**3GPP TSG-CT WG3 Meeting #140 *C3-251324***

**Wuhan, CN, 7 - 11 April 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **29.508** | **CR** | **0331** | **rev** | **-** | **Current version:** | **19.2.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| --- |
|  |
| ***Title:***  | Support of Energy Consumption Information |
|  |  |
| ***Source to WG:*** | Huawei, Nokia, Samsung |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | EnergySys |  | ***Date:*** | 2025-03-31 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | In SA2#167 meeting, the S2-2502575 and S2-2502567 were agreed to update the service operations and procedures into the Nsmf\_EventExposure service for energy consumption information collection, calculation and exposure. The new feature of energy consumption information should be supported in present specification for Session Management Event Exposure accordingly. |
|  |  |
| ***Summary of change:*** | Define a new event and the related feature, related IEs etc for the new funtionality. |
|  |  |
| ***Consequences if not approved:*** | Missing stage 2 requirements on support for Energy Consumption Information. |
|  |  |
| ***Clauses affected:*** | 4.1.1, 4.2.2.2, 4.2.3.2, 5.6.1, 5.6.2.2, 5.6.2.4, 5.6.2.5, 5.6.2.16(new), 5.6.3.3, 5.8, A.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This CR introduces a backwards compatible new feature to the OpenAPI description of the following API: TS29508\_Nsmf\_EventExposure.yaml |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* Start of Changes \* \* \*

### 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 NF service consumers to subscribe and unsubscribe for events on a PDU session; and

- notifies recipient of notification(s) subscribed by NF service consumers with a corresponding subscription about observed events on the PDU session.

The types of observed events applicable for (H-)SMF (i.e. in non-roaming and LBO scenarios) 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;

- UE IP address/prefix change;

- QFI allocation;

- QoS monitoring;

- SM congestion control experience for PDU Session;

- Dispersion;

- Satellite backhaul category change;

- WLAN information for PDU Session;

- Redundant transmission experience for PDU Session;

- UPF events;

- Traffic Correlation; and/or

- Energy Consumption Information.

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

- Downlink data delivery status;

- UP Path Change (for the HR-SBO scenario).

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

- Downlink data delivery status;

- QoS monitoring;

- UPF events.

\* \* \* Next Change \* \* \*

#### 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 "DDDS" 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 PDU session 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 traffic correlation, and/or traffic routing requirement installation outcome 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, or as provided by the V-NEF for implicit subscription of UP path change as defined in clause 4.4.2.4.2 of 3GPP TS 29.591 [28], as "upPathChgNotifCorreId" attribute within "eventNotifications" 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;

g) if the PDU Session type is Ethernet, the MAC address of the UE in the "ueMac" attribute;

h) if the "CommonEASDNAI" feature is supported,

 - the candidate DNAI(s) for the PDU Session in "candidateDnais" attribute, optionally together with the indication of their prioritization within the "candDnaisPrioInd" attribute, if the "candDnaiInd" attribute was set to "true" in the PCC rule(s); or

 - the indication of EAS re-discovery in "easRediscoverInd" attribute if EAS re-discovery took place.

NOTE 1: In this release, when SMF acting as the I-SMF based on the Local Offloading Management does not cover common DNAI/EAS selection.

i) if both the SMF and the NF service consumer support "ULBuffering" and/or "EASIPreplacement" features, these supported features within the "supportedFeatures" attribute.

NOTE 2: The SMF gets the knowledge of the feature supported by the NF service consumer as described in clause 5.8.

j) if the "EasRelocationEnh" feature is supported and the SMF determines that the target DNAI is supported by an AF different to the one that shall receive this notification, the identifier of the target AF that supports this DNAI in the "targetAfId" attribute.

k) if the "HR-SBO" feature is supported and the SMF determines that the UE has moved to a serving PLMN in which local traffic offload is allowed, the identifier of this new serving PLMN within the "plmnId" attribute, as well as the DNN and S-SNSSAI of the HPLMN within the "dnn" and "snssai" attributes, respectively.

l) if available and if the "UeSatUeComm" feature is supported, the serving satellite identity in the "servSatId" attribute, when the UE is accessible via regenerative satellite access.

NOTE 3: The SMF can determine this by comparing the AF ID of the EAS Deployment Information entry that contains the old DNAI with the AF ID of the EAS Deployment Information entry that contains the target DNAI. These EAS Deployment Information entries are received via the Nnef\_EASDeployment API defined in 3GPP TS 29.591 [25].

NOTE 4: 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 5: If the DNAI is not changed while the N6 traffic routing information change, the source DNAI and target DNAI are not provided.

NOTE 6: 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 released PDU session as "dnn" attribute, if the "PduSessionStatus" feature is supported;

c) The type of the released 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 released 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. If the "WlanPerformanceExt\_AIML " feature is supported, the "supi" attribute may also be included for a single UE when the subscription applies to the "WLAN\_INFO" event;

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 event, if the "QoSMonitoring" feature is supported:

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

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

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

NOTE 7: 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).

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

e) if the feature "EnQoSMon" is supported, UL and/or DL congestion information within the "ulCongInfo" attribute and "dlCongInfo" attribute; and/or

f) if the feature "EnQoSMon" is supported, UL and/or DL data rate measurement within the "ulDataRate" attribute and/or "dlDataRate" attribute.

NOTE 8: The SMF gets the knowledge of the NF service consumer support of "QoSMonitoring", "PacketDelayFailureReport" and "EnQoSMon" features as described in 3GPP TS 29.512 [14].

NOTE 9: 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]).

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 established PDU session as "dnn" attribute;

c) The type of the established 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" or feature is supported:

a) QFI of the allocated QoS Flow ID for the application as "qfi" attribute or, if the "EnQfiAllocation" feature is also supported, the 5QI of the allocated QoS Flow ID for the application as "5qi" 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;

f) To obtain the PDU Session information, if the "PduSessionInfo" feature is supported:

i) the information about the UE access type provided as "accessType" attribute;

ii) the information about the PDU Session Type in the "pduSessType" attribute and/or the SSC mode in the "sscMode" attribute associated with the application provided as "appId" attribute; and/or

iii) the information about the PDU Session associated list of access types as "pduAccTypes" attribute, if the "MultipleAccessTypes" feature is also supported.

15. for an RAT type change event, 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.

22. for a satellite backhaul category change, if the "EnSatBackhaulCategoryChg" feature is supported:

a) satellite backhaul category as "satBackhaulCat" attribute.

23. for traffic correlation, if the "CommonEASDNAI" feature is supported:

a) the traffic correlation information in the "trafCorreInfo" attribute, if the "notifUri" attribute, "notifCorrId" attribute and "tfcCorrId" attribute are provided in the PCC rule, and the common EAS is not provided in the PCC rule or the SMF decides to trigger EAS discovery for the set of UE(s).

NOTE 10: Traffic correlation notification can be the result of an implicit subscription of the PCF on behalf of the NEF 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]).

- 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 11: 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.

24. for a traffic route requirement installation outcome notification, if the "TraffRouteReqOutcome" feature is supported:

a) the information indicating the installation outcome of the traffic routing requirements within the "traffRouteReqOutcome" attribute.

b) the source DNAI and/or target DNAI within the "sourceDnai" attribute and "targetDnai" attribute respectively, if the DNAI is changed;

c) if available, for the source DNAI, the N6 traffic routing information related to the UE within the "sourceTraRouting" attribute; and

d) if available, for the target DNAI, the N6 traffic routing information related to the UE within the "targetTraRouting" attribute;

NOTE 12: The Traffic Routing Requirement Installation Outcome Notification i.e. N6 traffic routing requirements installation outcome, 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]).

25. for energy consumption information collection, if the "Energy" feature is supported:

a) the list of Data Volume information within the "dataVolInfos" attribute, which includes UL/DL Data Volume, (I-)UPF ID(s) and gNB ID; and

b) the SUPI as the "supi" attribute; or

c) the DNN as the "dnn" attribute and/or the slice as the "snssai" attribute.

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

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

If the feature "ES3XX" is not supported and,

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

NOTE 13: An AMF as NF service consumer and/or notified NF 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 notified NF 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.

\* \* \* Next Change \* \* \*

#### 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, the Network Function instance identity if "UPEAS" feature is supported and the "eventSubs" attribute contains an entry with the "event" set to the value "UPF\_EVENT", and 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;

f) for event "RED\_TRANS\_EXP", the data collection target period in the "targetPeriod" attribute;

g) for event "UPF\_EVENT", the UPF event exposure information in the "upfEvents" attribute;

h) for event "QOS\_MON", the Application Identifier in the "appIds" of the application for which the QoS flows are to be monitored and an indication within the "defQosSupp" attribute to inform whether the NF service consumer supports to receive QoS Flow performance information for the QoS Flow associated with the default QoS rule if there are no measurements available for the provided Application Identifier included within the "appIds" attribute; and/or

i) for event "ENGRGY\_USAGE\_DATA", the UE Identity within "supi" attribute, and/or the S-NSSAI within the "snssai" attribute and the corresponding DNN information within the "dnn" attribute, and/or the Application Identifier in the "appIds" of the application or the service data flow information within the "flowDescs" for which the uplink/downlink data volume information is collected and notified.

NOTE 2: Explicit subscription to "UPF\_EVENT" and "QOS\_MON" events as described in this clause implies the direct notification from the UPF as specified in 3GPP TS 29.564 [26].

NOTE 3: The user-plane energy consumption information reporting interval from the SMFs is the PLMN-wide configurable starting time and interval T.

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;

- an identification of network area by "networkArea" attribute, if the feature AreaFilter or the feature UPEAS is supported and the "anyUeInd" attribute is provided and set to true;

NOTE 4: Care needs to be taken with regards to load and major signalling caused when requesting Any UE. This could be achieved via utilization of some event filters (e.g. Area of Interest), a specific DNN, S-NSSAI or sampling ratio as part of Event Reporting Information.

- a Data Network Identifier as "dnai" attribute, if the feature UPEAS is supported;

- the SSID that the PDU session is related to as "ssid" attribute, if the feature UPEAS is supported;

- the BSSID that the PDU session is related to as "bssid" attribute, if the feature UPEAS is supported;

- the UPF identifier as "upfId" attribute, if the feature UPEAS is supported;

- immediate reporting flag as "ImmeRep" attribute;

NOTE 5: For the "PDU\_SES\_EST" event subscription, the "ImmeRep" attribute needs to be included to enable the SMF to report the current available "PDU\_SES\_EST" event information for the subscribed PDU Session which is already established.

- 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;

- a notification flag as "notifFlag" attribute if the EneNA feature is supported;

- notification muting exception instructions within the "notifFlagInstruct" attribute, if the EnhDataMgmt feature is supported and the "notifFlag" attribute is provided and set to "DEACTIVATE"; and/or

- if the EnUPEAS feature is supported, the UPF event remaining data reporting indication as "remainRepInd" attribute for UPF relocation and PDU session release.

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;

- if the feature "UPEAS" is supported, and if the NF service consumer subscribed to "QOS\_MON" event, the SMF shall check if there is an active PCC rule that includes a Data Collection Application Identifier as described in 3GPP TS 29.512 [14] that matches the Application Identifier received within "appIds" attribute. If there is an active PCC rule, the SMF shall allow the NF service consumer to receive QoS monitoring reports enabled by that PCC rule. If no PCC rule is identified and the "defQosSupp" attribute was received and set to true, the SMF may instruct the UPF to perform QoS monitoring for the QoS Flow associated to the default QoS rule as described in 3GPP TS 29.244 [23]. If no PCC rule is identified and the "defQosSupp" attribute was received and set to false or not received, the SMF may, based on local configuration, reject the request by sending the NO\_ACTIVE\_PCC\_RULE error described in clause 5.7 or include the "qosMonPending" indication set to true in the response to inform the NF service consumer that the reporting will be activated when the measurements are enabled by a PCC rule;

NOTE 6: The reporting can be activated when a new PCC rule is installed or an existing one is modified with QoS monitoring information that includes the Data Collection Application Identifier related to the subscription. In this case the SMF will act as if the new subscription is received from the NF service consumer.

- if the feature "UPEAS" is supported and the "upfEvents" attribute is provided together with the "networkArea" attribute in the EventSubscription data type, the SMF shall subscribe to the UPF for the respective UPF events as described in 3GPP TS 29.564 [26] only when the UE is located in the indicated area. When the UE leaves the indicated area, the SMF shall unsubscribe those events from the UPF as described in 3GPP TS 29.564 [26].

NOTE 7: To know when a UE enters or leaves the indicated area, the SMF can subscribe to the respective AMF Event Exposure event.

- 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 recipient of notification(s) subscribed in the "notifUri" attribute 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 until the NF service consumer requests to retrieve them by setting the "notifFlag" attribute to "RETRIEVAL" or until a muting exception occurs (e.g. full buffer). When a muting exception occurs, the SMF may consider the contents of the "notifFlagInstruct" attribute (if provided) and/or local configuration to determine its actions. If the EnhDataMgmt feature is supported and the SMF accepts the muting instructions provided in the "notifFlag" and/or the "notifFlagInstruct" attributes, it may indicate the applied muting notification settings within the "mutingSetting" attribute in the response. If the SMF does not accept the muting instructions provided in the "notifFlag" and/or the "notifFlagInstruct" attributes, it shall send an HTTP "403 Forbidden" error response including the "cause" attribute set to "MUTING\_INSTR\_NOT\_ACCEPTED".

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.

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

\* \* \* Next Change \* \* \*

### 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 |
| TrafficCorrelationNotification | 5.6.2.14 | Represents the traffic correlation Information for Notification. | CommonEASDNAI |
| TraffRouteReqOutcome | 5.6.2.15 | Represents the installation outcome of the requested traffic routing, requirements. | TraffRouteReqOutcome |
| 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. | ServiceExperienceDnPerformance |
| DataVolumeInformation | 5.6.2.16 | Represents the Data Volume information. | Energy |

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 |
| 5Qi | 3GPP TS 29.571 [11] | The 5G QoS Identifier. | EnQfiAllocation |
| AccessType | 3GPP TS 29.571 [11] | Represents the access type. |  |
| AfResultInfo | 3GPP TS 29.522 [20] | Represents application handling information. |  |
| ApplicationId | 3GPP TS 29.571 [11] | The application identifier. | QfiAllocationPduSessionInfo |
| BitRate | 3GPP TS 29.571 [11] | Represents the bit rate. | EnQoSMon |
| CommunicationFailure | 3GPP TS 29.518 [13] | Represents the communication failure information. | CommunicationFailure |
| DateTime | 3GPP TS 29.571 [11] | Represents a date and a time. |  |
| 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] | Represents a DNAI. |  |
| DnaiChangeType | 3GPP TS 29.571 [11] | Describes the types of DNAI change. |  |
| Dnn | 3GPP TS 29.571 [11] | Represents a DNN | QfiAllocation, PduSessionStatus |
| DurationSec | 3GPP TS 29.571 [11] | Represents a time duration expressed in seconds. |  |
| 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 |  |
| GNbId | 3GPP TS 29.571 [11] | gNB Identifier. | Energy |
| Gpsi | 3GPP TS 29.571 [11] | Represents a GPSI. |  |
| GroupId | 3GPP TS 29.571 [11] | Represents the identifier of a group or UEs. |  |
| Guami | 3GPP TS 29.571 [11] | Globally Unique AMF Identifier |  |
| IpAddr | 3GPP TS 29.571 [11] | UE IP address. | DispersionCommonEASDNAI |
| Ipv4Addr | 3GPP TS 29.571 [11] | Represents an IPv4 address. |  |
| Ipv6Addr | 3GPP TS 29.571 [11] | Represents an IPv6 address. |  |
| Ipv6Prefix | 3GPP TS 29.571 [11] | Represents an IPv6 prefix. |  |
| MacAddr48 | 3GPP TS 29.571 [11] | MAC Address. |  |
| MutingExceptionInstructions | 3GPP TS 29.571 [11] | Contains instructions to be executed upon the occurrence of an event muting exception (e.g. full buffer). | EnhDataMgmt |
| MutingNotificationsSettings | 3GPP TS 29.571 [11] | Contains setting related to the muting of notifications. | EnhDataMgmt |
| NetworkAreaInfo | 3GPP TS 29.554 [27] | Identifies the network area. | AreaFilterUPEAS |
| NfInstanceId | 3GPP TS 29.571 [11] | Instance identity of the Network Function | UPEASCommonEASDNAI |
| 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] | Represents the identifier of a PDU Session. |  |
| PduSessionType | 3GPP TS 29.571 [11] | PDU session type. | PduSessionStatusPduSessionInfo |
| 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] | Represents error related information. |  |
| Qfi | 3GPP TS 29.571 [11] | QoS flow identifier. | QfiAllocation |
| RatType | 3GPP TS 29.571 [11] | RAT type. | EneNA |
| 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. |  |
| SatelliteBackhaulCategory | 3GPP TS 29.571 [11] | Indicates the satellite backhaul category or non-satellite backhaul. | EnSatBackhaulCategoryChg |
| ServiceName | 3GPP TS 29.510 [12] | Name of the service instance. |  |
| Snssai | 3GPP TS 29.571 [11] | S-NSSAI | QfiAllocation |
| SscMode | 3GPP TS 29.571 [11] | SSC Mode selected for the PDU Session. | PduSessionInfo |
| Supi | 3GPP TS 29.571 [11] | Represents a SUPI. |  |
| 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] | Represents an unsigned integer. |  |
| UpfEvent | 3GPP TS 29.564 [26] | Contains UPF event information. | UPEAS |
| Uri | 3GPP TS 29.571 [11] | Represents a URI. |  |
| VolumeTimedReport | 3GPP TS 29.571 [11] | Contains the UL/DL data volume information of a PDU Session. | Energy |

\* \* \* Next Change \* \* \*

#### 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) (NOTE 8) (NOTE 9) |  |
| gpsi | Gpsi | C | 0..1 | Generic Public Subscription Identifier (NOTE 1) (NOTE 8)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) (NOTE 7) |  |
| groupId | GroupId | C | 0..1 | Identifies a group of UEs. (NOTE 1) |  |
| pduSeId | PduSessionId | C | 0..1 | PDU session ID (NOTE 1) |  |
| dnn | Dnn | C | 0..1 | Data Network Name.(NOTE 9) |  |
| snssai | Snssai | C | 0..1 | A single Network Slice Selection Assistance Information.(NOTE 4) (NOTE 9) |  |
| dnai | Dnai | O | 0..1 | Data network access identifier. | UPEAS |
| ssId | string | O | 0..1 | SSID that the PDU session is related to.  | UPEAS |
| bssId | string | O | 0..1 | BSSID that the PDU session is related to. | UPEAS |
| upfId | string | O | 0..1 | Identifies the UPF. | UPEAS |
| nfId | NfInstanceId | C | 0..1 | Indicates the instance identity of the NF creating the subscription. It shall be provided if the "eventSubs" attribute contains an entry with the "event" set to the value "UPF\_EVENT". | UPEAS |
| 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 | Indicates whether immediate reporting of the current status of the subscribed event. Set to "true": it is requested that the current status of the subscribed event is immediately reported.- Set to "false": the current status of the subscribed event is not requested to be immediately reported.- Default value is "false" if omitted.(NOTE 6) |  |
| notifMethod | NotificationMethod | O | 0..1 | If "notifMethod" is not supplied, the default value "ON\_EVENT\_DETECTION" applies.(NOTE 4) (NOTE 5) |  |
| maxReportNbr | Uinteger | O | 0..1 | If omitted, there is no limit.(NOTE 4) (NOTE 5) |  |
| 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 | This attribute indicates the reporting period. Shall be provided if the notification method is set to "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 |
| notifFlagInstruct | MutingExceptionInstructions | O | 0..1 | Contains instructions to be executed upon the occurrence of an event muting exception (e.g. full buffer). It may only be provided if the "notifFlag" is provided and set to "DEACTIVATE". | EnhDataMgmt |
| mutingSetting | MutingNotificationsSettings | O | 0..1 | Contains settings related to the muting of notifications. It may only be provided in the NF service producer response and only if the muting instructions provided in the "notifFlag" and/or the "notifFlagInstruct" attributes are accepted. | EnhDataMgmt |
| defQosSupp | boolean | O | 0..1 | Indicates whether the NF service consumer requests to receive QoS Flow performance information for the QoS Flow associated with the default QoS rule if there are no measurements available for the provided Application Identifier included within the "appIds" attribute.- Set to "true": NF service consumer requests to receive QoS Flow performance information for the QoS Flow associated with the default QoS rule.- Set to "false": NF service consumer does not request to receive QoS Flow performance information for the QoS Flow associated with the default QoS rule.- Default value is "false" if omitted. | UPEAS |
| qosMonPending | boolean | O | 0..1 | Indicates whether the reporting will be activated when the measurements are enabled by a PCC rule.- Set to "true": the reporting will be activated when the measurements are enabled by a PCC rule. It shall be always set to "true" when present.It may only be provided in the response. | UPEAS |
| remainRepInd | boolean | O | 0..1 | Indicates whether the source UPF should send the remaining collected UPF event data to the NF service consumer during UPF relocation and PDU Session release.(NOTE 8)- Set to "true": the source UPF should send the collected data to the NF service consumer.- Set to "false": the source UPF should not send the collected data to the NF service consumer.- Default value is "false" if omitted. | EnUPEAS |
| 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. NOTE 5: The attribute "maxReportNbr" is not applicable when the value of "notifMethod" is set to "ONE\_TIME".NOTE 6: The attribute does not follow the related naming convention (i.e. "lowerCamel") defined in clause 5.1.4 of 3GPP TS 29.501 [7]. This attribute is however kept as currently defined in this specification for backward compatibility considerations.NOTE 7: When the "anyUeInd" attribute is set to true for User Plane events, the SMF does not consider PDU sessions for which it is acting as I-SMF.NOTE 8: If the "remainRepInd" attribute is provided, the "gpsi" attribute or "supi" attribute shall be provided.NOTE 9: If the "Energy" feature is supported, the "supi" attribute or the "snssai" attribute and the corresponding "dnn" attribute shall be provided for the "ENGRGY\_USAGE\_DATA" event. |

\* \* \* Next Change \* \* \*

#### 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 if the subscribed event is set to "UP\_PATH\_CH". |  |
| 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", "DISPERSION", "ENGRGY\_USAGE\_DATA" or "QOS\_MON".(NOTE 1) (NOTE 3) | QfiAllocationDispersionPduSessionInfoUPEASEnergy |
| networkArea | NetworkAreaInfo | O | 0..1 | Identification of network area to which the subscription applies. | AreaFilterUPEAS |
| 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 |
| upfEvents | array(UpfEvent) | O | 1..N | Indicates the exposure information related to UPF events. May be included for event "UPF\_EVENT". (NOTE 2) | UPEAS |
| 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 "ENGRGY\_USAGE\_DATA".(NOTE 3) | Energy |
| NOTE 1: Only one instance of "ApplicationId" shall be provided when the event is "QOS\_MON".NOTE 2: If the "UPEAS feature" is supported and the "immediateFlag" attribute within the "upfEvents" attribute is provided, the "ImmeRep" attribute within the NsmfEventExposure data type is not applicable.NOTE 3: If the "Energy" feature is supported, either the "appIds" or "flowDescs" attribute shall be provided when the event is "ENGRGY\_USAGE\_DATA".  |

\* \* \* Next Change \* \* \*

#### 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. (NOTE 9) |  |
| 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 events "UP\_PATH\_CH" and "TRAFF\_ROUTE\_REQ\_OUTCOME" if the DNAI changed.(NOTE 1, NOTE 2) |  |
| targetDnai | Dnai | C | 0..1 | Target DN Access Identifier. Shall be included for events "UP\_PATH\_CH" and "TRAFF\_ROUTE\_REQ\_OUTCOME" if the DNAI changed.(NOTE 1, NOTE 2) |  |
| dnaiChgType | DnaiChangeType | C | 0..1 | DNAI Change Type. Shall be included for event "UP\_PATH\_CH". |  |
| traffRouteReqOutcome | TraffRouteReqOutcome | C | 0..1 | Contains the installation outcome of requested traffic routing requirements.This attribute shall be present when the event is set to "TRAFF\_ROUTE\_REQ\_OUTCOME". | TraffRouteReqOutcome |
| candidateDnais | array(Dnai) | O | 1..N | The candidate DNAI(s) for the PDU Session. May be included for event "UP\_PATH\_CH". | CommonEASDNAI |
| easRediscoverInd | boolean | O | 0..1 | Indication of EAS re-discovery. If present and set to "true", it indicates the EAS re-discovery is performed, e.g. due to change of common EAS. Default value is "false" if omitted. | CommonEASDNAI |
| candDnaisPrioInd | boolean | O | 0..1 | If provided and set to "true", it indicates that the candidate DNAIs provided in the "candidateDnais" attribute are in descending priority order, i.e. the lower the array index the higher the priority of the respective DNAI. If omitted, the default value is "false". It may only be provided if the "candidateDnais" attribute is provided and the "dnaiChgType" attribute is set to the value "EARLY". | CommonEASDNAI |
| trafCorreInfo | TrafficCorrelationNotification | C | 0..1 | Contains traffic correlation information for notification.It shall be provided if the event attribute has the value "TRAFFIC\_CORRELATION". | CommonEASDNAI |
| 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 events "UP\_PATH\_CH" and "TRAFF\_ROUTE\_REQ\_OUTCOME" if available (NOTE 2). |  |
| targetTraRouting | RouteToLocation | C | 0..1 | N6 traffic routing information for the target DNAI. Shall be included for events "UP\_PATH\_CH" and "TRAFF\_ROUTE\_REQ\_OUTCOME" 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".It shall be included for event "UP\_PATH\_CH" to contain the new serving PLMN identifier, if the "HR-SBO" feature is supported and the UE has moved to a serving PLMN where local traffic offloading is allowed.(NOTE 7) |  |
| accType | AccessType | C | 0..1 | New Access Type. Shall be included for event "AC\_TY\_CH" and may be included for event "QFI\_ALLOC". |  |
| pduAccTypes | array(AccessType) | O | 1..N | The list of Access Types used for the PDU session. May be included for event "QFI\_ALLOC".(NOTE 10) | MultipleAccessTypes |
| 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 "DDDS". | DownlinkDataDeliveryStatus |
| maxWaitTime | DateTime | C | 0..1 | The estimated maximum waiting time for downlink data delivery. Shall be included for event "DDDS" with status "BUFFERED". | DownlinkDataDeliveryStatus |
| dddTraDescriptor | DddTrafficDescriptor | C | 0..1 | The downlink data descriptor impacted by downlink data delivery status change. Shall be included for event "DDDS". | DownlinkDataDeliveryStatus |
| commFailure | CommunicationFailure | C | 0..1 | Describes the communication failure cause for the UE. Shall be included for event "COMM\_FAIL". | CommunicationFailure |
| ipv4Addr | Ipv4Addr | O | 0..1 | IPv4 address. May be included for event "PDU\_SES\_REL" or "PDU\_SES\_EST". | PduSessionStatus |
| ipv6Prefixes | array(Ipv6Prefix) | O | 1..N | IPv6 prefixes. May be included for event "PDU\_SES\_REL" or "PDU\_SES\_EST". (NOTE 3) | PduSessionStatus |
| ipv6Addrs | array(Ipv6Addr) | O | 1..N | IPv6 addresses. May be included for event "PDU\_SES\_REL" or "PDU\_SES\_EST". (NOTE 3) | PduSessionStatus |
| pduSessType | PduSessionType | C | 0..1 | PDU session type. Shall be included if the PduSessionStatus or PduSessionInfo feature is supported. (NOTE 8) | PduSessionStatusPduSessionInfo |
| sscMode | SscMode | O | 0..1 | Represents the SSC mode of the PDU Session. It may be included for event "QFI\_ALLOC". (NOTE 8) | PduSessionInfo |
| qfi | Qfi | C | 0..1 | QoS flow identifier. May be included for event "QFI\_ALLOC".(NOTE 12) | QfiAllocation |
| appId | ApplicationId | O | 0..1 | Contains the application identifier. May be included for event "QFI\_ALLOC". (NOTE 4) (NOTE 8) | QfiAllocationPduSessionInfo |
| ethFlowDescs | array(EthFlowDescription) | 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) | MultipleFlowDescriptions |
| ethfDescs | array(EthFlowDescription) | 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) | MultipleFlowDescriptions |
| 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 indicate the DNN associated with URLLC service for event "RED\_TRANS\_EXP".Shall be included if DNN based SMCC is applied.It shall be included for event "UP\_PATH\_CH" to contain the HPLMN DNN, if the "HR-SBO" feature is supported and the UE has moved to a serving PLMN where local traffic offloading is allowed. | QfiAllocation, PduSessionStatusRedundantTransmissionExpSMCCEHR-SBO |
| 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.It shall be included for event "UP\_PATH\_CH" to contain the HPLMN S-NSSAI, if the "HR-SBO" feature is supported and the UE has moved to a serving PLMN where local traffic offloading is allowed. | QfiAllocationEneNASMCCEHR-SBO |
| 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 |
| ulCongInfo | Uinteger | O | 0..1 | Uplink congestion information. Percentage of packets that UPF uses for ECN marking for L4S (without "%" sign). May be included for event "QOS\_MON". | EnQoSMon |
| dlCongInfo | Uinteger | O | 0..1 | Downlink congestion information. Percentage of packets that UPF uses for ECN marking for L4S (without "%" sign). May be included for event "QOS\_MON". | EnQoSMon |
| rtDelays | array(Uinteger) | O | 1..N | Round trip delay in units of milliseconds. May be included for event "QOS\_MON". (NOTE 5) | QoSMonitoring |
| ulDataRate | BitRate | O | 0..1 | Uplink data rate. May be included for event "QOS\_MON". | EnQoSMon |
| dlDataRate | BitRate | O | 0..1 | Downlink data rate. May be included for event "QOS\_MON". | EnQoSMon |
| 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". | ServiceExperienceDnPerformance |
| 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 |
| satBackhaulCat | SatelliteBackhaulCategory | C | 0..1 | The satellite backhaul category or non-satellite backhaul used for the PDU session. Shall be included for event "SATB\_CH".  | EnSatBackhaulCategoryChg |
| supportedFeatures | SupportedFeatures | C | 0..1 | List of negotiated features supported by the SMF and NF service consumer as described in clause 5.8.This parameter shall be supplied by the SMF when the SMF detects that at least one feature related to an implicit subscription is supported by both the SMF and the NF service consumer. |  |
| targetAfId | string | O | 0..1 | Identifier of the Application Function responsible for the target DNAI. May be included for event "UP\_PATH\_CH" if the target DNAI is not known to the source AF. | EasRelocationEnh |
| 5qi | 5Qi | O | 0..1 | The 5G QoS Identifier. May be included for event "QFI\_ALLOC". | EnQfiAllocation |
| servSatId | string | C | 0..1 | Indicates UE serving satellite Identity.Shall be included for event "UP\_PATH\_CH" when the identifier of satellite serving the UE has changed. | UeSatUeComm |
| dataVolInfos | array(DataVolumeInformation) | C | 1..N | Indicates the list of data volume information. Shall be included for the event "ENGRGY\_USAGE\_DATA". | Energy |
| 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.NOTE 8: When the subscribed event is "QFI\_ALLOC" and the PduSessionInfo feature is supported, if the "pduSessType" attribute and/or "sscMode" attribute is included, the associated "appId" attribute shall be provided.NOTE 9: If the "WlanPerformanceExt\_AIML" feature is supported, the "supi" attribute may also be included for a single UE when the subscription applies to the "WLAN\_INFO" event.NOTE 10: If multiple Access Types are used for the PDU Session and the "MultipleAccessTypes" feature is supported, the SMF shall include each PDU Session Access Type in the "pduAccTypes" attribute.NOTE 11: Void.NOTE 12: The "qfi" attribute and "5qi" attribute are mutually exclusive, either "qfi" attribute or "5qi" attribute shall be included for event "QFI\_ALLOC". |

\* \* \* Next Change \* \* \*

#### 5.6.2.16 Type: DataVolumeInformation

Table 5.6.2.16-1: Definition of type DataVolumeInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| dataVol | VolumeTimedReport | M | 1 | Data usage for UL/DL of a PDU Session. |  |
| upfIds | array(UpfInformation) | M | 1..N | List of identifier of any (I-)UPF(s) associated to a reported data volume. |  |
| gNBId | GNbId | M | 1 | Identifier of the gNB serving the UE. |  |

\* \* \* Next Change \* \* \*

#### 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. | ServiceExperienceDnPerformance |
| UP\_STATUS\_INFO | User Plane status information | UeCommunication |
| UPF\_EVENT | UPF event subscribed via SMF. (NOTE) | UPEAS |
| SATB\_CH | Indicates that the SMF has detected a change between different satellite category, or non-satellite backhaul | EnSatBackhaulCategoryChg |
| TRAFFIC\_CORRELATION | Indicates that the SMF provides 5GC determined traffic correlation information for a set of UEs identified by Traffic Correlation ID. | CommonEASDNAI |
| TRAFF\_ROUTE\_REQ\_OUTCOME | Indicates the report of the installation outcome of the requested traffic routing requirements. | TraffRouteReqOutcome |
| ENGRGY\_USAGE\_DATA | Indicates that the SMF provides user-plane energy consumption information. | Energy |
| NOTE: UPF\_EVENT shall only be used for "USER\_DATA\_USAGE\_MEASURES" and "USER\_DATA\_USAGE\_TRENDS" event types in 3GPP TS 29.564 [26]. |

\* \* \* Next Change \* \* \*

## 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. (NOTE 1) (NOTE 3) |
| 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 exposing information required the enhancements of network data analytics requirements. |
| 8 | ULBuffering | This feature indicates support for Uplink buffering indication. (See NOTE 2) |
| 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 of the available subscribed event(s) within the subscription response to the NF service consumer. |
| 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 2) |
| 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 exposing information required by UE communication analytics, i.e. User Plane status information. |
| 17 | ServiceExperience | This feature indicates the support for exposing UPF information required e.g. by QoS Sustainability analytics. (NOTE 4) |
| 18 | DnPerformance | This feature indicates the support for exposing UPF information required e.g. by QoS Sustainability analytics. (NOTE 4) |
| 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 1) |
| 21 | CommonEASDNAI | This feature indicates support of enhancements of UP path change event notification. (NOTE 1) |
| 22 | PduSessionInfo | This feature indicates support for PDU Session parameters information. |
| 23 | EnhDataMgmt | Indicates the support of enhanced data management mechanisms. Supporting this feature also requires the support of feature EneNA. |
| 24 | WlanPerformanceExt\_AIML | This feature indicates support for the enhancements of WLAN performance supporting AIML, including support of analytics per UE granularity. Supporting this feature also requires the support of feature WlanPerformance. |
| 25 | EasRelocationEnh | This feature indicates enhanced support of EAS relocation procedures via additional information about the AFs that are responsible for certain EAS. |
| 26 | UPEAS | This feature indicates the support of UPF enhancements for exposure. |
| 27 | EnSatBackhaulCategoryChg | This feature indicates the support of notification of a change between different satellite backhaul categories, or dynamic satellite backhaul categories, or between satellite backhaul and non-satellite backhaul. |
| 28 | Void |  |
| 29 | AreaFilter | This feature indicates support for using an area as a subscription filter. |
| 30 | MultipleAccessTypes | This feature indicates the support of providing list of Access Type(s) used for the PDU Session. This is used for MA PDU sessions as well. |
| 31 | EnQfiAllocation | Indicates the enhancement on "QFI allocation" event including support of 5QI. Supporting this feature also requires the support of feature QfiAllocation. |
| 32 | EnQoSMon | This feature indicates the support of enhanced QoS monitoring functionality, i.e. the report of the congestion information, and/or, the data rate information monitoring. (NOTE 1) (NOTE 3)This feature requires that QosMonitoring feature is supported. |
| 33 | HR-SBO | This feature indicates the support of extensions to User Plane Path Change event notifications to support Home Routed sessions with Session Breakout. (NOTE 2) |
| 34 | EnUPEAS | This feature indicates the support of UPF enhancements for exposure during UPF relocation and PDU Session release.The following functionalities are supported:- provision the remaining data reporting indication.This feature requires that UPEAS feature is supported. |
| 35 | TraffRouteReqOutcome | This feature indicates the support for reporting the installation outcome of the requested traffic routing requirements. (NOTE 1) |
| 36 | UeSatUeComm | This feature indicates the support of reporting about serving satellite identity for UE-Satellite-UE communication in IMS. |
| 37 | Energy | This feature indicates the support of provisioning the energy consumption information. |
| NOTE 1: SMF determines the support of this feature by the NF service consumer as part of the implicit subscription information provided by the PCF as described in 3GPP TS 29.512 [14].NOTE 2: NF service consumers determine the support of this feature as part of the notification of the implicitly subscribed events as described in clause 4.2.2.2.NOTE 3: The negotiation of this feature may be explicit (via Nsmf\_EventExposure\_Subscribe service operation) or implicit as described in NOTE 1.NOTE 4: The features "ServiceExperience" and "DnPerformance" indicate the support of exactly the same functionality of exposing UPF information, but they are both kept for backwards compatibility purposes. An NF service consumer may use these features for any purpose that requires UPF Information and not only for the calculation of QoS Sustainability analytics. |

\* \* \* Next Change \* \* \*

# A.2 Nsmf\_EventExposure API

openapi: 3.0.0

info:

 version: 1.4.0-alpha.2

 title: Nsmf\_EventExposure

 description: |

 Session Management Event Exposure Service.

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externalDocs:

 description: 3GPP TS 29.508 V19.2.0; 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'

 '502':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/502'

 '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'

 '502':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/502'

 '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'

 '502':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/502'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 /subscriptions/{subId}:

 parameters:

 - name: subId

 in: path

 description: Event Subscription ID

 required: true

 schema:

 $ref: '#/components/schemas/SubId'

 get:

 operationId: GetIndividualSubcription

 summary: Read an individual subscription for event notifications from the SMF

 tags:

 - IndividualSubscription (Document)

 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'

 '502':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/502'

 '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'

 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'

 '502':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/502'

 '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)

 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'

 '502':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/502'

 '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'

 dnai:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Dnai'

 ssId:

 type: string

 description: SSID that the PDU session is related to.

 bssId:

 type: string

 description: BSSID that the PDU session is related to.

 upfId:

 type: string

 description: UPF identity.

 nfId:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

 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'

 notifFlagInstruct:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/MutingExceptionInstructions'

 mutingSetting:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/MutingNotificationsSettings'

 defQosSupp:

 type: boolean

 description: >

 Indicates whether the NF service consumer requests to receive QoS Flow performance

 information for the QoS Flow associated with the default QoS rule if there are no

 measurements available for the provided Application Identifier included in the appIds

 attribute.

 qosMonPending:

 type: boolean

 enum:

 - true

 description: >

 Indicates whether the reporting will be activated when the measurements are

 enabled by a PCC rule. Set to "true" indicates that the reporting will be activated.

 It may only be provided in the response.

 remainRepInd:

 type: boolean

 description: >

 Indicates whether the source UPF should send the remaining collected UPF event data

 to the NF service consumer during UPF relocation and PDU Session release.

 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

 networkArea:

 $ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

 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'

 upfEvents:

 type: array

 items:

 $ref: 'TS29564\_Nupf\_EventExposure.yaml#/components/schemas/UpfEvent'

 description: Indicates UPF event exposure information.

 minItems: 1

 flowDescs:

 type: array

 items:

 $ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/FlowDescription'

 description: Descriptor(s) of IP traffic.

 minItems: 1

 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'

 traffRouteReqOutcome:

 $ref: '#/components/schemas/TraffRouteReqOutcome'

 candidateDnais:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Dnai'

 minItems: 1

 description: The candidate DNAI(s) for the PDU Session.

 candDnaisPrioInd:

 type: boolean

 description: >

 If provided and set to true, it indicates that the candidate DNAIs provided

 in the candidateDnais attribute are in descending priority order, i.e.,

 the lower the array index the higher the priority of the respective DNAI.

 If omitted, the default value is false.

 easRediscoverInd:

 type: boolean

 description: >

 Indication of EAS re-discovery. If present and set to "true", it indicates the EAS

 re-discovery is performed, e.g. due to change of common EAS. Default value is "false" if

 omitted.

 trafCorreInfo:

 $ref: '#/components/schemas/TrafficCorrelationNotification'

 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'

 pduAccTypes:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/AccessType'

 minItems: 1

 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'

 sscMode:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/SscMode'

 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

 ulCongInfo:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Uinteger'

 dlCongInfo:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Uinteger'

 ulDataRate:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

 dlDataRate:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

 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'

 pdmf:

 type: boolean

 description: Represents the packet delay measurement failure indicator.

 satBackhaulCat:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/SatelliteBackhaulCategory'

 supportedFeatures:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/SupportedFeatures'

 targetAfId:

 type: string

 description: Identifier of the Application Function responsible for the target DNAI.

 5qi:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/5Qi'

 servSatId:

 type: string

 dataVolInfos:

 type: array

 items:

 $ref: '#/components/schemas/DataVolumeInformation'

 minItems: 1

 required:

 - event

 - timeStamp

 not:

 required: [ipv6Prefixes,ipv6Addrs]

 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'

 TrafficCorrelationNotification:

 description: Represents notifications for 5GC determined Traffic Correlation Information.

 type: object

 properties:

 smfId:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

 tfcCorrId:

 type: string

 description: >

 Identification of a set of UEs accessing the application identified by the

 Application Identifier or traffic filtering information.

 dnais:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Dnai'

 minItems: 1

 easFqdn:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Fqdn'

 easIpAddr:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/IpAddr'

 pduSessionNbr:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Uinteger'

 required:

 - smfId

 - pduSessionNbr

 - tfcCorrId

 anyOf:

 - required: [dnais]

 - oneOf:

 - required: [easFqdn]

 - required: [easIpAddr]

 TraffRouteReqOutcome:

 description: >

 Represents the installation outcome of the requested traffic routing requirements.

 type: object

 properties:

 succTrafficFlows:

 type: array

 items:

 $ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/FlowDescription'

 minItems: 1

 succEthTrafficFlows:

 type: array

 items:

 $ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

 minItems: 1

 failedTrafficFlows:

 type: array

 items:

 $ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/FlowDescription'

 minItems: 1

 failedEthTrafficFlows:

 type: array

 items:

 $ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

 minItems: 1

 allOf:

 - not:

 required: [succTrafficFlows, succEthTrafficFlows]

 - not:

 required: [failedTrafficFlows, failedEthTrafficFlows]

 DataVolumeInformation:

 description: Represents the Data Volume information.

 type: object

 properties:

 dataVol:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/VolumeTimedReport'

 upfIds:

 type: array

 items:

 $ref: '#/components/schemas/UpfInformation'

 minItems: 1

 gNBId:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/GNbId'

 required:

 - dataVol

 - upfIds

 - gNBId

 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

 - UPF\_EVENT

 - SATB\_CH

 - TRAFFIC\_CORRELATION

 - TRAFF\_ROUTE\_REQ\_OUTCOME

 - ENGRGY\_USAGE\_DATA

 - type: string

 description: >

 This string provides forward-compatibility with future

 extensions to the enumeration and is not used to encode

 content defined in the present version of this API.

 description: |

 Represents the types of events that can be subscribed.

 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.

 - UPF\_EVENT: UPF event subscribed via SMF.

 - SATB\_CH: Satellite backhaul category change.

 - TRAFFIC\_CORRELATION: Indicates that the SMF provides 5GC determined traffic correlation

 information for a set of UEs identified by Traffic Correlation ID.

 - TRAFF\_ROUTE\_REQ\_OUTCOME: Indicates the report of the installation outcome of the requested

 traffic routing requirements.

 - ENGRGY\_USAGE\_DATA: Indicates that the SMF provides user-plane energy consumption

 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 and is not used to encode

 content defined in the present version of this API.

 description: |

 Represents the notification methods that can be subscribed.

 Possible values are:

 - 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.

 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 and is not used to encode

 content defined in the present version of this API.

 description: |

 Represents the type of applied SM congestion control.

 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 provides forward-compatibility with future extensions to the enumeration

 and is not used to encode content defined in the present version of this API.

 description: |

 Represents the metric on UE Session Management transactions.

 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 provides forward-compatibility with future extensions to the enumeration

 and is not used to encode content defined in the present version of this API.

 description: |

 Represents the status of the PDU Session.

 Possible values are:

 - ACTIVATED: PDU Session status is activated.

 - DEACTIVATED: PDU Session status is deactivated.

\* \* \*End Changes \* \* \*