {apiRoot}/nsmf-event-exposure/v1/subscriptions

This resource shall support the resource URI variables defined in table 5.3.2.2-1.

Table 5.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.1

5.3.2.3 Resource Standard Methods

5.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.3.2.3.1-1.

Table 5.3.2.3.1-1: 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 5.3.2.3.1-2 and the response data structures and response codes specified in table 5.3.2.3.1-3.

Table 5.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
NsmfEventExposure	M	1	Create a new Individual SMF Notification Subscription resource.

Table 5.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NsmfEventExposure	M	1	201 Created	The creation of an Individual SMF Notification Subscription resource is confirmed and a representation of that resource is returned.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.3.2.3.1-4: 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}/nsmf-event-exposure/v1/subscriptions/{subId}

5.3.2.4 Resource Custom Operations

None.

5.3.3 Resource: Individual SMF Notification Subscription

5.3.3.1 Description

The SMF Notification Subscriptions resource represents a single subscription to the SMF event exposure service.

5.3.3.2 Resource definition

Resource URI: {apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}

This resource shall support the resource URI variables defined in table 5.3.3.2-1.

Table 5.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.1
subId	string	Identifies a subscription to the SMF event exposure service formatted as defined for the SubId type in table 5.6.3.2-1.

5.3.3.3 Resource Standard Methods

5.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.3.3.3.1-1.

Table 5.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.3.3.3.1-2 and the response data structures and response codes specified in table 5.3.3.3.1-3.

Table 5.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NsmfEventExposure	M	1	200 OK	A representation of the SMF Notification Subscription matching the subId is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during Individual SMF Notification Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SMF (service) instance. Applicable if the feature "ES3XX" is supported.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during Individual SMF Notification Subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SMF (service) instance. Applicable if the feature "ES3XX" is supported..
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SMF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected

Table 5.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SMF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected

5.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 5.3.3.3.2-1.

Table 5.3.3.3.2-1: 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 5.3.3.3.2-2 and the response data structures and response codes specified in table 5.3.3.3.2-3.

Table 5.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
NsmfEventExposure	M	1	Modify the existing Individual SMF Notification Subscription resource matching the subId according to the representation in the NsmfEventExposure

Table 5.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NsmfEventExposure	M	1	200 OK	Successful case: The Individual SMF Notification Subscription resource matching the subId was modified and a representation is returned.
n/a			204 No Content	Successful case: The Individual SMF Notification Subscription resource matching the subId was modified.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during Individual SMF Notification Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SMF (service) instance. Applicable if the feature "ES3XX" is supported.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during Individual SMF Notification Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SMF (service) instance. Applicable if the feature "ES3XX" is supported..
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SMF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected

Table 5.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SMF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected

5.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.3.3.3.3-1.

Table 5.3.3.3.3-1: 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 5.3.3.3.3-2 and the response data structures and response codes specified in table 5.3.3.3.3-3.

Table 5.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case: The Individual SMF Notification Subscription resource matching the subId was deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during Individual SMF Notification Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SMF (service) instance. Applicable if the feature "ES3XX" is supported.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during Individual SMF Notification Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative SMF (service) instance. Applicable if the feature "ES3XX" is supported..
NOTE: The manadatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SMF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected

Table 5.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative SMF (service) instance.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the request is redirected

5.3.3.4 Resource Custom Operations

None.

5.4 Custom Operations without associated resources

None.

5.5 Notifications

5.5.1 General

Notifications shall comply to clause 6.2 of 3GPP TS 29.500 [4] and clause 4.6.2.3 of 3GPP TS 29.501 [5].

Table 5.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Event Notification	{notifUri}	POST	Provides information about observed events.
Acknowledgement of event notification	{ackUri}	POST	Provides acknowledgement of event notification

5.5.2 Event Notification

5.5.2.1 Description

The Event Notification is used by the SMF to report one or several observed Events to a NF service consumer that has subscribed to such Notifications.

NOTE 1: The definition of "callbacks" in the OpenAPI specification found in clause A.2 associated to the POST method of the "SMF Notification Subscriptions" resource is used as the notification request for both explicit and implicit subscriptions.

NOTE 2: For implicit subscriptions, the PCF can have previously stored in the SMF the notification URI to be used in the notifications initiated by the SMF. See 3GPP TS 29.512 [14] for the details.

5.5.2.2 Target URI

The Callback URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.5.2.2-1.

Table 5.5.2.2-1: Callback URI variables

Name	Data type	Definition
notifUri	Uri	The Notification Uri as assigned either within the Individual SMF Notification Subscription Resource during the explicit subscription service operation and described within the NsmfEventExposure type (see table 5.6.2.2-1) or assigned during the implicit subscription via the provisioning of the subscription information within the PCC Rule from the PCF (see 3GPP TS 29.512 [14].

5.5.2.3 Standard Methods

5.5.2.3.1 POST

This method shall support the URI query parameters specified in table 5.5.2.3.1-1.

Table 5.5.2.3.1-1: 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 5.5.2.3.1-2 and the response data structures and response codes specified in table 5.5.2.3.1-3.

Table 5.5.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
NsmfEventExposureNotification	M	1	Provides Information about observed events

Table 5.5.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the acknowledgement request should be sent. Applicable if the feature "ES3XX" is supported.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. Applicable if the feature "ES3XX" is supported.
ProblemDetails	O	0..1	404 Not Found	The NF service consumer can use this response when the notification can be sent to another host.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.5.2.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected. May be included if the feature "ES3XX" is supported.

Table 5.5.2.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected

5.5.3 Acknowledgement of event notification

5.5.3.1 Description

The Acknowledgement of Event Notification is used by the NF service consumer to acknowledge the SMF about handling result of the event notification (e.g. UP path change).

5.5.3.2 Target URI

The Callback URI **"{ackUri}"** shall be used with the callback URI variables defined in table 5.5.3.2-1.

Table 5.5.3.2-1: Callback URI variables

Name	Data type	Definition
ackUri	Uri	Acknowledgement Uri as assigned during the procedure of notification about subscribed events and described within the NsmfEventExposureNotification data type (see table 5.6.2.3-1).

5.5.3.3 Standard Methods

5.5.3.3.1 POST

This method shall support the URI query parameters specified in table 5.5.3.3.1-1.

Table 5.5.3.3.1-1: 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 5.5.3.3.1-2 and the response data structures and response codes specified in table 5.5.3.3.1-3.

Table 5.5.3.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AckOfNotify	M	1	Acknowledgement information of event notification

Table 5.5.3.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the acknowledgement is successful.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during acknowledgement of notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SMF (service) instance where the acknowledgement request should be sent. Applicable if the feature "ES3XX" is supported.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during acknowledgement of notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative SMF (service) instance where the acknowledgement request should be sent. Applicable if the feature "ES3XX" is supported.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.5.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SMF (service) instance towards which the acknowledgement should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the acknowledgement request is redirected

Table 5.5.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative SMF (service) instance towards which the acknowledgement should be redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the acknowledgement request is redirected

5.6 Data Model

5.6.1 General

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

Table 5.6.1-1 specifies the data types defined for the Nsmf_EventExposure service based interface protocol.

Table 5.6.1-1: Nsmf_EventExposure specific Data Types

Data type	Section defined	Description	Applicability
AckOfNotify	5.6.2.7	Acknowledgement information of event notification	
AppliedSmccType	5.6.3.6	The type of applied SM congestion control.	SMCCE
EventNotification	5.6.2.5	Describes notifications about a single event that occurred.	
EventSubscription	5.6.2.4	Represents the subscription to a single event	
NotificationMethod	5.6.3.4	Represents the notification methods that can be subscribed	
NsmfEventExposure	5.6.2.2	Represents an Individual SMF Notification Subscription resource	
NsmfEventExposureNotification	5.6.2.3	Describes Notifications about events that occurred.	
PduSessionInfo	5.6.2.12	Represents session information.	UeCommunication
PduSessionInformation	5.6.2.11	Represents the PDU session related information.	UeCommunication
PduSessionStatus	5.6.3.8	Status of the PDU Session.	UeCommunication
SmfEvent	5.6.3.3	Represents the types of events that can be subscribed	
SubId	5.6.3.2	Identifies an Individual SMF Notification Subscription.	
SmNasFromSmf	5.6.2.9	Describes the information of the SM NAS messages from SMF with backoff timer	SMCCE
SmNasFromUe	5.6.2.8	Describes the information of the SM NAS requests from UE	SMCCE
TransactionInfo	5.6.2.10	UE Session Management transaction information.	Dispersion
TransactionMetric	5.6.3.7	Metric on UE Session Management transactions.	Dispersion
UpfInformation	5.6.2.13	The information of the UPF serving the UE.	ServiceExperience DnPerformance

Table 5.6.1-2 specifies data types re-used by the Nsmf_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 Nsmf_EventExposure service based interface.

Table 5.6.1-2: Nsmf_EventExposure re-used Data Types

Data type	Reference	Comments	Applicability
AccessType	3GPP TS 29.571 [11]		
AfResultInfo	3GPP TS 29.522 [20]	Represents application handling information.	
ApplicationId	3GPP TS 29.571 [11]	The application identifier.	QfiAllocation
CommunicationFailure	3GPP TS 29.518 [13]	Represents the communication failure information.	Communication Failure
DateTime	3GPP TS 29.571 [11]		
DlDataDeliveryStatus	3GPP TS 29.571 [11]	Status of downlink data delivery	DownlinkDataDeliveryStatus
DddTrafficDescriptor	3GPP TS 29.571 [11]	Traffic descriptor of source of downlink data	DownlinkDataDeliveryStatus
Dnai	3GPP TS 29.571 [11]		
DnaiChangeType	3GPP TS 29.571 [11]	Describes the types of DNAI change.	
Dnn	3GPP TS 29.571 [11]		QfiAllocation, PduSessionStatus
DurationSec	3GPP TS 29.571 [11]		
EthFlowDescription	3GPP TS 29.514 [22]	Ethernet flow description	QfiAllocation
FlowDescription	3GPP TS 29.514 [22]	IP flow description	QfiAllocation
Fqdn	3GPP TS 29.571 [11]	FQDN	
Gpsi	3GPP TS 29.571 [11]		
GroupId	3GPP TS 29.571 [11]		
Guami	3GPP TS 29.571 [11]	Globally Unique AMF Identifier	
IpAddr	3GPP TS 29.571 [11]	UE IP address.	Dispersion
Ipv4Addr	3GPP TS 29.571 [11]		
Ipv6Addr	3GPP TS 29.571 [11]		
Ipv6Prefix	3GPP TS 29.571 [11]		
MacAddr48	3GPP TS 29.571 [11]	MAC Address.	
NotificationFlag	3GPP TS 29.571 [11]	Notification flag.	EneNA
PartitioningCriteria	3GPP TS 29.571 [11]	Used to partition UEs before applying sampling.	EneNA
PduSessionId	3GPP TS 29.571 [11]		
PduSessionType	3GPP TS 29.571 [11]	PDU session type.	PduSessionStatus
PlmnIdNid	3GPP TS 29.571 [11]	Identification of a network: the PLMN Identifier or the SNPN Identifier (the PLMN Identifier and the NID).	
ProblemDetails	3GPP TS 29.571 [11]		
Qfi	3GPP TS 29.571 [11]	QoS flow identifier.	QfiAllocation
RatType	3GPP TS 29.571 [11]		
RedirectResponse	3GPP TS 29.571 [11]	Contains redirection related information.	ES3XX
RouteToLocation	3GPP TS 29.571 [11]	A traffic route to/from an DNAI	
SamplingRatio	3GPP TS 29.571 [11]	Sampling Ratio.	
ServiceName	3GPP TS 29.510 [12]	Name of the service instance.	
Snssai	3GPP TS 29.571 [11]	S-NSSAI	QfiAllocation
Supi	3GPP TS 29.571 [11]		
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features defined in table 5.8-1.	
TimeWindow	3GPP TS 29.122 [24]	A start time and a stop time of a time window.	SMCCE
Uinteger	3GPP TS 29.571 [11]		
Uri	3GPP TS 29.571 [11]		

5.6.2 Structured data types

5.6.2.1 Introduction

This clause defines the structures to be used in resource representations.

5.6.2.2 Type NsmfEventExposure

Table 5.6.2.2-1: Definition of type NsmfEventExposure

Attribute name	Data type	P	Cardinality	Description	Applicability
supi	Supi	C	0..1	Subscription Permanent Identifier (NOTE 1)	
gpsi	Gpsi	C	0..1	Generic Public Subscription Identifier (NOTE 1) This IE is not applicable to "SMCC_EXP" event.	
anyUeInd	boolean	C	0..1	This IE shall be present if the event subscription is applicable to any UE. It indicates whether the event subscription is applicable to any UE: - "true": the event subscription is applicable to any UE; - "false"(default): the event subscription is not applicable to any UE. (NOTE 1) (NOTE 4)	
groupId	GroupId	C	0..1	Identifies a group of UEs. (NOTE 1)	
pduSeId	PduSessionId	C	0..1	PDU session ID (NOTE 1)	
dnn	Dnn	O	0..1	Data Network Name.	
snssai	Snssai	O	0..1	A single Network Slice Selection Assistance Information. (NOTE 4)	
subId	SubId	C	0..1	Subscription ID. This parameter shall be supplied by the SMF in HTTP responses that include an object of NsmfEventExposure type.	
notifId	string	M	1	Notification Correlation ID provided by the NF service consumer. (NOTE 2)	
notifUri	Uri	M	1	Identifies the recipient of Notifications sent by the SMF.	
altNotifIpv4Addrs	array(Ipv4Addr)	O	1..N	Alternate or backup IPv4 Address(es) where to send Notifications.	
altNotifIpv6Addrs	array(Ipv6Addr)	O	1..N	Alternate or backup IPv6 Address(es) where to send Notifications.	
altNotifFqdns	array(Fqdn)	O	1..N	Alternate or backup FQDN(s) where to send Notifications.	
eventSubs	array(EventSubscription)	M	1..N	Subscribed events. (NOTE 4)	
eventNotifs	array(EventNotification)	O	1..N	Represents the SMF Events to be reported in the Nsmf_EvenExposure_Subscribe response. May be present when the "ERIR" feature is supported and the "ImmeRep" attribute set to true is included in the subscription request.	ERIR
ImmeRep	boolean	O	0..1	It is included and set to true if the immediate reporting of the current status of the subscribed event, if available is required.	
notifMethod	NotificationMethod	O	0..1	If "notifMethod" is not supplied, the default value "ON_EVENT_DETECTION" applies. (NOTE 4)	
maxReportNbr	Uinteger	O	0..1	If omitted, there is no limit. (NOTE 4)	

expiry	DateTime	C	0..1	This attribute indicates the expiry time of the subscription, after which the SMF shall not send any event notifications and the subscription becomes invalid. It may be included in an event subscription request and may be included in an event subscription response based on operator policies. If an expiry time was included in the request, then the expiry time returned in the response should be less than or equal to that value. If the expiry time is not included in the response, the NF service consumer shall not associate an expiry time for the subscription. (NOTE 4)	
repPeriod	DurationSec	C	0..1	Is supplied for notification Method "periodic".	
guami	Guami	C	0..1	The Globally Unique AMF Identifier (GUAMI) shall be provided by an AMF as NF service consumer.	
serviceName	ServiceName	O	0..1	If the NF service consumer is an AMF, it should provide the name of a service produced by the AMF that makes use of the notification about subscribed events.	
supportedFeatures	SupportedFeatures	C	0..1	List of Supported features used as described in clause 5.8. This parameter shall be supplied by NF service consumer and SMF in the POST request that request the creation of an SMF Notification Subscriptions resource and the related reply, respectively.	
sampRatio	SamplingRatio	O	0..1	Indicates the ratio of the random subset to target UEs, event reports only relates to the subset.	
partitionCriteria	array(PartitioningCriteria)	O	1..N	Defines criteria for partitioning the UEs in order to apply the sampling ratio for each partition. It may only be included in event subscription requests when the "sampRatio" attribute is also provided. (NOTE 3)	EneNA
grpRepTime	DurationSec	O	0..1	Indicates the time for which the SMF aggregates the event reports detected by the UEs in a group and report them together to the NF service consumer.	
notifFlag	NotificationFlag	O	0..1	Indicates the notification flag, which is used to mute/unmute notifications and to retrieve events stored during a period of muted notifications. Default: "ACTIVATE"	EneNA

NOTE 1: If the event subscription applies for a specific PDU session, the PDU session of a single UE (pduSeId, and gpsi/supi) shall be included; otherwise one and only one of a single UE (gpsi/supi), a group of UEs (groupId), or anyUeInd set to true shall be included.

NOTE 2: If the UDM as NF service consumer subscribes to event (e.g. downlink data delivery status, PDU Session Establishment, PDU Session Release) on behalf of AF/NEF, "notifId" shall be set the same as "referenceId" received from the AF/NEF as defined in clause 6.4.6.2.4 of 3GPP TS 29.503 [14].

NOTE 3: For a given type of partitioning criteria, the UE shall belong to only one single partition as long as it is served by the NF service producer.

NOTE 4: If EneNA feature is supported, when the "snssai" attribute is presented together with "anyUeInd" attribute and the "eventSubs" attribute contains "PDU_SES_EST" and "PDU_SES_REL", then only the "ON_EVENT_DETECTION" value is applicable in the "notifMethod" attribute together with "maxReportNbr" attribute and/or "expiry"attribute presence.

5.6.2.3 Type NsmfEventExposureNotification

Table 5.6.2.3-1: Definition of type NsmfEventExposureNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
notifId	string	M	1	Notification correlation ID used to identify the subscription which the notification is corresponding to. It shall be set to the same value as the "notifId" attribute of NsmfEventExposure data type or the value of "notifCorreId" within the UpPathChgEvent data type defined in 3GPP TS 29.512 [14] or the value of "notifyCorreId" within the QosMonitoringData data type defined in 3GPP TS 29.512 [14].	
eventNotifs	array(EventNotification)	M	1..N	Notifications about Individual Events	
ackUri	Uri	O	0..1	The URI provided by the SMF for the AF acknowledgement. If present, it only applies to the "UP_PATH_CH" event indicated in the "eventNotifs" attribute.	

5.6.2.4 Type EventSubscription

Table 5.6.2.4-1: Definition of type EventSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
event	SmfEvent	M	1	Subscribed events	
dnaiChgType	DnaiChangeType	C	0..1	For event UP path change, this attribute indicates whether the subscription is for early, late, or early and late DNAI change notification shall be supplied.	
dddTraDescriptors	array(DddTrafficDescriptor)	C	1..N	The traffic descriptor(s) of the downlink data source. Shall be included for event "DDDS".	DownlinkDataDeliveryStatus
dddStati	array(DlDataDeliveryStatus)	O	1..N	May be included for event "DDDS". The subscribed statuses (discarded, transmitted, buffered) for the event. If omitted all statuses are subscribed.	DownlinkDataDeliveryStatus
appIds	array(ApplicationId)	O	1..N	May be included for event "QFI_ALLOC" or "DISPERSION".	QfiAllocationDispersion
targetPeriod	TimeWindow	O	0..1	Indicates the data collection target period. May be included for event "SMCC_EXP", "RED_TRANS_EXP" or "WLAN_INFO".	SMCCERedundantTransmissionExpWlanPerformance
transacDispInd	boolean	O	0..1	Indicates the subscription for UE transaction dispersion collection, if it is included and set to "true". Default value is "false". May be included for event "DISPERSION".	Dispersion
transacMetrics	array(TransactionMetric)	O	1..N	Requested transaction metrics. May be included for event "DISPERSION".	Dispersion
ueIpAddr	IpAddr	O	0..1	Indicates the UE IP address. May be included for event "DISPERSION".	Dispersion

5.6.2.5 Type EventNotification

Table 5.6.2.5-1: Definition of type EventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
event	SmfEvent	M	1	Event that is notified.	
timeStamp	DateTime	M	1	Time at which the event is observed.	
supi	Supi	C	0..1	Subscription Permanent Identifier. It is included when the subscription applies to a group of UE(s) or any UE.	
gpsi	Gpsi	C	0..1	Identifies a GPSI. It shall contain an MSISDN. It is included when it is available and the subscription applies to a group of UE(s) or any UE. This IE is not applicable to "SMCC_EXP" event.	
ueIpAddr	IpAddr	C	0..1	Indicates the UE IP address, It is included for event "DISPERSION" when it is available and requested in the subscription.	Dispersion
transacInfos	array(TransactionInfo)	C	1..N	Transaction Information. Shall be included for event "DISPERSION".	Dispersion
sourceDnai	Dnai	C	0..1	Source DN Access Identifier. Shall be included for event "UP_PATH_CH" if the DNAI changed (NOTE 1, NOTE 2).	
targetDnai	Dnai	C	0..1	Target DN Access Identifier. Shall be included for event "UP_PATH_CH" if the DNAI changed (NOTE 1, NOTE 2).	
dnaiChgType	DnaiChangeType	C	0..1	DNAI Change Type. Shall be included for event "UP_PATH_CH".	
sourceUeIpv4Addr	Ipv4Addr	O	0..1	The IPv4 Address of the served UE for the source DNAI. May be included for event "UP_PATH_CH".	
sourceUeIpv6Prefix	Ipv6Prefix	O	0..1	The Ipv6 Address Prefix of the served UE for the source DNAI. May be included for event "UP_PATH_CH".	
targetUeIpv4Addr	Ipv4Addr	O	0..1	The IPv4 Address of the served UE for the target DNAI. May be included for event "UP_PATH_CH".	
targetUeIpv6Prefix	Ipv6Prefix	O	0..1	The Ipv6 Address Prefix of the served UE for the target DNAI. May be included for event "UP_PATH_CH".	
sourceTraRouting	RouteToLocation	C	0..1	N6 traffic routing information for the source DNAI. Shall be included for event "UP_PATH_CH" if available (NOTE 2).	
targetTraRouting	RouteToLocation	C	0..1	N6 traffic routing information for the target DNAI. Shall be included for event "UP_PATH_CH" if available (NOTE 2).	
ueMac	MacAddr48	O	0..1	UE MAC address. May be included for event "UP_PATH_CH".	
adIpv4Addr	Ipv4Addr	O	0..1	Added IPv4 Address(es). May be included for event "UE_IP_CH".	
adIpv6Prefix	Ipv6Prefix	O	0..1	Added Ipv6 Address Prefix(es). May be included for event "UE_IP_CH".	
reIpv4Addr	Ipv4Addr	O	0..1	Removed IPv4 Address(es). May be included for event "UE_IP_CH".	
reIpv6Prefix	Ipv6Prefix	O	0..1	Removed Ipv6 Address Prefix(es). May be included for event "UE_IP_CH".	
plmnId	PlmnIdNid	C	0..1	New PLMN Identifier or the SNPN Identifier. Shall be included for event "PLMN_CH". (NOTE 7)	

accType	AccessType	C	0..1	New Access Type. Shall be included for event "AC_TY_CH".	
pduSeId	PduSessionId	C	0..1	PDU session ID. Shall be included for event "PDU_SES_REL" and "PDU_SES_EST". It shall also be included for event "QFI_ALLOC" if the subscription was for a UE, a group of UEs, or any UE, and not for a specific PDU Session.	
ratType	RatType	C	0..1	New RAT Type. Shall be included for event 'RAT_TY_CH'.	EneNA
dddStatus	DlDataDeliveryStatus	C	0..1	Downlink data delivery status (discarded, transmitted, buffered). Shall be included for event "downlink data delivery status",	DownlinkData DeliveryStatus
maxWaitTime	DateTime	C	0..1	The estimated maximum waiting time for downlink data delivery, Shall be included for event "downlink data delivery status" with status "BUFFERED".	DownlinkData DeliveryStatus
dddTraDescriptor	DddTrafficDescriptor	C	0..1	The downlink data descriptor impacted by downlink data delivery status change. Shall be included for event "downlink data delivery status"	DownlinkData DeliveryStatus
commFailure	CommunicationFailur e	C	0..1	Describes the communication failure cause for the UE. Shall be included for event "COMM_FAIL".	Communicatio nFailure
ipv4Addr	Ipv4Addr	O	0..1	IPv4 address. May be included for event "PDU_SES_REL" or "PDU_SES_EST".	PduSessionSt atus
ipv6Prefixes	array(Ipv6Prefix)	O	1..N	IPv6 prefixes. May be included for event "PDU_SES_REL" or "PDU_SES_EST". (NOTE 3)	PduSessionSt atus
ipv6Addrs	array(Ipv6Addr)	O	1..N	IPv6 addresses. May be included for event "PDU_SES_REL" or "PDU_SES_EST". (NOTE 3)	PduSessionSt atus
pduSessType	PduSessionType	C	0..1	PDU session type. Shall be included if the PduSessionStatus feature is supported.	PduSessionSt atus
qfi	Qfi	C	0..1	QoS flow identifier. Shall be included for event "QFI_ALLOC".	QfiAllocation
appId	ApplicationId	O	0..1	Contains the application identifier. May be included for event "QFI_ALLOC". (NOTE 4)	QfiAllocation
ethFlowDescs	array(EthFlowDescript ion)	O	1..N	Descriptor(s) for non-IP traffic in which only ethernet flow description is defined. It allows the encoding of multiple UL and/or DL flows. Each entry of the array describes a single Ethernet flow. May be included for event "QFI_ALLOC", when the description of the Ethernet traffic requires multiple UL and/or DL flows. (NOTE 4)	MultipleFlowD escriptions
ethfDescs	array(EthFlowDescript ion)	O	1..2	Contains the flow description for the Uplink and/or Downlink Ethernet flows. May be included for event "QFI_ALLOC". (NOTE 4)	QfiAllocation
flowDescs	array(FlowDescription)	O	1..N	Descriptor(s) of IP traffic. It allows the encoding of multiple UL and/or DL flows. Each entry of the array describes a single IP flow. May be included for event "QFI_ALLOC", when the description of the IP traffic requires multiple UL and/or DL flows. (NOTE 4)	MultipleFlowD escriptions

fDescs	array(FlowDescription)	O	1..2	Contains the flow description for the Uplink and/or Downlink IP flows. May be included for event "QFI_ALLOC". (NOTE 4)	QfiAllocation
dnn	Dnn	C	0..1	Data network name, Shall be included for event "QFI_ALLOC". May be included for event "PDU_SES_REL" or "PDU_SES_EST". Shall be included to indiate the DNN associated with URLLC service for event "RED_TRANS_EXP". Shall be included if DNN based SMCC is applied.	QfiAllocation, PduSessionStatus RedundantTransmissionExp SMCCE
snssai	Snssai	C	0..1	Identifies the slice information. Shall be included for event "QFI_ALLOC". Shall be included if S-NSSAI based SMCC is applied.	QfiAllocation EneNA SMCCE
ulDelays	array(Uinteger)	O	1..N	Uplink packet delay in units of milliseconds. May be included for event "QOS_MON". (NOTE 5)	QoSMonitoring
dlDelays	array(Uinteger)	O	1..N	Downlink packet delay in units of milliseconds. May be included for event "QOS_MON". (NOTE 5)	QoSMonitoring
rtDelays	array(Uinteger)	O	1..N	Round trip delay in units of milliseconds. May be included for event "QOS_MON". (NOTE 5)	QoSMonitoring
timeWindow	TimeWindow	C	0..1	Time window representing a start time and a stop time of the data collection period. Shall be included for event "SMCC_EXP".	SMCCE
smNasFromUe	array(SmNasFromUe)	C	1..N	Information on the SM NAS messages that SMF receives from UE for PDU Session. Shall be included for event "SMCC_EXP".	SMCCE
smNasFromSmf	array(SmNasFromSmf)	C	1..N	Information on the SM congestion control applied SM NAS messages that SMF sends to UE for PDU Session. Shall be included for event "SMCC_EXP".	SMCCE
upRedTrans	boolean	C	0..1	Indicates whether the redundant transmission is setup or terminated. Set to "true" if the redundant transmission is setup, otherwise set to "false" if the redundant transmission is terminated. Default value is set to "false". Shall be included for event "RED_TRANS_EXP".	RedundantTransmissionExp
ssId	string	C	0..1	SSID that the PDU session is related to. (NOTE 6)	WlanPerformance
bssId	string	C	0..1	BSSID that the PDU session is related to. (NOTE 6)	WlanPerformance
startWlan	DateTime	C	0..1	The time stamp that indicates when the existing PDU Session's access type changes to WLAN or when the new PDU Session for WLAN is established. (NOTE 6)	WlanPerformance
endWlan	DateTime	C	0..1	The time stamp that indicates when the existing WLAN based PDU Session's access type is not WLAN any more or when the PDU Session for WLAN is released. (NOTE 6)	WlanPerformance
pduSessInfos	array(PduSessionInformation)	C	1..N	The PDU session related information. It shall be included for event "UP_STATUS_INFO".	UeCommunication

upfInfo	UpfInformation	C	0..1	The information of the UPF serving the UE. Shall be included for event "UPF_INFO".	ServiceExperience DnPerformance
pdmf	boolean	O	0..1	Packet delay measurement failure indicator. When set to true, it indicates that a packet delay failure has occurred, i.e. no measurement result is available during the reporting period. Default value is false if omitted. May be included for event "QOS_MON".	PacketDelayFailureReport

NOTE 1: If the DNAI is not changed while the N6 traffic routing information is changed, the "sourceDnai" attribute and "targetDnai" attribute shall not be provided.
NOTE 2: The change from the UP path status where no DNAI applies to a status where a DNAI applies indicates the activation of the related AF request and therefore only the target DNAI and N6 traffic routing information is provided in the event notification; the change from the UP path status where a DNAI applies to a status where no DNAI applies indicates the de-activation of the related AF request and therefore only the source DNAI and N6 traffic routing information is provided in the event notification.
NOTE 3: If provided, either ipv6Prefixes or ipv6Addrs shall be present.
NOTE 4: Only one of the appId, ethfDescs, ethFlowDescs, flowDescs or fDescs attributes shall be provided.
NOTE 5: In this release of the specification one element may be included in the array as specified in clause 4.2.2.2.
NOTE 6: If notified event is "WLAN_INFO", then one of the "ssId" or "bssId" attribute and one of the "startWlan" or "endWlan" attribute shall be present.
NOTE 7: The SNPN Identifier consists of the PLMN Identifier and the NID.

5.6.2.6 void.

5.6.2.7 Type AckOfNotify

Table 5.6.2.7-1: Definition of type AckOfNotify

Attribute name	Data type	P	Cardinality	Description	Applicability
notifId	string	M	1	Notification correlation ID provided by the SMF during UP path change notification.	
ackResult	AfResultInfo	M	1	Identifies the result of application layer handling.	
supi	Supi	O	0..1	Subscription Permanent Identifier.	
gpsi	Gpsi	O	0..1	Identifies a GPSI.	

5.6.2.8 Type SmNasFromUe

Table 5.6.2.8-1: Definition of type SmNasFromUe

Attribute name	Data type	P	Cardinality	Description	Applicability
smNasType	string	M	1	The type of SM NAS message transmitted by UE (e.g. PDU Session Establishment Request, PDU Session Modification Request, etc.).	
timeStamp	DateTime	M	1	Indicates the time stamp when SMF receives SM NAS message from UE.	

5.6.2.9 Type SmNasFromSmf

Table 5.6.2.9-1: Definition of type SmNasFromSmf

Attribute name	Data type	P	Cardinality	Description	Applicability
smNasType	string	M	1	The type of SM NAS message with backoff timer provided to UE (e.g. PDU Session Establishment Reject, PDU Session Modification Reject, PDU Session Release Command, etc.).	
timeStamp	DateTime	M	1	Indicates the time stamp when SMF sends SM NAS message to UE.	
backOffTimer	DurationSec	M	1	Indicates the value of backoff timer provided to UE in terms of time units of seconds.	
appliedSmccType	AppliedSmccType	M	1	The type of applied SM congestion control, i.e. DNN based congestion control or S-NSSAI based congestion control.	

5.6.2.10 Type TransactionInfo

Table 5.6.2.10-1: Definition of type TransactionInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
transaction	Uinteger	M	1	Number of transactions.	
snssai	Snssai	C	0..1	Identifier of the network slice.	
appIds	array(ApplicationId)	O	1..N	Application Identifiers.	
transMetrics	array(TransactionMetric)	O	1..N	Indicates Session Management Transaction metrics.	

5.6.2.11 Type PduSessionInformation

Table 5.6.2.11-1: Definition of type PduSessionInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
pduSessId	PduSessionId	C	0..1	Identification of PDU Session. It shall be provided if available.	
sessInfo	PduSessionInfo	C	0..1	Represents session information. It shall be provided if available.	

5.6.2.12 Type PduSessionInfo

Table 5.6.2.12-1: Definition of type PduSessionInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
n4SessId	string	C	0..1	Identification of N4 Session. It shall be provided if available.	
sessInactiveTimer	DurationSec	C	0..1	The value of the session inactivity timer. It shall be provided if available.	
pduSessStatus	PduSessionStatus	C	0..1	Status of the PDU Session. It shall be provided if available.	

5.6.2.13 Type UpfInformation

Table 5.6.2.13-1: Definition of type UpfInformation

Attribute name	Data type	P	Cardinality	Description	Applicability
upfId	string	C	0..1	Identifies the UPF. (NOTE 1) (NOTE 2)	
upfAddr	AddrFqdn	C	0..1	Represents the IP address/FQDN of the UPF. (NOTE 1) (NOTE 2)	
NOTE 1: At least one of the "upfId" attribute and "upfAddr" attribute shall be included. NOTE 2: The "upfId" attribute and "upfAddr" attribute may indicate an anchor UPF of the PDU session containing the QoS flow.					

5.6.3 Simple data types and enumerations

5.6.3.1 Introduction

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

5.6.3.2 Simple data types

The simple data types defined in table 5.6.3.2-1 shall be supported.

Table 5.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
SubId	string	Identifies an Individual SMF Notification Subscription. To enable that the value is used as part of a URI, the string shall only contain characters allowed according to the "lower-with-hyphen" naming convention defined in 3GPP TS 29.501 [5]. In an OpenAPI [10] schema, the format shall be designated as "SubId".	

5.6.3.3 Enumeration: SmfEvent

Table 5.6.3.3-1: Enumeration SmfEvent

Enumeration value	Description	Applicability
AC_TY_CH	Access Type Change	
UP_PATH_CH	UP Path Change	
PDU_SES_REL	PDU Session Release	
PLMN_CH	PLMN Change	
UE_IP_CH	UE IP address change	
RAT_TY_CH	RAT Type Change	EneNA
DDDS	Downlink data delivery status	DownlinkDataDeliveryStatus
COMM_FAIL	Communication failure	CommunicationFailure
PDU_SES_EST	PDU Session Establishment	PduSessionStatus
QFI_ALLOC	QFI allocation	QfiAllocation
QOS_MON	QoS Monitoring	QoSMonitoring
SMCC_EXP	SM congestion control experience for PDU Session	SMCCE
DISPERSION	Session Management transaction dispersion	Dispersion
RED_TRANS_EXP	Redundant transmission experience for PDU Session	RedundantTransmissionExp
WLAN_INFO	WLAN information on PDU session for which Access Type is NON_3GPP_ACCESS and RAT Type is TRUSTED_WLAN	WlanPerformance
UPF_INFO	The UPF information, including the UPF ID/address/FQDN information.	ServiceExperience DnPerformance
UP_STATUS_INFO	User Plane status information	UeCommunication

5.6.3.4 Enumeration: NotificationMethod

The enumeration NotificationMethod represents the notification methods that can be subscribed. It shall comply with the provisions defined in table 5.6.3.4-1.

Table 5.6.3.4-1: Enumeration NotificationMethod

Enumeration value	Description	Applicability
PERIODIC	The notification is periodically sent.	
ONE_TIME	The notification is only sent one time.	
ON_EVENT_DETECTION	The notification is sent each time the event is detected.	

5.6.3.5 void.

5.6.3.6 Enumeration: AppliedSmccType

Table 5.6.3.6-1: Enumeration AppliedSmccType

Enumeration value	Description	Applicability
DNN_CC	Indicates the DNN based congestion control.	
SNSSAI_CC	Indicates the S-NSSAI based congestion control.	

5.6.3.7 Enumeration: TransactionMetric

Table 5.6.3.7-1: Enumeration TransactionMetric

Enumeration value	Description	Applicability
PDU_SES_EST	PDU Session Establishment	
PDU_SES_AUTH	PDU Session Authenication	
PDU_SES_MODIF	PDU Session Modification	
PDU_SES_REL	PDU Session Release	

5.6.3.8 Enumeration: PduSessionStatus

Table 5.6.3.8-1: Enumeration PduSessionStatus

Enumeration value	Description	Applicability
ACTIVATED	Indicates the pdu session status is activated.	
DEACTIVATED	Indicates the pdu session status is deactivated.	

5.7 Error handling

5.7.1 General

For the Nsmf_EventExposure API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Nsmf_EventExposure API.

5.7.2 Protocol Errors

No specific procedures for the Nsmf_EventExposure service are specified.

5.7.3 Application Errors

The application errors defined for the Nsmf_EventExposure service are listed in Table 5.7.3-1.

Table 5.7.3-1: Application errors

Application Error	HTTP status code	Description

5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Nsmf_EventExposure API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.8-1: Supported Features

Feature number	Feature Name	Description
1	DownlinkDataDeliveryStatus	This feature indicates support for the "Downlink data delivery status" event.
2	CommunicationFailure	This feature indicates support for the "communication failure" event.
3	PduSessionStatus	This feature indicates support for the PDU session establishment event and enhancement (PDU session type, IP address) for the PDU session release event.
4	QfiAllocation	This feature indicates support for the "QFI allocation" event.
5	QosMonitoring	This feature indicates support for the "QoS Monitoring" event.
6	ES3XX	Extended Support for 3xx redirections. This feature indicates the support of redirection for any service operation, according to Stateless NF procedures as specified in clauses 6.5.3.2 and 6.5.3.3 of 3GPP TS 29.500 [4] and according to HTTP redirection principles for indirect communication, as specified in clause 6.10.9 of 3GPP TS 29.500 [4].
7	EneNA	This feature indicates support for the enhancements of network data analytics requirements.
8	ULBuffering	This feature indicates support for Uplink buffering indication. (See NOTE)
9	SMCCE	This feature indicates support for Session Management Congestion Control Experience for PDU Session.
10	Dispersion	This feature indicates support for Session Management transactions dispersion.
11	ERIR	Indicates the support of immediate report within the subscription response.
12	RedundantTransmissionExp	This feature indicates support for Redundant Transmission Experience.
13	WlanPerformance	This feature indicates support for WLAN information on PDU Session for which Access Type is NON_3GPP_ACCESS and RAT Type is TRUSTED_WLAN, to support WLAN performance analytics.
14	EASIPreplacement	This feature indicates the support of provisioning of EAS IP replacement info (See NOTE).
15	BIUMR	This feature bit indicates whether the NF Service Consumer (e.g. SMF) and PCF supports Binding Indication Update for multiple resource contexts specified in clauses 6.12.1 and 5.2.3.2.6 of 3GPP TS 29.500 [4].
16	UeCommunication	This feature indicates the support of UE communication analytics.
17	ServiceExperience	This feature indicates support for service experience analytics.
18	DnPerformance	This feature indicates support for DN performance analytics.
19	MultipleFlowDescriptions	This feature indicates the support of the report of multiple UL and/or DL flows.
20	PacketDelayFailureReport	This feature indicates the support of packet delay failure report as part of QoS Monitoring procedures. This feature requires that QosMonitoring feature is supported.
NOTE: SMF and NF service consumers shall determine the support of this feature.		

5.9 Security

As indicated in 3GPP TS 33.501 [15] and 3GPP TS 29.500 [4], the access to the Nsmf_EventExposure API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [16]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, an NF service consumer, prior to consuming services offered by the Nsmf_EventExposure API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], 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 Nsmf_EventExposure service.

The Nsmf_EventExposure API defines a single scope "nsmf-event-exposure" for the entire service, and it does not define any additional scopes at resource or operation level.

Annex A (normative): OpenAPI specification

A.1 General

The present Annex contains an OpenAPI [10] specification of HTTP messages and content bodies used by the Nsmf_EventExposure API.

This Annex shall take precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API.

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 file contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [19] and clause 5.3.1 of the 3GPP TS 29.501 [5] for further information).

A.2 Nsmf_EventExposure API

```
openapi: 3.0.0

info:
  version: 1.2.4
  title: Nsmf_EventExposure
  description: |
    Session Management Event Exposure Service.
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.508 V17.15.0; 5G System; Session Management Event Exposure Service.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.508/

servers:
  - url: '{apiRoot}/nsmf-event-exposure/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
    - nsmf-event-exposure

paths:
  /subscriptions:
    post:
      operationId: CreateIndividualSubcription
      summary: Create an individual subscription for event notifications from the SMF
      tags:
        - Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NsmfEventExposure'
      responses:
        '201':
          description: Created.
          headers:
            Location:
              description: >
                Contains the URI of the newly created resource, according to the structure
```

```
            {apiRoot}/nsmf-event-exposure/v1/subscriptions/{subId}
          required: true
          schema:
            type: string
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/NsmfEventExposure'
    '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'
    default:
      $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  callbacks:
    myNotification:
      '{$request.body#/notifUri}':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/NsmfEventExposureNotification'
          responses:
            '204':
              description: No Content, Notification was successful.
            '307':
              $ref: 'TS29571_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29571_CommonData.yaml#/components/responses/308'
            '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'
            default:
              $ref: 'TS29571_CommonData.yaml#/components/responses/default'
          callbacks:
            afAcknowledgement:
              '{request.body#/ackUri}':
                post:
                  requestBody:  # contents of the callback message
                    required: true
                    content:
                      application/json:
                        schema:
```

```
                        $ref: '#/components/schemas/AckOfNotify'
                    responses:
                      '204':
                        description: No Content (successful acknowledgement)
                      '307':
                        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
                      '308':
                        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
                      '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'
                      default:
                        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subId}:
    get:
      operationId: GetIndividualSubcription
      summary: Read an individual subscription for event notifications from the SMF
      tags:
        - IndividualSubscription (Document)
      parameters:
        - name: subId
          in: path
          description: Event Subscription ID
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NsmfEventExposure'
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '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'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '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'
    put:
      operationId: ReplaceIndividualSubcription
      summary: Replace an individual subscription for event notifications from the SMF
      tags:
        - IndividualSubscription (Document)
```

```
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/NsmfEventExposure'
    parameters:
      - name: subId
        in: path
        description: Event Subscription ID
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK. Resource was successfully modified and representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NsmfEventExposure'
      '204':
        description: No Content. Resource was successfully modified
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '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'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
  delete:
    operationId: DeleteIndividualSubcription
    summary: Delete an individual subscription for event notifications from the SMF
    tags:
      - IndividualSubscription (Document)
    parameters:
      - name: subId
        in: path
        description: Event Subscription ID
        required: true
        schema:
          type: string
    responses:
      '204':
        description: No Content. Resource was successfully deleted
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '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'
      '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'

components:

  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nsmf-event-exposure: Access to the Nsmf_EventExposure API

  schemas:

    NsmfEventExposure:
      description: >
        Represents an Individual SMF Notification Subscription resource. The serviveName property
        corresponds to the serviceName in the main body of the specification.
      type: object
      properties:
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        anyUeInd:
          type: boolean
          description: >
            Any UE indication. This IE shall be present if the event subscription is applicable to
            any UE. Default value "false" is used, if not present.
        groupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        pduSeId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        subId:
          $ref: '#/components/schemas/SubId'
        notifId:
          type: string
          description: Notification Correlation ID assigned by the NF service consumer.
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        altNotifIpv4Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
          description: Alternate or backup IPv4 address(es) where to send Notifications.
          minItems: 1
        altNotifIpv6Addrs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
          description: Alternate or backup IPv6 address(es) where to send Notifications.
          minItems: 1
        altNotifFqdns:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Fqdn'
          minItems: 1
          description: Alternate or backup FQDN(s) where to send Notifications.
        eventSubs:
          type: array
          items:
            $ref: '#/components/schemas/EventSubscription'
          minItems: 1
          description: Subscribed events
        eventNotifs:
          type: array
          items:
            $ref: '#/components/schemas/EventNotification'
          minItems: 1
```

```
      ImmeRep:
        type: boolean
      notifMethod:
        $ref: '#/components/schemas/NotificationMethod'
      maxReportNbr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      expiry:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      repPeriod:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      guami:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'
      serviveName:
        $ref: 'TS29510_Nnrf_NFManagement.yaml#/components/schemas/ServiceName'
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      sampRatio:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
      partitionCriteria:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PartitioningCriteria'
        minItems: 1
        description: Criteria for partitioning the UEs before applying the sampling ratio.
      grpRepTime:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      notifFlag:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/NotificationFlag'
    required:
      - notifId
      - notifUri
      - eventSubs

  NsmfEventExposureNotification:
    description: Represents notifications on events that occurred.
    type: object
    properties:
      notifId:
        type: string
        description: Notification correlation ID
      eventNotifs:
        type: array
        items:
          $ref: '#/components/schemas/EventNotification'
        minItems: 1
        description: Notifications about Individual Events
      ackUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    required:
      - notifId
      - eventNotifs

  EventSubscription:
    description: Represents a subscription to a single event.
    type: object
    properties:
      event:
        $ref: '#/components/schemas/SmfEvent'
      dnaiChgType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DnaiChangeType'
      dddTraDescriptors:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DddTrafficDescriptor'
        minItems: 1
      dddStati:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DlDataDeliveryStatus'
        minItems: 1
      appIds:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
        minItems: 1
      targetPeriod:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
      transacDispInd:
```

```
        type: boolean
        description: >
          Indicates the subscription for UE transaction dispersion collectionon, if it is included
          and set to "true". Default value is "false".
      transacMetrics:
        type: array
        items:
          $ref: '#/components/schemas/TransactionMetric'
        description: Indicates Session Management Transaction metrics.
        minItems: 1
      ueIpAddr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
    required:
      - event

  EventNotification:
    description: Represents a notification related to a single event that occurred.
    type: object
    properties:
      event:
        $ref: '#/components/schemas/SmfEvent'
      timeStamp:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      gpsi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      ueIpAddr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
      transacInfos:
        type: array
        items:
          $ref: '#/components/schemas/TransactionInfo'
        description: Transaction Information.
        minItems: 1
      sourceDnai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
      targetDnai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
      dnaiChgType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DnaiChangeType'
      sourceUeIpv4Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      sourceUeIpv6Prefix:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
      targetUeIpv4Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      targetUeIpv6Prefix:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
      sourceTraRouting:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
      targetTraRouting:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
      ueMac:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
      adIpv4Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      adIpv6Prefix:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
      reIpv4Addr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
      reIpv6Prefix:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
      plmnId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnIdNid'
      accType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/AccessType'
      pduSeId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
      ratType:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/RatType'
      dddStatus:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DlDataDeliveryStatus'
      dddTraDescriptor:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DddTrafficDescriptor'
      maxWaitTime:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      commFailure:
```

```
      $ref: 'TS29518_Namf_EventExposure.yaml#/components/schemas/CommunicationFailure'
    ipv4Addr:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
    ipv6Prefixes:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
      minItems: 1
    ipv6Addrs:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
      minItems: 1
    pduSessType:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionType'
    qfi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Qfi'
    appId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
    ethFlowDescs:
      type: array
      items:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
      minItems: 1
      description: >
        Descriptor(s) for non-IP traffic. It allows the encoding of multiple UL and/or DL flows.
        Each entry of the array describes a single Ethernet flow.
    ethfDescs:
      type: array
      items:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
      minItems: 1
      maxItems: 2
      description: >
        Contains the UL and/or DL Ethernet flows. Each entry of the array describes a single
        Ethernet flow.
    flowDescs:
      type: array
      items:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/FlowDescription'
      minItems: 1
      description: >
        Descriptor(s) for IP traffic. It allows the encoding of multiple UL and/or DL flows.
        Each entry of the array describes a single IP flow.
    fDescs:
      type: array
      items:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/FlowDescription'
      minItems: 1
      maxItems: 2
      description: >
        Contains the UL and/or DL IP flows. Each entry of the array describes a single
        IP flow.
    dnn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
    snssai:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    ulDelays:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      minItems: 1
    dlDelays:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      minItems: 1
    rtDelays:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      minItems: 1
    pdmf:
      type: boolean
      description: Represents the packet delay measurement failure indicator.
    timeWindow:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
    smNasFromUe:
```

```
        $ref: '#/components/schemas/SmNasFromUe'
      smNasFromSmf:
        $ref: '#/components/schemas/SmNasFromSmf'
      upRedTrans:
        type: boolean
        description: >
          Indicates whether the redundant transmission is setup or terminated. Set to "true" if
          the redundant transmission is setup, otherwise set to "false" if the redundant
          transmission is terminated. Default value is set to "false".
      ssId:
        type: string
      bssId:
        type: string
      startWlan:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      endWlan:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      pduSessInfos:
        type: array
        items:
          $ref: '#/components/schemas/PduSessionInformation'
        minItems: 1
      upfInfo:
        $ref: '#/components/schemas/UpfInformation'
    required:
      - event
      - timeStamp

  SubId:
    type: string
    format: SubId
    description: >
      Identifies an Individual SMF Notification Subscription. To enable that the value is used as
      part of a URI, the string shall only contain characters allowed according to the
      "lower-with-hyphen" naming convention defined in 3GPP TS 29.501. In an OpenAPI schema, the
      format shall be designated as "SubId".

  AckOfNotify:
    description: Represents an acknowledgement information of an event notification.
    type: object
    properties:
      notifId:
        type: string
      ackResult:
        $ref: 'TS29522_TrafficInfluence.yaml#/components/schemas/AfResultInfo'
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      gpsi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
    required:
      - notifId
      - ackResult

  SmNasFromUe:
    description: >
      Represents information on the SM NAS messages that SMF receives from UE for PDU Session.
    type: object
    properties:
      smNasType:
        type: string
      timeStamp:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    required:
      - smNasType
      - timeStamp

  SmNasFromSmf:
    description: >
      Represents information on the SM congestion control applied SM NAS messages that SMF sends
      to UE for PDU Session.
    type: object
    properties:
      smNasType:
        type: string
      timeStamp:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      backoffTimer:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
```

```
      appliedSmccType:
        $ref: '#/components/schemas/AppliedSmccType'
    required:
      - smNasType
      - timeStamp
      - backoffTimer
      - appliedSmccType

  TransactionInfo:
    description: Represents SMF Transaction Information.
    type: object
    properties:
      transaction:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      snssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      appIds:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
        minItems: 1
      transacMetrics:
        type: array
        items:
          $ref: '#/components/schemas/TransactionMetric'
        minItems: 1
    required:
      - transaction

  PduSessionInformation:
    description: Represents the PDU session related information.
    type: object
    properties:
      pduSessId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionId'
      sessInfo:
        $ref: '#/components/schemas/PduSessionInfo'

  PduSessionInfo:
    description: Represents session information.
    type: object
    properties:
      n4SessId:
        type: string
        description: The identifier of the N4 session for the reported PDU Session.
      sessInactiveTimer:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      pduSessStatus:
        $ref: '#/components/schemas/PduSessionStatus'

  UpfInformation:
    description: Represents the ID/address/FQDN of the UPF.
    type: object
    properties:
      upfId:
        type: string
      upfAddr:
        $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/AddrFqdn'

  SmfEvent:
    anyOf:
    - type: string
      enum:
        - AC_TY_CH
        - UP_PATH_CH
        - PDU_SES_REL
        - PLMN_CH
        - UE_IP_CH
        - RAT_TY_CH
        - DDDS
        - COMM_FAIL
        - PDU_SES_EST
        - QFI_ALLOC
        - QOS_MON
        - SMCC_EXP
        - DISPERSION
        - RED_TRANS_EXP
        - WLAN_INFO
```

```
        - UPF_INFO
        - UP_STATUS_INFO
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
    description: |
      Possible values are:
      - AC_TY_CH: Access Type Change
      - UP_PATH_CH: UP Path Change
      - PDU_SES_REL: PDU Session Release
      - PLMN_CH: PLMN Change
      - UE_IP_CH: UE IP address change
      - RAT_TY_CH: RAT Type Change
      - DDDS: Downlink data delivery status
      - COMM_FAIL: Communication Failure
      - PDU_SES_EST: PDU Session Establishment
      - QFI_ALLOC: QFI allocation
      - QOS_MON: QoS Monitoring
      - SMCC_EXP: SM congestion control experience for PDU Session
      - DISPERSION: Session Management transaction dispersion
      - RED_TRANS_EXP: Redundant transmission experience for PDU Session
      - WLAN_INFO: WLAN information on PDU session for which Access Type is NON_3GPP_ACCESS and
        RAT Type is TRUSTED_WLAN
      - UPF_INFO: The UPF information, including the UPF ID/address/FQDN information.
      - UP_STATUS_INFO: The User Plane status information.

  NotificationMethod:
    anyOf:
    - type: string
      enum:
        - PERIODIC
        - ONE_TIME
        - ON_EVENT_DETECTION
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
    description: |
      Possible values are:
      - PERIODIC
      - ONE_TIME
      - ON_EVENT_DETECTION

  AppliedSmccType:
    anyOf:
    - type: string
      enum:
        - DNN_CC
        - SNSSAI_CC
      description: >
        This string indicates the type of applied SM congestion control.
    - type: string
      description: >
        This string provides forward-compatibility with future
        extensions to the enumeration but is not used to encode
        content defined in the present version of this API.
    description: |
      Possible values are:
      - DNN_CC: Indicates the DNN based congestion control.
      - SNSSAI_CC: Indicates the S-NSSAI based congestion control.

  TransactionMetric:
    anyOf:
    - type: string
      enum:
        - PDU_SES_EST
        - PDU_SES_AUTH
        - PDU_SES_MODIF
        - PDU_SES_REL
    - type: string
      description: >
        This string Indicates Session Management Transaction metrics.
    description: |
      Possible values are:
      - PDU_SES_EST: PDU Session Establishment
```

```
      - PDU_SES_AUTH: PDU Session Authentication
      - PDU_SES_MODIF: PDU Session Modification
      - PDU_SES_REL: PDU Session Release

  PduSessionStatus:
    anyOf:
    - type: string
      enum:
        - ACTIVATED
        - DEACTIVATED
    - type: string
      description: >
        This string Indicates the status of the PDU Session.
    description: |
      Possible values are:
      - ACTIVATED: PDU Session status is activated.
      - DEACTIVATED: PDU Session status is deactivated.
```

Annex B (informative): Change history

Change history

Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-10						TS skeleton of Session Management Event Exposure Service specification	0.0.0
2017-10	CT3#92					C3-175326,C3-175327 and C3-175281	0.1.0
2017-12	CT3#93					C3-176071, C3-176240, C3-176316, C3-176242, C3-176243, C3-176244, C3-176317 and C3-176318	0.2.0
2018-01	CT3#94					C3-180034, C3-180196 and C3-180197	0.3.0
2018-03	CT3#95	C3-181366				Inclusion of P-CRs agreed in CT3#95: C3-181214, C3-181215, C3-181216, C3-181217, C3-181354, C3-181353.	0.4.0
2018-04	CT3#96					C3-182315, C3-182316, C3-182144, C3-182317	0.5.0
2018-05	CT3#97					C3-183452, C3-183451, C3-183829, C3-183453, C3-183454, C3-183283 and C3-183455.	0.6.0
2018-06	CT#80	CP-181039				TS sent to plenary for approval	1.0.0
2018-06	CT#80	CP-181039				TS approved by plenary	15.0.0
2018-09	CT#81	CP-182015	0001	2	F	DNAI change notification type	15.1.0
2018-09	CT#81	CP-182015	0002	4	F	Completion of Error Codes in OpenAPI file	15.1.0
2018-09	CT#81	CP-182015	0003		F	Definition of DNAI	15.1.0
2018-09	CT#81	CP-182015	0004	2	F	Stateless AMF support updates	15.1.0
2018-09	CT#81	CP-182015	0007	1	F	Encoding of the "N6 traffic routing information"	15.1.0
2018-09	CT#81	CP-182033	0008	2	F	Addition of Time Stamp	15.1.0
2018-09	CT#81	CP-182015	0009	1	F	Update of resource figure	15.1.0
2018-09	CT#81	CP-182015	0010		F	Update of resource figure	15.1.0
2018-12	CT#82	CP-183205	0011	6	F	Correction to the event subscription	15.2.0
2018-12	CT#82	CP-183205	0012	4	F	Correction to the AF influence traffic steering control	15.2.0
2018-12	CT#82	CP-183137	0013	5	F	Immediate reporting flag	15.2.0
2018-12	CT#82	CP-183205	0014	2	F	UE ID in the notification	15.2.0
2018-12	CT#82	CP-183205	0015	1	F	Correction to the overview	15.2.0
2018-12	CT#82	CP-183205	0016	2	F	Correction to the NF consumer	15.2.0
2018-12	CT#82	CP-183205	0017	1	F	Location Header	15.2.0
2018-12	CT#82	CP-183205	0018		F	Data for notification	15.2.0
2018-12	CT#82	CP-183205	0019	1	F	NotificationMethod	15.2.0
2018-12	CT#82	CP-183205	0020	1	F	Correction of apiName	15.2.0
2018-12	CT#82	CP-183205	0021		F	Default value for apiRoot	15.2.0
2018-12	CT#82	CP-183205	0023		F	API version	15.2.0
2018-12	CT#82	CP-183205	0024	1	F	ExternalDocs OpenAPI field	15.2.0
2018-12	CT#82	CP-183205	0025		F	Location header field in OpenAPI	15.2.0
2018-12	CT#82	CP-183205	0026	1	F	Security	15.2.0
2018-12	CT#82	CP-183205	0027		F	supported content types	15.2.0
2018-12	CT#82	CP-183205	0028	2	F	HTTP Error responses	15.2.0
2018-12	CT#82	CP-183205	0029	1	F	Monitoring identities	15.2.0
2018-12	CT#82	CP-183205	0030		F	Correction to the names of data types	15.2.0
2018-12	CT#82	CP-183205	0031		F	Report of Ethernet UE address	15.2.0

2019-03	CT#83	CP-190117	0032	1	F	Correction of name of security scope	15.3.0
2019-03	CT#83	CP-190117	0033	2	F	API version update for Rel-15	15.3.0
2019-03	CT#83	CP-190117	0034	1	F	Correction of URIs in resource structure table and figure	15.3.0
2019-06	CT#84	CP-191074	0037	3	F	Correct condition for DNAI in UP path change	15.4.0
2019-06	CT#84	CP-191074	0038	1	F	Precedence of OpenAPI file	15.4.0
2019-06	CT#84	CP-191074	0041	1	F	Correction of Misplaced Location header in OpenAPI file	15.4.0
2019-06	CT#84	CP-191074	0043	2	F	API version Update	15.4.0
2019-06	CT#84	CP-191074	0044	1	F	Copyright Note in YAML file	15.4.0
2019-06	CT#84	CP-191070	0039	3	B	Downlink data delivery status event	16.0.0
2019-06	CT#84	CP-191071	0040	3	B	AF acknowledgement of UP path event notification	16.0.0
2019-06	CT#84	CP-191101	0042	2	F	API version Update	16.0.0
2019-09	CT#85	CP-192169	0045		B	Add communication failure event	16.1.0
2019-09	CT#85	CP-192141	0046	1	A	Correct SMF event exposure service name	16.1.0
2019-09	CT#85	CP-192157	0047	1	B	Enhancement of event reporting information	16.1.0
2019-09	CT#85	CP-192157	0048	2	B	Support for Service Experience	16.1.0
2019-09	CT#85	CP-192159	0049	1	B	I-SMF notification to SMF	16.1.0
2019-09	CT#85	CP-192220	0050	3	B	Notification of downlink data delivery status	16.1.0
2019-09	CT#85	CP-192138	0051	2	B	AF acknowledgement of UP path event notification	16.1.0
2019-09	CT#85	CP-192173	0054		F	OpenAPI version update for TS 29.508 Rel-16	16.1.0
2019-12	CT#86	CP-193183	0056		A	Usage of the "serviveName" attribute	16.2.0
2019-12	CT#86	CP-193197	0057		F	Data type of the "serviceName" attribute	16.2.0
2019-12	CT#86	CP-193181	0058	1	B	OpenAPI file update to support AF acknowledgement	16.2.0
2019-12	CT#86	CP-193181	0059	3	F	Update of AFRelocationAck feature	16.2.0
2019-12	CT#86	CP-193201	0060	1	B	I-SMF applicable event	16.2.0
2019-12	CT#86	CP-193183	0062	1	A	Correction on 307 error, 29.508	16.2.0
2019-12	CT#86	CP-193212	0064		F	Update of API version and TS version in OpenAPI file	16.2.0
2020-03	CT#87e	CP-200220	0065	1	B	Update of the Availability after DDN Failure event	16.3.0
2020-03	CT#87e	CP-200230	0066	1	B	Update of the DDD status event	16.3.0
2020-03	CT#87e	CP-200202	0067	1	B	QoS Monitoring Report	16.3.0
2020-03	CT#87e	CP-200198	0068		B	Support PDU session establishment event	16.3.0
2020-03	CT#87e	CP-200198	0070		F	V-SMF applicable event	16.3.0
2020-03	CT#87e	CP-200241	0071	2	B	QFI allocation event	16.3.0
2020-03	CT#87e	CP-200211	0072		F	DDD status for I-SMF	16.3.0
2020-03	CT#87e	CP-200216	0073		F	Update of OpenAPI version and TS version in externalDocs field	16.3.0
2020-06	CT#88e	CP-201210	0075	1	F	Correction to the DDD status event	16.4.0
2020-06	CT#88e	CP-201246	0077	1	F	Correct presence condition in event subscription	16.4.0
2020-06	CT#88e	CP-201244	0078	1	F	Storage of YAML files in ETSI Forge	16.4.0

2020-06	CT#88e	CP-201210	0079		F	Monitoring event normalization in roaming case	16.4.0
2020-06	CT#88e	CP-201256	0080	1	F	URI of the Nsmf_EventExposure service	16.4.0
2020-06	CT#88e	CP-201213	0081	1	F	Correction to QoS Monitoring report	16.4.0
2020-06	CT#88e	CP-201216	0083		A	Notification Uri and subId resource URI	16.4.0
2020-06	CT#88e	CP-201216	0085	1	A	OpenAPI: adding Location header field in 307 response	16.4.0
2020-06	CT#88e	CP-201233	0086	1	B	FQDN of alternate or backup AMF	16.4.0
2020-06	CT#88e	CP-201210	0087		B	Add DNN and Slice filter	16.4.0
2020-06	CT#88e	CP-201210	0088		F	Correct presence condition for snssai	16.4.0
2020-06	CT#88e	CP-201213	0089	1	F	Add missing event	16.4.0
2020-06	CT#88e	CP-201244	0092		F	Optionality of ProblemDetails	16.4.0
2020-06	CT#88e	CP-201244	0093	1	F	Supported headers, Resource Data type, Operation Name	16.4.0
2020-06	CT#88e	CP-201255	0095		F	Update of OpenAPI version and TS version in externalDocs field	16.4.0
2020-09	CT#89e	CP-202050	0096	1	F	notifId used for QoS monitoring report	16.5.0
2020-09	CT#89e	CP-202048	0097		F	Correction to detection of downlink data delivery status change	16.5.0
2020-09	CT#89e	CP-202067	0100		F	Remove UP path change for I-SMF	16.5.0
2020-09	CT#89e	CP-202209	0101	1	F	Subscribed delivery status	16.5.0
2020-09	CT#89e	CP-202073	0098		F	Successful status code	17.0.0
2020-12	CT#90e	CP-203139	0103	1	A	Essential corrections and alignments	17.1.0
2020-12	CT#90e	CP-203139	0105	1	A	Storage of YAML files in 3GPP Forge	17.1.0
2020-12	CT#90e	CP-203108	0107		A	Correction to ddd status when the SMF buffers the data	17.1.0
2020-12	CT#90e	CP-203113	0110	1	A	Corrections on resourceURI	17.1.0
2020-12	CT#90e	CP-203108	0112	1	A	notifId provided by the UDM for CIoT events	17.1.0
2021-03	CT#91e	CP-210191	0115	1	A	Support of stateless NFs	17.2.0
2021-03	CT#91e	CP-210218	0118		F	OpenAPI reference	17.2.0
2021-03	CT#91e	CP-210219	0119		F	Clarification on optional HTTP custom headers	17.2.0
2021-03	CT#91e	CP-210189	0121	1	A	Correction to DDD status event detection	17.2.0
2021-03	CT#91e	CP-210189	0123		A	Correction to DDD status event subscription	17.2.0
2021-03	CT#91e	CP-210221	0124	1	F	Ambiguous concept of NF service consumer terminology	17.2.0
2021-03	CT#91e	CP-210219	0125	1	F	Adding some missing description fields to data type definitions in OpenAPI specification files	17.2.0
2021-03	CT#91e	CP-210194	0128		A	alignment of dnaiChgType attribute	17.2.0
2021-03	CT#91e	CP-210240	0130		F	Update of OpenAPI version and TS version in externalDocs field	17.2.0
2021-06	CT#92e	CP-211221	0131	2	B	Partitioning criteria for applying sampling in specific UE partitions in SMF exposure	17.3.0
2021-06	CT#92e	CP-211221	0132	1	B	Support of Mute Reporting	17.3.0
2021-06	CT#92e	CP-211200	0134	1	A	Temporary and Permanent Redirection	17.3.0
2021-06	CT#92e	CP-211243	0135	1	F	Removal of resource URI in Notification Acknowledgement procedure	17.3.0
2021-06	CT#92e	CP-211221	0136	1	B	Nsmf_EventExposure supports RAT Type Change Event	17.3.0
2021-06	CT#92e	CP-211265	0138		F	Update of OpenAPI version and TS version in externalDocs field	17.3.0

2021-09	CT#93e	CP-212220	0139	1	F	Correction of URI structure	17.4.0
2021-09	CT#93e	CP-212221	0141	1	A	Missing PDU Session ID from QFI allocation event notifications	17.4.0
2021-09	CT#93e	CP-212198	0142	2	B	Adding uplink buffering indication for Application Relocation	17.4.0
2021-09	CT#93e	CP-212203	0143	1	F	Corrections for RAT Type exposure	17.4.0
2021-09	CT#93e	CP-212223	0144		F	Update of OpenAPI version and TS version in externalDocs field	17.4.0
2021-12	CT#94e	CP-213227	0145	1	B	Update input data collection for Slice load level information	17.5.0
2021-12	CT#94e	CP-213228	0146	2	B	New event for SM congestion control experience	17.5.0
2021-12	CT#94e	CP-213238	0148		A	The <apiName> of the Nsmf_EventExposure API	17.5.0
2021-12	CT#94e	CP-213223	0149	1	B	Adding EAS IP replacement information in AppRelocationInfo	17.5.0
2021-12	CT#94e	CP-213228	0150	1	B	Adding DCCF as SMF event exposure NF service consumer	17.5.0
2021-12	CT#94e	CP-213239	0151		F	Adding missing conditions on features for notifications about subscribed events	17.5.0
2021-12	CT#94e	CP-213244	0152		F	Handling of implicit subscriptions	17.5.0
2021-12	CT#94e	CP-213215	0154	1	A	Essential correction to immediate report	17.5.0
2021-12	CT#94e	CP-213228	0155	1	B	Transactions dispersion information collected from serving SMF	17.5.0
2021-12	CT#94e	CP-213246	0156		F	Update of OpenAPI version and TS version in externalDocs field	17.5.0
2022-03	CT#95e	CP-220195	0159	4	B	Event report in the subscription response	17.6.0
2022-03	CT#95e	CP-220189	0161	1	B	Support Redundant Transmission Experience	17.6.0
2022-03	CT#95e	CP-220189	0162	1	B	Support new event on WLAN information	17.6.0
2022-03	CT#95e	CP-220190	0163	1	F	Corrections related to SMCCE	17.6.0
2022-03	CT#95e	CP-220190	0164	1	F	Corrections related to Dispersion	17.6.0
2022-03	CT#95e	CP-220192	0165	1	D	Correction of SMCC and other abbreviations	17.6.0
2022-03	CT#95e	CP-220186	0166	1	F	Handling of supported features for Edge Computing	17.6.0
2022-03	CT#95e	CP-220175	0168		A	Corrections related to URLLC	17.6.0
2022-03	CT#95e	CP-220201	0169		B	Updating Binding Indication for multiple resource contexts feature	17.6.0
2022-03	CT#95e	CP-220191	0170		B	Provide PDU session information for supporting the UE communication analytics	17.6.0
2022-03	CT#95e	CP-220192	0171	1	B	Support UPF information for service experience and DN performance analytics	17.6.0
2022-03	CT#95e	CP-220194	0172		F	Update of info and externalDocs fields	17.6.0
2022-06	CT#96	CP-221154	0173	1	F	Formatting of description fields	17.7.0
2022-06	CT#96	CP-221154	0174		F	Using the common data type for FQDN	17.7.0
2022-06	CT#96	CP-221157	0175		F	Inaccurate condition for immediate reporting	17.7.0
2022-06	CT#96	CP-221129	0176		F	Correction to the notifFlag attribute in subscription modification	17.7.0
2022-06	CT#96	CP-221129	0177		F	Completion of subscription modification procedure	17.7.0
2022-06	CT#96	CP-221129	0178		F	missing applicable RED_TRANS_EXP event for targetPeriod attribute	17.7.0
2022-06	CT#96	CP-221130	0179	1	B	Resolve editor's note on Redundant Transmission Experience event	17.7.0
2022-06	CT#96	CP-221130	0180		F	Corrections to SMCCE	17.7.0
2022-06	CT#96	CP-221133	0181		F	Muting notifications correction	17.7.0
2022-06	CT#96	CP-221157	0182	1	F	Correction to the reported flows	17.7.0

2022-06	CT#96	CP-221151	0183		F	Update of info and externalDocs fields	17.7.0
2022-09	CT#97e	CP-222123	0184	1	F	Alignment with the SBI template	17.8.0
2022-12	CT#98e	CP-223173	0186	1	F	User Plane Status Information event handling	17.9.0
2022-12	CT#98e	CP-223177	0188		F	Adding support of SNPN	17.9.0
2022-12	CT#98e	CP-223188	0190		F	Update of info and externalDocs fields	17.9.0
2023-03	CT#99	CP-230145	0201		F	Missing presence condition for transacInfos attribute	17.10.0
2023-03	CT#99	CP-230140	0208		F	Correction on the feature support for implicit subscriptions	17.10.0
2023-03	CT#99	CP-230173	0210	1	F	Correction on handling of Packet Delay Failure report Threshold	17.10.0
2023-03	CT#99	CP-230160	0216		F	Update of info and externalDocs fields	17.10.0
2023-12	CT#102	CP-233254	0247		A	Correction of anyUeInd attribute	17.11.0
2024-03	CT#103	CP-240170	0254	2	A	Corrections on QoS monitoring reports	17.12.0
2024-03	CT#103	CP-241129	0278	1	F	Wrong attribute name	17.13.0
2024-12	CT#106	CP-243122	0289	1	F	Corrections on the support of SNPN	17.14.0
2024-12	CT#106	CP-243145	0307		F	Update of info and externalDocs fields	17.14.0
2025-03	CT#107	CP-250089	0315		F	Corrections on the WLAN information	17.15.0
2025-03	CT#107	CP-250127	0319		F	Update of info and externalDocs fields	17.15.0
2025-06	CT#108	CP-251113	0342		A	Wrong attribute name	17.16.0

History

Document history		
V17.6.0	May 2022	Publication
V17.7.0	June 2022	Publication
V17.8.0	September 2022	Publication
V17.9.0	January 2023	Publication
V17.10.0	April 2023	Publication
V17.11.0	January 2024	Publication
V17.12.0	April 2024	Publication
V17.13.0	July 2024	Publication
V17.14.0	January 2025	Publication
V17.15.0	March 2025	Publication
V17.16.0	June 2025	Publication