**3GPP TSG-CT WG3 Meeting #130C3-234060**

**Xiamen, China, 9 - 13 October, 2023 (revision of C3-233abc)**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **29.508** | **CR** | **0235** | **rev** |  | **Current version:** | **18.3.0** |  |
|  |
| *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:***  | Collect list of Access Types used for the PDU session from SMF |
|  |  |
| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | eNA\_Ph3 |  | ***Date:*** | 2023-09-25 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | As indicated in S2-2308392, multiple Access Types may be used for a PDU Session since the PDU session can be handed over between Access Types (i.e. 3GPP access <-> N3GPP access) as well as can use both Access Types simultaneously. Hence, the SMF may report multiple Access Types for a PDU session. |
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| ***Summary of change:*** | Support to notify multiple Access Types for a PDU session. |
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| ***Consequences if not approved:*** | Misalignment between stage 2 and stage 3. |
|  |  |
| ***Clauses affected:*** | 4.2.2.2, 5.6.2.5, 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 backward compatible features to the OpenAPI of the Nsmf\_EventExposure API. |
|  |  |
| ***This CR's revision history:*** |  |

**Additional discussion(if needed):**

**Proposed changes:**

\*\*\* 1st 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 as defined in clause 4.2.6.2.6.2 of 3GPP TS 29.512 [14], or as provided by the PCF for implicit subscription of QoS Monitoring as defined in clause 4.2.3.25 of 3GPP TS 29.512 [14], as "notifId" attribute; and

- information about the observed event(s) within the "eventNotifs" attribute that shall contain for each observed event an "EventNotification" data structure that shall include:

1. the Event Trigger as "event" attribute;

2. for a UP path change notification:

a) type of notification ("EARLY" or "LATE") as "dnaiChgType" attribute;

b) source DNAI and/or target DNAI as "sourceDnai" attribute and "targetDnai" attribute if DNAI is changed, respectively (NOTE 3); and

c) if the PDU Session type is IP, for the source DNAI IP address/prefix of the UE as "sourceUeIpv4Addr" attribute or "sourceUeIpv6Prefix" attribute; and

d) if the PDU Session type is IP, for the target DNAI IP address/prefix of the UE as "targetUeIpv4Addr" attribute or "targetUeIpv6Prefix" attribute;

e) if available (NOTE 3), for the source DNAI, N6 traffic routing information related to the UE as "sourceTraRouting" attribute;

f) if available (NOTE 3), for the target DNAI, N6 traffic routing information related to the UE as "targetTraRouting" attribute;

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.

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

NOTE 1: 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.

NOTE 2: 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 3: 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 4: If the DNAI is not changed while the N6 traffic routing information change, the source DNAI and target DNAI are not provided.

NOTE 5: 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, if the "QoSMonitoring" or "E2eDataVolTransTime" feature is supported:

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

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

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

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

e) if the feature "XRM\_5G" is supported, UL and/or DL congestion information within the "ulConInfo" attribute and "dlConInfo" attribute; or

f) if the feature "XRM\_5G" is supported, the congestion information measurement failure indicator within "cimf" attribute.

NOTE 6: The SMF gets the knowledge of the NF service consumer support of "QoSMonitoring" feature as described in 3GPP TS 29.512 [14].

NOTE 7: 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 "E2eDataVolTransTime" feature is supported:

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

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

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

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

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

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 access type as "pduAccTypes" attribute, if the "MultipleAccessTypes" feature is also supported.

Editor's note: Whether the PDU Session information is provided via the QFI allocation event can be updated based on related updates in stage 2.

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

a) new RAT type as "ratType" attribute;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

b) Start time or End time of the PDU Session for WLAN as "startWLAN" or "endWLAN" attribute;

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

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

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

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

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

a) satellite backhaul category as "satBackhaulCat" attribute.

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

NOTE 8: Based on the indication of AF acknowledgment to be expected in the PCC rules received from the PCF and local configuration, the SMF may determine to wait for the AF acknowledgement before activating the new UP path associated with the new DNAI.

Upon the reception of an HTTP POST request with "{notifUri}" as URI and an NsmfEventExposureNotification data structure as request body, the 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 9: 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 \*\*\*

#### 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 event "UP\_PATH\_CH" if the DNAI changed (NOTE 1, NOTE 2). |  |
| targetDnai | Dnai | C | 0..1 | Target DN Access Identifier. Shall be included for event "UP\_PATH\_CH" if the DNAI changed (NOTE 1, NOTE 2). |  |
| dnaiChgType | DnaiChangeType | C | 0..1 | DNAI Change Type. Shall be included for event "UP\_PATH\_CH". |  |
| 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 |
| sourceUeIpv4Addr | Ipv4Addr | O | 0..1 | The IPv4 Address of the served UE for the source DNAI. May be included for event "UP\_PATH\_CH". |  |
| sourceUeIpv6Prefix | Ipv6Prefix | O | 0..1 | The Ipv6 Address Prefix of the served UE for the source DNAI. May be included for event "UP\_PATH\_CH". |  |
| targetUeIpv4Addr | Ipv4Addr | O | 0..1 | The IPv4 Address of the served UE for the target DNAI. May be included for event "UP\_PATH\_CH". |  |
| targetUeIpv6Prefix | Ipv6Prefix | O | 0..1 | The Ipv6 Address Prefix of the served UE for the target DNAI. May be included for event "UP\_PATH\_CH". |  |
| sourceTraRouting | RouteToLocation | C | 0..1 | N6 traffic routing information for the source DNAI. Shall be included for event "UP\_PATH\_CH" if available (NOTE 2). |  |
| targetTraRouting | RouteToLocation | C | 0..1 | N6 traffic routing information for the target DNAI. Shall be included for event "UP\_PATH\_CH" if available (NOTE 2). |  |
| ueMac | MacAddr48 | O | 0..1 | UE MAC address. May be included for event "UP\_PATH\_CH". |  |
| adIpv4Addr | Ipv4Addr | O | 0..1 | Added IPv4 Address(es). May be included for event "UE\_IP\_CH". |  |
| adIpv6Prefix | Ipv6Prefix | O | 0..1 | Added Ipv6 Address Prefix(es). May be included for event "UE\_IP\_CH". |  |
| reIpv4Addr | Ipv4Addr | O | 0..1 | Removed IPv4 Address(es). May be included for event "UE\_IP\_CH". |  |
| reIpv6Prefix | Ipv6Prefix | O | 0..1 | Removed Ipv6 Address Prefix(es). May be included for event "UE\_IP\_CH". |  |
| plmnId | PlmnIdNid | C | 0..1 | New PLMN Identifier or the SNPN Identifier. Shall be included for event "PLMN\_CH".(NOTE 7) |  |
| accType | AccessType | C | 0..1 | New Access Type. Shall be included for event "AC\_TY\_CH" 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 11) | 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. Shall be included for event "QFI\_ALLOC". | QfiAllocation |
| appId | ApplicationId | O | 0..1 | Contains the application identifier. May be included for event "QFI\_ALLOC". (NOTE 4) (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 indiate the DNN associated with URLLC service for event "RED\_TRANS\_EXP".Shall be included if DNN based SMCC is applied. | QfiAllocation, PduSessionStatusRedundantTransmissionExpSMCCE |
| 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. | QfiAllocationEneNASMCCE |
| ulDelays | array(Uinteger) | O | 1..N | Uplink packet delay in units of milliseconds. May be included for event "QOS\_MON". (NOTE 5) | QoSMonitoringE2eDataVolTransTime |
| dlDelays | array(Uinteger) | O | 1..N | Downlink packet delay in units of milliseconds. May be included for event "QOS\_MON". (NOTE 5) | QoSMonitoringE2eDataVolTransTime |
| ulConInfo | Uinteger | O | 0..1 | Uplink congestion information. Percentage of packets that UPF uses for ECN marking for L4S (without "%" sign). (NOTE 10) | XRM\_5G |
| dlConInfo | Uinteger | O | 0..1 | Downlink congestion information. Percentage of packets that UPF uses for ECN marking for L4S (without "%" sign). (NOTE 10) | XRM\_5G |
| cimf | boolean | O | 0..1 | Congestion information measurement failure indicator. When set to true, it indicates that a congestion information failure has occurred.Default value is false if omitted. (NOTE 10) | XRM\_5G |
| rtDelays | array(Uinteger) | O | 1..N | Round trip delay in units of milliseconds. May be included for event "QOS\_MON". (NOTE 5) | QoSMonitoringE2eDataVolTransTime |
| 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 |
| 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 the maximum number of elements in the array is 2. If more than one value is received at one given point of time for UL packet delay, DL packet delay or round trip packet delay respectively, the SMF reports the minimum and maximum packet delays to the NEF/AF.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 "pduSessionType" 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 the "cimf" attribute is set to true, "ulConInfo" and "dlConInfo" shall not be present.NOTE 11: If multiple Access Types are used for the PDU session and the "MultipleAccessTypes" feature is supported, the SMF shall include one Access Type in the "accType" attribute and the remaining Access Types in the "addAccTypes" attribute. |

Editor's note: Whether the "ulConInfo" and "dlConInfo" attributes are single or plural is FFS.

\*\*\* 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) |
| 6 | ES3XX | Extended Support for 3xx redirections. This feature indicates the support of redirection for any service operation, according to Stateless NF procedures as specified in clauses 6.5.3.2 and 6.5.3.3 of 3GPP TS 29.500 [4] and according to HTTP redirection principles for indirect communication, as specified in clause 6.10.9 of 3GPP TS 29.500 [4].  |
| 7 | EneNA | This feature indicates support for the enhancements of network data analytics requirements. |
| 8 | ULBuffering | This feature indicates support for Uplink buffering indication. (See NOTE 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 of UE communication analytics. |
| 17 | ServiceExperience | This feature indicates support for service experience analytics. |
| 18 | DnPerformance | This feature indicates support for DN performance analytics. |
| 19 | MultipleFlowDescriptions | This feature indicates the support of the report of multiple UL and/or DL flows. |
| 20 | PacketDelayFailureReport | This feature indicates the support of packet delay failure report as part of QoS Monitoring procedures. This feature requires that QosMonitoring feature is supported. |
| 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 | E2eDataVolTransTime | This feature indicates support for E2E data volume transfer time analytics. |
| 29 | XRM\_5G | This feature indicates the support of multi-modal communication service for extended reality (XR) and interactive media services. |
| 30 | MultipleAccessTypes | This feature indicates the support of providing list of Access Type(s) used for the PDU Session. |
| 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. |

Editor's Note: It is FFS of XRM\_5G feature name and feature granularity.

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

# A.2 Nsmf\_EventExposure API

openapi: 3.0.0

info:

 version: 1.3.0-alpha.4

 title: Nsmf\_EventExposure

 description: |

 Session Management Event Exposure Service.

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externalDocs:

 description: 3GPP TS 29.508 V18.3.0; 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}:

 get:

 operationId: GetIndividualSubcription

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

 tags:

 - IndividualSubscription (Document)

 parameters:

 - name: subId

 in: path

 description: Event Subscription ID

 required: true

 schema:

 type: string

 responses:

 '200':

 description: OK. Resource representation is returned

 content:

 application/json:

 schema:

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

 '307':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/307'

 '308':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/308'

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '406':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/406'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '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'

 parameters:

 - name: subId

 in: path

 description: Event Subscription ID

 required: true

 schema:

 type: string

 responses:

 '200':

 description: OK. Resource was successfully modified and representation is returned

 content:

 application/json:

 schema:

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

 '204':

 description: No Content. Resource was successfully modified

 '307':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/307'

 '308':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/308'

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '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)

 parameters:

 - name: subId

 in: path

 description: Event Subscription ID

 required: true

 schema:

 type: string

 responses:

 '204':

 description: No Content. Resource was successfully deleted

 '307':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/307'

 '308':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/308'

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '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'

 required:

 - notifId

 - notifUri

 - eventSubs

 NsmfEventExposureNotification:

 description: Represents notifications on events that occurred.

 type: object

 properties:

 notifId:

 type: string

 description: Notification correlation ID

 eventNotifs:

 type: array

 items:

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

 minItems: 1

 description: Notifications about Individual Events

 ackUri:

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

 required:

 - notifId

 - eventNotifs

 EventSubscription:

 description: Represents a subscription to a single event.

 type: object

 properties:

 event:

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

 dnaiChgType:

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

 dddTraDescriptors:

 type: array

 items:

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

 minItems: 1

 dddStati:

 type: array

 items:

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

 minItems: 1

 appIds:

 type: array

 items:

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

 minItems: 1

 targetPeriod:

 $ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

 transacDispInd:

 type: boolean

 description: >

 Indicates the subscription for UE transaction dispersion collectionon, if it is included

 and set to "true". Default value is "false".

 transacMetrics:

 type: array

 items:

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

 description: Indicates Session Management Transaction metrics.

 minItems: 1

 ueIpAddr:

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

 upfEvents:

 type: array

 items:

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

 description: Indicates UPF event exposure information.

 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'

 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.

 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/PlmnId'

 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

 ulConInfo:

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

 dlConInfo:

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

 cimf:

 type: boolean

 description: Represents the congestion information measurement failure indicator.

 timeWindow:

 $ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

 smNasFromUe:

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

 smNasFromSmf:

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

 upRedTrans:

 type: boolean

 description: >

 Indicates whether the redundant transmission is setup or terminated. Set to "true" if

 the redundant transmission is setup, otherwise set to "false" if the redundant

 transmission is terminated. Default value is set to "false".

 ssId:

 type: string

 bssId:

 type: string

 startWlan:

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

 endWlan:

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

 pduSessInfos:

 type: array

 items:

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

 minItems: 1

 upfInfo:

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

 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.

 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'

 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

 - SATB\_CH

 - 5QI\_INFO

 - 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.

 - SATB\_CH: Satellite backhaul category change.

 - 5QI\_INFO: Indicates that the event subscribed is related to 5QI.

 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

 - ONE\_TIME

 - ON\_EVENT\_DETECTION

 AppliedSmccType:

 anyOf:

 - type: string

 enum:

 - DNN\_CC

 - SNSSAI\_CC

 description: >

 This string indicates the type of applied SM congestion control.

 - type: string

 description: >

 This string provides forward-compatibility with future

 extensions to the enumeration 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 of Changes \*\*\*