**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *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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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | S2 | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | | 16 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | |  |
|  | *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 can be 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:*** | | 1. In their icoming LS S2-2504505, CT3 requested clarifications about the QoS information exposed by the Nsmf\_EventExposure Service via the QFI allocation event (as mentioned in clause 5.2.8.3.1).   TS 23.502 contains the following:  5.2.5.7 Npcf\_EventExposure service  *5.2.5.7.1 General*  ***Service description:*** *This service enables an NF to subscribe and get notified about PCF events for a group of UE(s) or any UE accessing a combination of (DNN, S-NSSAI).*  *The events can be subscribed by a NF consumer are described in clause 6.1.3.18 of TS 23.503 [20].*  *When the consumer NF is the NWDAF, the event ID “Signalling Storm” including Request type and number of requests corresponding to the request type from NF, Unexpected operational status indicator, etc. is used to collect data for NF related information from PCF for Signalling Storm Analytics as specified in clause 6.x.2 of TS 23.288 [50].*  *..*  Related stage 3 TS 29.523 contains:  **Table 5.6.2.8-1: Definition of type PcEventNotification**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | sigInfos | array(NfSignallingInfo) | C | 1..N | Contains signalling information. It shall be included when the reported event is "SIGNALLING\_INFO". | SignallingInfo |   And TS 29.571 defines: 5.2.4.29 Type NfSignallingInfo Table 5.2.4.29-1: Definition of type NfSignallingInfo   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | | nfSigInfoPerWndw | array(NfSignallingInfoPerTimeWindow) | O | 1..N | Contains NF signalling information per time window. | | avgReqProcTime | Uinteger | O | 0..1 | The average processing time (in milliseconds) of each request, i.e. the time duration between receiving the request from an NF and sending the response to the NF. | | nfHeartbeatInfo | NfHeartbeatInfo | O | 0..1 | Contains NF heartbeat-related information. | | unexpStatusInd | boolean | O | 0..1 | Indicates whether the NF is at an unexpected status (i.e. deviates from the normal operations, based on thresholds or rules configured by operator).  - "true": the NF is at an unexpected status.  - "false": the NF is not at an unexpected status.  The default value is "false" if omitted. |  5.2.4.30 Type NfSignallingInfoPerTimeWindow Table 5.2.4.30-1: Definition of type NfSignallingInfoPerTimeWindow   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | | tw | TimeWindow | M | 1 | The time window in which the provided signalling information occurred. | | nfSigInfoPerService | map(NfSignallingInfoPerService) | M | 1..N | Each entry of the map contains NF signalling information for a specific service. The key of the map is the "serviceName" attribute of the NfSignallingInfoPerService data type. |  5.2.4.31 Type NfSignallingInfoPerService Table 5.2.4.31-1: Definition of type NfSignallingInfoPerService   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | | serviceName | ServiceName | M | 1 | The name of the service as specified in clause 6.1.6.3.11 of 3GPP TS 29.510 [29] to which the provided signalling information refers. | | numOfReq | Uinteger | O | 0..1 | The number of requests received for this service. (NOTE) | | numOfReqUnresp | Uinteger | O | 0..1 | The number of requests received for this service which were not responded. (NOTE) | | numOfReqReject | Uinteger | O | 0..1 | The number of requests received for this service which were rejected. (NOTE) | | numOfRedMessages | Uinteger | O | 0..1 | The number of redundant received messages, i.e. messages which were transmitted multiple times. | | numOfPosteriorReq | Uinteger | O | 0..1 | The number of posterior requests, i.e. requests that were triggered by a previous request received by the same NF. |   Editor's Note: It is FFS, whether the above measurements should be reported per service name or per service instance. 5.2.4.32 Type NfHeartbeatInfo Table 5.2.4.32-1: Definition of type NfHeartbeatInfo   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | | numOfRetrans | Uinteger | O | 0..1 | Number of retransmissions performed. | | hbIntvl | Uinteger | O | 0..1 | NF heartbeat interval in milliseconds. |   However, TS 23.503 Clause 6.1.3.18 does not define an NFSignallingInfo Event. As the Event is only vaguly related to PCCit may be preferable to define it in TS 23.502 rather than TS 23.503. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. The QoS information exposed by the Nsmf\_EventExposure Service via the QFI allocation event consist of the QoS profile as defined in Clause 5.7.1.2 of TS 23.501, including 5QI and QoS characteristics according to Clause 5.7.3 of TS 23.501. 2. Align with TS 23.288 and stage 3 TS 23.523 by adding to Npcf\_EventExposure Service event exposure parameters required as input to related to signalling load analytics. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | 1. Unclear requirements related to QoS information exposed by the Nsmf\_EventExposure Service via the QFI allocation event confise downstream groups. 2. Misalignment with TS 23.288 and stage 3 TS 23.523 related to Npcf\_EventExposure Service event exposure parameters for signalling load analytics | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2.5.7.1, 5.2.8.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | For Issue #2, an alternative proposal to document the new event in TS 23.503 is in S2-2506209. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

1st change: Npcf\_EventExposure Service

##### 5.2.5.7.1 General

**Service description:** This service enables an NF to subscribe and get notified about PCF events for a group of UE(s) or any UE.

The events that can be subscribed by a NF consumer are the events described in clause 6.1.3.18 of TS 23.503 [20] and the following events:

* **Signalling Information**: The PCF reports information related the amount of successful and failed signalling interactions with peer NF service instances, as detailed in Clause 6.22.2 of TS 23.288 [50].

When the consumer NF is the NWDAF, the event ID "Service Signalling characteristics" including Request type and number of requests corresponding to the request type from NF, Unexpected operational status indicator, etc. is used to collect data for NF related information from PCF for Signalling Storm Analytics as specified in clause 6.22.2 of TS 23.288 [50].

The following service operations are defined for the Npcf\_EventExposure service:

- Npcf\_EventExposure\_Subscribe.

- Npcf\_EventExposure\_UnSubscribe.

- Npcf\_EventExposure\_Notify.

2nd change: Nsmf\_EventExposure Service

##### 5.2.8.3.1 General

**Service description:** This service provides events related to PDU Sessions towards consumer NF. The service operations exposed by this service allow other NFs to subscribe and get notified of events happening on PDU Sessions. The following are the key functionalities of this NF service.

- Allow consumer NFs to Subscribe and unsubscribe for an Event ID on PDU Session(s);

- Allow the NWDAF to collect data for network data analytics from SMF as specified in TS 23.288 [50] and from UPF as specified in clause 4.15.4.5;

- Allow the EIF to collect data from SMF as specified in clause 5.51.2 of TS 23.501 [2] and in clause 4.29.2;

- Notifying events on the PDU Session to the subscribed NFs; and

- Allow consumer NFs to acknowledge or respond to an event notification.

The following events can be subscribed by a NF consumer (Event ID is defined in clause 4.15.1):

- UE IP address / Prefix allocation/change: The event notification may contain a new UE IP address / Prefix or an indication of which UE IP address / Prefix has been released.

- PDU Session Establishment and/or PDU Session Release.

The event notification may contain following information:

- PDU Session Type.

- DNN.

- UE IP address/Prefix.

- UP path change: a notification corresponding to this event is sent when the UE IP address / Prefix and / or DNAI and /or the N6 traffic routing information has changed.

The event notification may contain following information:

- the type of notification ("EARLY" or "LATE").

- for both the source and target UP path between the UE and the DN, the corresponding information is provided when it has changed:

- DNAI.

- UE IP address / Prefix.

- N6 traffic routing information.

- Candidate DNAI(s) for the PDU Session.

- Change of common EAS.

- Simultaneous Connectivity failure: a notification indicating that the simultaneous connectivity over the source and target PSA at edge relocation is not possible (as described in clause 6.3.4 of TS 23.548 [74])

NOTE 1: UP path change notification, DNAI and N6 traffic routing information are further described in clause 5.6.7 of TS 23.501 [2].

NOTE 2: The UP path change notification includes DNAI to represent the change of satellite identifier in case of UE-Satellite-UE (UE-SAT-UE) communication.

NOTE 3: DNAI value can be derived from the satellite identifier as per operator policy and implementation.

- QoS Monitoring: the event notification may contain the QoS Monitoring report for the QoS parameter(s) to be measured defined in clause 5.45 of TS 23.501 [2]. Implicit subscription of the PCF on behalf of the NEF/AF as part of setting PCC rule(s) may trigger SMF to send this event notification.

- Change of Access Type; The event notification contains the new Access Type for the PDU Session. For MA PDU Session the Change of Access Type may include two Access Type information that the user is currently using.

- Change of RAT Type; the event notification contains the new RAT Type for the PDU Session.

- PLMN change; The event notification contains the new PLMN Identifier for the PDU Session and may indicate:

- whether local traffic offload is possible, i.e. mobility of the PDU session either towards HPLMN or towards a VPLMN where HR-SBO is supported and allowed; and

- DNN and S-NSSAI of HPLMN.

- Change of Satellite backhaul category; The event notification contains the new Satellite backhaul category for the PDU session.

- Downlink data delivery status. The event notification contains the status of downlink data buffering in the core network including:

- First downlink packet per source of the downlink IP traffic in extended buffering and Estimated maximum wait time.

- First downlink packet per source of the downlink IP traffic discarded.

- First downlink packet per source of the downlink IP traffic transmitted after previous buffering and/or discarding of corresponding packet(s).

- QFI allocation: The event notification is sent whenever a new QoS Flow is established and contains:

- If the Target of Event Reporting is a PDU Session and the QoS Flow is associated with this PDU Session, both the allocated QFI and either one of the following (Application Identifier or IP Packet Filter Set or Ethernet Packet Filter Set). The QoS profile as defined in Clause 5.7.1.2 of TS 23.501 [2], including 5QI and QoS characteristics according to Clause 5.7.3 of TS 23.501 [2], corresponding to the QoS Flow and the DNN, S-NSSAI corresponding to the PDU Session are also sent.

- If the Target of Event Reporting is a SUPI and the PDU Session is associated with this SUPI, both the allocated QFI and either one of the following (Application Identifier or IP Packet Filter Set or Ethernet Packet Filter Set). The QoS profile corresponding to the QoS Flow and the DNN, S-NSSAI corresponding to the PDU Session are also sent.

- If the Target of Event Reporting is an Internal-Group-Id and the PDU Session is associated with this Internal-Group-Id (i.e. the PDU Session belongs to a UE belonging to this Internal-Group-Id), both the allocated QFI and either one of the following (Application Identifier or IP Packet Filter Set or Ethernet Packet Filter Set). The QoS profile corresponding to the QoS Flow and the DNN, S-NSSAI, PDU Session ID, SUPI corresponding to the PDU Session are also sent.

- If the Target of Event Reporting is any UE, both the allocated QFI and either one of the following (Application Identifier or IP Packet Filter Set or Ethernet Packet Filter Set). The QoS profile corresponding to the QoS Flow and the DNN, S-NSSAI, PDU Session ID, SUPI corresponding to the PDU Session are also sent.

- QoS Flow change: The event notification is sent whenever application traffic is bound to an existing QoS Flow or the QoS parameters of the QoS Flow that the application traffic is bound are modified. The Target of Event Reporting may be SUPI, Internal-Group-Id, or any UE. Related event notifications contain parameters as specified for the QFI allocation event.

- QFI deallocation: The event notification is sent whenever the QoS Flow is released. The Target of Event Reporting may be SUPI, Internal-Group-Id, or any UE. Related event notifications contain parameters as specified for the QFI allocation event.

NOTE 4: When the consumer NF is the NWDAF, the QFI allocation, QoS Flow change, and QFI deallocation events are used to collect data for analytics as specified in TS 23.288 [50].

- Total number of Session Management transactions:

- The total number of Session Management transaction is used to collect the number of SM transactions of a SUPI or Internal Group ID, for example Dispersion Analytics as specified in TS 23.288 [50]. The transaction count is incremented when the NAS transactions from PDU Session Establishment, PDU Session Authentication, PDU Session Modification and PDU Session Release procedures is concluded. Only the periodic reporting mode applies.

- Information on PDU Session for WLAN (i.e. Access Type is Non-3GPP and RAT Type is TRUSTED\_WLAN).

- User plane status information: The event notification contains:

- PDU Session ID.

- User Plane Inactivity Timer (as specified in TS 29.244 [69]).

- PDU Session status (activated, deactivated).

NOTE 5: When the consumer NF is the NWDAF, the event user plane status information is used to collect data for UE Communication analytics as specified in TS 23.288 [50].

- Session Management Congestion Control Experience for PDU Session: The event notification contains the data related to Session Management Congestion Control experience per PDU Session as described in TS 23.288 [50].

- UE session behaviour trends (see clause 4.15.4.3);

- UE communications trends (see clause 4.15.4.3);

- UP with redundant transmission: the event notification indicates if redundant transmission (see clause 5.33.2.2 of TS 23.501 [2]) has been activated or not for the PDU session;

- User Data Usage Measures (see clause 4.15.4.5): SMF conveys the subscription to UPF on behalf of the consumer. Consumer receives the events directly from UPF. For certain UE(s), the SMF conveys the subscription to I-SMF on behalf of the consumer, and the I-SMF conveys the subscription to UPF on behalf of SMF. Consumer receives the events directly from UPF; and

- User Data Usage Trends (see clause 4.15.4.5): SMF conveys the subscription to UPF on behalf of the consumer. Consumer receives the events directly from UPF. For certain UE(s), the SMF conveys the subscription to I-SMF on behalf of the consumer, and the I-SMF conveys the subscription to UPF on behalf of the SMF. Consumer receives the events directly from UPF.

- Service Signalling characteristics: The event notification includes Request type and number from NF, Number of receiving Session Report from UPFs, State transition information, Timer information, Unexpected operational status indicator, etc. from SMF for Signalling Storm Analytics as specified in clause 6.22.2 of TS 23.288 [50].

- Usage data per gNB and (I-)UPF: the notification reports data specified in clause 5.51.2 of TS 23.501 [2] as part of the Energy Consumption information collection defined in clause 4.29.2.

When the consumer NF is the NWDAF, the event Information on PDU Session for WLAN is used to collect data for WLAN performance analytics as specified in TS 23.288 [50].

When the consumer NF is the NWDAF, the event Session Management Congestion Control Experience for PDU Session is used to collect data for Session Management Congestion Control Experience analytics as specified in TS 23.288 [50].

When the consumer NF is the NWDAF, the events QoS Monitoring, User Data Usage Measures and User Data Usage Trends are used to collect data from UPF for analytics as specified in clause 4.15.4.5 and in TS 23.288 [50]. SMF conveys the subscription to UPF on behalf of the NWDAF or the SMF conveys the subscription to I-SMF on behalf of the NWDAF and the I-SMF conveys the subscription to UPF on behalf of SMF.

The consumer NF may request to subscribe the UPF exposure events (including event ID of exposed UPF event of QoS monitoring, User Data Usage Measures and User Data Usage Trends) via SMF indirectly by Nsmf\_EventExposure. After receiving this subscription request, the SMF does a third-party subscription onto UPF on behalf of this consumer. The consumer should also provide the subscribed UPF event to SMF.

Event Filters are used to specify the conditions to match for notifying the events (i.e. "List of Parameter values to match"). If there are no conditions to match for a specific Event ID, then the Event Filter is not provided. The following table provides as an example how the conditions to match for event reporting can be specified for various Event IDs for SMF exposure.

Table 5.2.8.3.1-1: Example of Event Filters for SMF exposure events

|  |  |
| --- | --- |
| Event ID for SMF exposure | Event Filter (List of Parameter Values to Match) |
| DNAI Change | None |
| Candidate DNAI(s) has changed | None |
| PDU Session Release | <Parameter Type = S-NSSAI, Value = S-NSSAI1> |
| PDU Session Establishment | <Parameter Type = S-NSSAI, Value = S-NSSAI1> |
| QoS Monitoring | <Parameter Type = S-NSSAI, Value = S-NSSAI1>  <Parameter Type = DNN, Value = DNN1>  <Parameter Type = Application Identifier, Value = Application Identifier1>  <Parameter Type = AoI, value = AoI1>  <Parameter Type = UPF Id, value = UPF Id1>  <Parameter Type = DNAI, value = DNAI1> |
| QFI allocation | <Parameter Type = DNN, Value = DNN1>  <Parameter Type = S-NSSAI, Value = S-NSSAI1> |
| QFI allocation | <Parameter Type = Application Identifier, Value = Application Identifier1> |
| QoS Flow change | <Parameter Type = Application Identifier, Value = Application Identifier1> |
| QFI deallocation | <Parameter Type = DNN, Value = DNN1>  <Parameter Type = S-NSSAI, Value = S-NSSAI1> |
| Transaction Count | <Parameter Type = TAI, Value = TA1> (NOTE)  <Parameter Type = S-NSSAI, Value = S-NSSAI1> |
| User plane status information | <Parameter Type = Application Identifier, Value = Application Identifier1>  <Parameter Type = SUPI, Value = SUPI1> |
| Information on PDU Session for WLAN | <Parameter Type = Access Type, Value = Non-3GPP> && <Parameter Type = RAT Type, Value = TRUSTED\_WLAN> |
| Session Management Congestion Control Experience for PDU Session | <Parameter Type = DNN, Value = DNN1>  <Parameter Type = S-NSSAI, Value = S-NSSAI1> |
| UP with redundant transmission | <Parameter Type = DNN, Value = DNN1> |
| User Data Usage Measures | <Parameter Type = S-NSSAI, Value = S-NSSAI1>  <Parameter Type = DNN, Value = DNN1>  <Parameter Type = Application Identifier, Value = Application Identifier1> (NOTE 2)  <Parameter Type = Flow Info, Value = Packet Filter Set1> (NOTE 2)  <Parameter Type = AoI, value = AoI1>  <Parameter Type = SSID/BSSID, Value = SSID/BSSID1> |
| User Data Usage Trends | <Parameter Type = S-NSSAI, Value = S-NSSAI1>  <Parameter Type = DNN, Value = DNN1>  <Parameter Type = Application Identifier, Value = Application Identifier1> (NOTE 2)  <Parameter Type = Flow Info, Value = Packet Filter Set1> (NOTE 2)  <Parameter Type = AoI, value = AoI1> |
| Usage data per gNB and (I-)UPF (NOTE 3) | <Parameter Type = S-NSSAI, Value = S-NSSAI1>  <Parameter Type = DNN, Value = DNN1>  <Parameter Type = Application Identifier, Value = Application Identifier1> (NOTE 2)  <Parameter Type = Flow Info, Value = Packet Filter Set1> (NOTE 2) |
| NOTE 1: Optionally the SMF can fetch the location information from the AMF but transaction information correlation at the location can also be achieved without it and through transaction information associated with the requested time period, which corresponds to the UE's time span at the location of interest.  NOTE 2: These Parameters are exclusive and only one of them can be provided.  NOTE 3: used by EIF to collect data from SMF as specified in clause 5.51.2 of TS 23.501 [2] | |

The target of SMF event reporting may correspond to a PDU Session ID, an UE ID (SUPI), an Internal Group Identifier, an indication that any UE is targeted (e.g. on a specific DNN), or an indication that any PDU session is the target.

An SMF receiving Nsmf\_EventExposure Subscription request to subscribe (e.g. to UPF event exposure) for "Any UE" does not consider PDU sessions for which it is acting as I-SMF when it selects the PDU session(s) it has to consider.

When acknowledgment is expected the SMF also provides Notification Correlation Information to the consumer NF in the event notification.

The consumer NF may provide the following event-specific information when acknowledging an event notification:

- For UP path change event:

- N6 traffic routing information related to the target DNAI.

NOTE 6: Acknowledgement to a UP path change event notification is further described in clause 5.6.7 of TS 23.501 [2].

End of changes