**3GPP TSG-CT WG3 Meeting #142 *C3-253380***

**Goteborg, Sweden, 25 – 29 August 2025 (Revision of C3-25xxxx)**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **29.522** | **CR** | **1690** | **rev** | **-** | **Current version:** | **19.3.0** |  |
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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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|  |
| ***Title:***  | Support RAT Type Exposure for PDU Session |
|  |  |
| ***Source to WG:*** | Ericsson, Verizon, AT&T, Oracle, Nokia |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | TEI19, CIoT-CT |  | ***Date:*** | 2025-08-01 |
|  |  |  |  |  |
| ***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)* |
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| ***Reason for change:*** | According to the agreed TS 23.502 CR 5531, the RAT Type can be reported in PDU Session Establishment and Release and RAT Type Change can be supported in NEF exposure.Hence needs to update in this TS accordingly. |
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| ***Summary of change:*** | Update the procedure adding new feature to support current RAT Type in PDU Session establishment and release, also new RAT Type when the RAT Type is changed for the PDU Session. |
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| ***Consequences if not approved:*** | Not aligned with stage 2 requirements on NEF exposure supporting RAT Type change and include last known RAT Type in PDU Session establishment or release if available. |
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| ***Clauses affected:*** | 4.4.2, 5.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 23.502 CR 5531  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This CR does not impact the OpenAPI file. |
|  |  |
| ***This CR's revision history:*** |  |

**Additional discussion(if needed):**

**Proposed changes:**

\*\*\* 1st Change \*\*\*

### 4.4.2 Procedures for Monitoring

The procedures and provisions for event monitoring defined in clause 4.4.2 of 3GPP TS 29.122 [4] shall be applicable in 5GS with the following differences:

- description of the SCS/AS applies to the AF;

- description of the SCEF applies to the NEF;

- description of the HSS applies to the UDM, and the NEF shall interact with the UDM by using Nudm\_EventExposure service as defined in 3GPP TS 29.503 [17];

- description of the MME/SGSN applies to the AMF, the NEF shall resolve a location area to the involved AMF(s) either by local configuration or via the NRF and the NEF shall interact with the AMF by using the Namf\_EventExposure service as defined in 3GPP TS 29.518 [18];

- description about the PCRF is not applicable;

- description about the change of IMSI-IMEI(SV) association monitoring event applies to the change of SUPI-PEI association monitoring event, the new PEI within the "pei" attribute may be included within the MonitoringEventReport data type if the "enNB2" feature is supported;

- when the "monitoringType" sets to "LOCATION\_REPORTING" within the MonitoringEventSubscription data type as defined in clause 5.3.2.1.2 of 3GPP TS 29.122 [4] during the monitoring event subscription, only "CGI\_ECGI", "TA\_RA", "GEO\_AREA" and "CIVIC\_ADDR" within the Accuracy data type, as defined in clause 5.3.2.4.7 of 3GPP TS 29.122 [4], are applicable for 5G event monitoring using the MonitoringEvent API;

- after validation of the AF request, the NEF may determine a monitoring expiry time, based on operator policy and take into account the monitoring expire time if included in the request; and the NEF may provide an expiry time (determined by the NEF, UDM or AMF) to the AF even the AF does not provided before;

- if the "Loss\_of\_connectivity\_notification" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, values 0-5 are not applicable for the lossOfConnectReason attribute within MonitoringEventReport data type, the lossOfConnectReason attribute shall be set to 6 if the UE is deregistered, 7 if the maximum detection timer expires, 8 if the UE is purged or 9 if the UE’s Unavailability Period Duration is available and the "Loss\_of\_connectivity\_notification\_5G" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported;

- the AF may include a periodic reporting time indicated by the "repPeriod" attribute within MonitoringEventSubscription data type, which is only applicable for the "Location\_notification", "eLCS", "Number\_of\_UEs\_in\_an\_area\_notification\_5G", "NSAC" and "Energy" features in the NEF;

- if the "locationType" attribute sets to "LAST\_KNOWN\_LOCATION", the "maximumNumberOfReports" attribute shall set to 1 as a One-time Monitoring Request;

- description about the PDN connectivity status event apply to the PDU session status event, the description of the MME/SGSN applies to the SMF during the reporting of monitoring event procedure, the NEF receives the event notification via Nsmf\_EventExposure service as defined in 3GPP TS 29.508 [26], and:

- if the "EnPduSesRatType" feature is supported, the current RAT type may be provided, if available, for the "PDN\_CONNECTIVITY\_STATUS" event when reporting the establishment or release of the PDU session.

- if the "Session\_Management\_Enhancement" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, the "dnn"and/or "snssai" may be provided in MonitoringEventSubscription data type for monitoring type provided "PDN\_CONNECTIVITY\_STATUS" or " DOWNLINK\_DATA\_DELIVERY\_STATUS";

- when sending the UDM/AMF/SMF event report to the AF, the NEF may store the event data in the report in the UDR as part of the data for exposure as specified in 3GPP TS 29.519 [23] by using Nudr\_DataRepository service as specified in 3GPP TS 29.504 [20];

- if the "Downlink\_data\_delivery\_status\_5G" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support the downlink data delivery status notification;

1) the AF shall send an HTTP POST message to the NEF to the resource "Monitoring Event Subscriptions" as defined in clause 5.3.3.2 of 3GPP TS 29.122 [4] for creating a subscription or send an HTTP PUT/PATCH message to the NEF to the resource "Individual Monitoring Event Subscription" defined in clause 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription as follows:

A) within the MonitoringEventSubscription data structure (or the requested modifications to the resource representation in case the HTTP PATCH method is used and the "Subscription\_Patch" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported), the AF may additionally include packet filter descriptor(s) within the "dddTraDescriptors" attribute and the list of monitoring downlink data delivery status event(s) within the "dddStati" attribute; and

B) the NEF shall subscribe the events to the appropriate UDM(s) within the network by invoking the Nudm\_EventExposure\_Subscribe service operation as defined in clause 5.5.2.2 of 3GPP TS 29.503 [17];

2) if the "Partial\_group\_modification" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support partial cancellation or addition of certain UE(s) within the active group event subscription, the NEF shall map the "excludedExternalIds" and/or "excludedMsisdns" attributes to the "excludeGpsiList" attribute for the partial group cancellation, or shall map the "addedExternalIds" and/or "addedMsisdns" attributes to the "includeGpsiList" attribute within the Nudm\_EventExposure service; and

3) when the NEF receives the event notification as defined in clause 4.4.2 of 3GPP TS 29.508 [26], the NEF shall send an HTTP POST message to the AF as defined in clause 4.4.2.3 of 3GPP TS 29.122 [4] with the difference that within each MonitoringEventReport data structure, the NEF shall include:

A) the downlink data delivery status within the "dddStatus" attribute;

B) the downlink data descriptor impacted by the downlink data delivery status change within the "dddTraDescriptor" attribute;

C) the estimated buffering time within the "maxWaitTime" attribute if the downlink data delivery status is set to "BUFFERED"; and

D) if the "Availability\_after\_DDN\_failure\_notification\_enhancement" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, the AF shall send an HTTP POST message to the NEF to the resource "Monitoring Event Subscriptions" as defined in clause 5.3.3.2 of 3GPP TS 29.122 [4] for creating an subscription or send an HTTP PUT/PATCH message to the NEF to the resource "Individual Monitoring Event Subscription" as defined in clause 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription with the difference that within the MonitoringEventSubscription data structure (or the requested modifications to the resource representation in case the HTTP PATCH method is used and the "Subscription\_Patch" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported), the AF shall include packet filter descriptions within the "dddTraDescriptors" attribute;

- if the "eLCS" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, the AF may send an HTTP POST message to the NEF to the resource "Monitoring Event Subscriptions" as defined in clause 5.3.3.2 of 3GPP TS 29.122 [4] for creating an subscription or send an HTTP PUT/PATCH message to the NEF to the resource "Individual Monitoring Event Subscription" defined in clause 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription as follows:

1) within the MonitoringEventSubscription data structure (or the requested modifications to the resource representation in case the HTTP PATCH method is used and the "Subscription\_Patch" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported), the AF may additionally include location QoS requirement within the "locQoS" attribute, the service identifier within the "svcId" attribute, Location deferred requested event type within the "ldrType" attribute, the validity start time and the validity end time within the "locTimeWindow" attribute, the maximum age of location estimate within the "maxAgeOfLocEst" attribute, the requesting target UE velocity within the "velocityRequested" attribute, the linear distance within the "linearDistance" attribute, the reporting target UE location estimate indication within the "reportingLocEstInd" attribute, the sampling interval within the "samplingInterval" attribute, the maximum reporting expire interval within the "maxRptExpireIntvl" attribute, the supported GAD shapes within the "supportedGADShapes" attribute, the Code word within the "codeword" attribute, and other attributes as defined in clause 5.3.2.3.2 of 3GPP TS 29.122 [4] for location information subscription; The MonitoringEventSubscription data structure (or the requested modifications to the resource representation in case the HTTP PATCH method is used and the "Subscription\_Patch" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported) may also include the "locationArea5G" attribute containing only the "geographicAreas" attribute and the "accuracy" attribute set to the value "GEO\_AREA". The "accuracy" attribute and "locQoS" attribute are mutually exclusive. If the "MULTIQOS" feature is also supported, Multiple QoS Class is supported in the "lcsQosClass" attribute within the "locQoS" attribute for deferred MT-LR. If the "eLCS\_en" feature is also supported, the AF may include the "upLocRepIndAf" attribute to indicate whether or not location reporting over user plane is required, and may also include the "upLocRepAddrAf" attribute to convery the AF's addressing information for location reporting over user plane. If the "Ranging\_SL" feature as defined in clause 5.3.4 of 3GPP TS 29.122 [4] is also supported, the AF may additionally include the ranging and sidelink positioning result(s) type within the "reqRangSlRes" attribute, the list of the related UE(s) for the ranging and sidelink positioning and the corresponding information within the "relatedUEs" attribute within the MonitoringEventSubscription data structure (or the requested modifications to the resource representation in case the HTTP PATCH method is used and the "Subscription\_Patch" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported);

2) if the NEF identifies the location request precision higher than cell level location accuracy is required based on the "locQoS" attribute received, the NEF shall interact with the appropriate GMLC within the network by invoking the Ngmlc\_Location\_ProvideLocation service operation as defined in clause 6.1 of 3GPP TS 29.515 [35];

3) if the location request precision is lower than or equal to cell level, based on implementation, the NEF may interact with the GMLC by invoking the Ngmlc\_Location\_ProvideLocation service operation as defined in clause 6.1 of 3GPP TS 29.515 [35]; or retrieve the UE location privacy information from the UDM by using Nudm\_SDM service as described in clause 5.2 of 3GPP TS 29.503 [17] and if the privacy setting is verified, the NEF shall interact with the UDM for the serving AMF address by invoking the Nudm\_UECM service as described in clause 5.3 of 3GPP TS 29.503 [17]. After receiving the serving AMF address from the UDM, the NEF shall interact with the AMF by invoking the Namf\_EventExposure\_Subscribe service operation as defined in clause 5.3 of 3GPP TS 29.518 [18]; or may interact with UDM by using Nudm\_EventExposure service as defined in clause 5.5 of 3GPP TS 29.503 [17] and the NEF receives the location event notification from the AMF via Namf\_EventExposure service as defined in in clause 5.5 of 3GPP TS 29.518 [18];

4) based on the received AF information and local authorization policy, the NEF shall derive the LCS client type with a suitable enumeration value for the AF location request, to be provided as the "externalClientType" attribute when invoking the Ngmlc\_Location\_ProvideLocation service operation as defined in clause 6.1 of 3GPP TS 29.515 [35];

5) upon receipt of successful location response from the GMLC or the AMF or the UDM, the NEF shall create or update the "Individual Monitoring Event Subscription" resource and then send an HTTP POST or PUT/PATCH response to the AF as defined in clause 4.4.2.2 of 3GPP TS 29.122 [4]. Upon receipt of the location Report from the GMLC or the AMF, the NEF shall determine the monitoring event subscription associated with the corresponding Monitoring Event Report as defined in clause 4.4.2.3 of 3GPP TS 29.122 [4]; and

6) in order to delete a previous active configured monitoring event subscription at the NEF:

- the AF shall send either:

- an HTTP DELETE request message to the NEF targeting the corresponding "Individual Monitoring Event Subscription" resource which is received in the response to the request that has created the monitoring events subscription resource; or

- an HTTP PUT/PATCH request to the NEF targeting the corresponding "Individual Monitoring Event Subscription" resource to remove the subscription to concerned event(s) from the list of subscribed event(s) together with the related information, as defined in clauses 5.3.3.3.3.2 and 5.3.3.3.3.3 of 3GPP TS 29.122 [4];

- the NEF shall interact with the GMLC, the AMF or the UDM to remove the corresponding events reporting; and

- upon reception of the successful response from the GMLC, the AMF or the UDM, the NEF shall delete or update accordingly the corresponding "Individual Monitoring Event Subscription" resource and send an HTTP response to the AF with either an HTTP "204 No Content" status code, or an HTTP "200 OK" status code including the monitoring event report if received (in case of resource deletion) or the updated representation of the resource (in case of resource update);

- based on local regulations' requirements and operator policies, user consent management specified in Annex V of 3GPP TS 33.501 [6] may be required for EDGE applications to access the Nnef\_EventExposure API for UE's location retrieval. When it is the case and the NEF is used by the Edge Enabler Layer entities to access 3GPP 5GC services, the NEF acts as the consent enforcement entity, as specified in clause 5.1.3 of 3GPP TS 33.558 [56];

- when user consent management shall be carried out for EDGE applications, then:

1) if the AF (e.g. Edge Enabler Server) does not support the "UserConsentRevocation" feature or does not indicate its support for this feature in the HTTP POST request to create a new "Individual Monitoring Event Subscription" resource with the "monitoringType" attribute set to "LOCATION\_REPORTING", the NEF shall reject the request and respond to the AF with an HTTP "403 Forbidden" status code with the response body including a ProblemDetails data structure containing the "CONSENT\_REVOCATION\_NOT\_SUPPORTED" application error within the "cause" attribute;

2) if the AF indicates its support for the "UserConsentRevocation" feature in the HTTP POST request to create a new "Individual Monitoring Event Subscription" resource with the "monitoringType" attribute set to "LOCATION\_REPORTING", the NEF shall check user consent for the targeted UE(s) by retrieving the user consent subscription data via the Nudm\_SDM service API of the UDM as specified in clause 5.2.2.2.24 of 3GPP TS 29.503 [17], subscribe to user consent revocation notifications only for those UE(s) for which user consent is granted also using the Nudm\_SDM service API of the UDM and accept the request for the creation of the event monitoring subscription only for the UE(s) for which user consent is granted;

3) if user consent is not granted for all the targeted UE(s), the NEF shall reject the request and respond to the AF with an HTTP "403 Forbidden" status code with the response body including a ProblemDetails data structure including the "USER\_CONSENT\_NOT\_GRANTED" application error within the "cause" attribute;

4) the AF shall provide within the HTTP POST request to create a new event monitoring subscription the URI via which it desires to receive user consent revocation notifications within the "revocationNotifUri" attribute. The AF may update this URI in subsequent HTTP PUT/PATCH requests to update/modify the corresponding "Individual Monitoring Event Subscription" resource;

5) when becoming aware of user consent revocation for one or several UE(s), the NEF shall:

A) stop processing the data related to the concerned UE(s);

B) send a user consent revocation notification to the AF by sending an HTTP POST request with the request body including the ConsentRevocNotif data structure that shall contain the user consent revocation information (e.g. UE(s) for which user consent was revoked, etc.);

C) remove the concerned UE(s) from the corresponding "Individual Monitoring Event Subscription" resource and from the related subscriptions at the GMLC, if any; and

D) unsubscribe from user consent revocation notifications for the concerned UE(s) at the UDM;

6) at the reception of the user consent revocation notification from the NEF, the AF shall take the necessary actions to stop processing the data related to the UE(s) for which user consent was revoked; and

7) if user consent is revoked for all the UE(s), the AF shall delete the corresponding "Individual Monitoring Event Subscription" resource as specified above in this clause;

- if the "NSAC" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support network slice status reporting:

1) the AF shall send an HTTP POST request to the NEF targeting the "Monitoring Event Subscriptions" resource to create a subscription, as defined in clause 5.3.3.2.3.4 of 3GPP TS 29.122 [4], or send an HTTP PUT/PATCH request targeting the NEF to the "Individual Monitoring Event Subscription" resource to update an existing subscription, as defined in clauses 5.3.3.3.3.2 and 5.3.3.3.3.3 of 3GPP TS 29.122 [4], as follows:

A) within the MonitoringEventSubscription data structure (or the requested modifications to the MonitoringEventSubscription data structure in case the HTTP PATCH method is used):

a) either the concerned network slice identified by the "snssai" attribute, in the case of a trusted AF, or the AF service identifier within the "afServiceId" attribute, in the case of an untrusted AF, shall be provided;

b) the value of the "monitoringType" attribute shall be set to either "NUM\_OF\_REGD\_UES" or "NUM\_OF\_ESTD\_PDU\_SESSIONS";

c) the "maximumNumberOfReports" attribute set to a value of 1 shall be provided, if one-time reporting of the current network slice status information is requested;

d) the "immediateRep" attribute shall be set to "true", if immediate reporting of the current network slice status information is requested or one-time reporting of the current network slice status information is requested;

e) if one-time reporting is not requested, either a targeted reporting threshold within the "tgtNsThreshold" attribute (if threshold-based reporting is requested) or a reporting periodicity within the "repPeriod" attribute (if periodic reporting is requested) shall be provided;

f) if periodic reporting or one-time reporting is requested, the "nsRepFormat" attribute shall be provided to indicate the requested reporting format (i.e. numerical or percentage); and

2) if needed, the NEF shall then further interact with the concerned NSACF(s) to create or update the associated subscription(s) to notifications by invoking the Nnsacf\_SliceEventExposure\_Subscribe service operation, as specified in 3GPP TS 29.536 [47];

3) if an AF service identifier was provided by the AF (case of an untrusted AF), the NEF shall translate it to the corresponding S-NSSAI prior to sending the request(s) to the concerned NSACF(s);

NOTE 1: There can be a single or multiple NSACF(s) deployed in a network as specified in clause 5.15.11 of 3GPP TS 23.501 [3]. Whether the NEF needs to interact with one or multiple NSACF(s) to establish and manage network slice status reporting depends on the deployed NSAC architecture option (cf. clause 4.15.3.2.10 of 3GPP TS 23.502 [2] and clause 5.15.11 of 3GPP TS 23.501 [3]).

NOTE 2: If multiple NSACFs need to be contacted by the NEF to establish and manage network slice status reporting for the requested S-NSSAI, the NEF can set the event reporting type to periodic in its request(s) to these NSACFs, irrespective of the requested reporting type by the AF (i.e., threshold based reporting or periodic reporting).

4) after receiving a successful response from the concerned NSACF(s), the NEF shall:

A) for the HTTP POST request, respond to the AF as defined in clause 5.3.3.2.3.4 of 3GPP TS 29.122 [4] with either;

a) an HTTP "201 Created" status code with the response body containing the created "Individual Monitoring Event Subscription" resource within the MonitoringEventSubscription data structure. The NEF shall include the current network slice status information received from the NSACF(s) within the "monitoringEventReport" attribute, if available and the "immediateRep" attribute was provided and set to "true" in the corresponding request; or

b) an HTTP "200 OK" status code with the response body containing the current network slice status information received from the NSACF(s) within the MonitoringEventReport data structure, if the corresponding request is a one-time reporting request with the "immediateRep" attribute set to "true";

B) for the HTTP PUT/PATCH request, respond to the AF with either:

- an HTTP "200 OK" status code, as defined in clause 5.3.3.3.3.2 of 3GPP TS 29.122 [4], and the response body including the MonitoringEventSubscription data structure containing a representation of the updated "Individual Monitoring Event Subscription" resource. The NEF shall include the current network slice status information received from the NSACF(s) within the "monitoringEventReport" attribute, if available and the "immediateRep" attribute was provided and set to "true" in the request; or

- an HTTP "204 No Content" status code;

NOTE 3: When the "maximumNumberOfReports" attribute is provided and set to a value of 1 and the "immediateRep" attribute is provided and set to "true", the "Individual Monitoring Event Subscription" is immediately terminated after returning the current network slice status information in the HTTP POST response body.

NOTE 4: When the "maximumNumberOfReports" attribute is either not present or present and set to a value above 1 and/or the "immediateRep" attribute is either not present or present and set to "false", the above steps 2 and 3 may occur after step 4, i.e., the NEF may acknowledge/respond to the request and create/update the "Individual Monitoring Event Subscription" resource accordingly before interacting with the the concerned NSACF(s).

NOTE 5: After sending a subscription creation request for network slice status reporting with a particular reporting format (e.g., percentage) for periodic reporting, an AF cannot send a subsequent subscription creation request for the same network slice with a different reporting format (e.g., numerical) for periodic reporting.

5) when the NEF receives event report(s) from the NSACF(s) as defined in 3GPP TS 29.536 [47], the NEF shall notify the AF via an HTTP POST request message (as defined in clause 5.3.3A.2.3 of 3GPP TS 29.122 [4]) as follows:

A) within the MonitoringEventReport data structure of the MonitoringNotification data structure:

a) the value of the "monitoringType" attribute shall be set to "NUM\_OF\_REGD\_UES" or "NUM\_OF\_ESTD\_PDU\_SESSIONS" (i.e., the same value received in the HTTP POST or PUT/PATCH request that created or updated the subscription);

b) the AF service identifier to which the notification is related, within the "afServiceId" attribute, if it was provided by the AF in the corresponding subscription request; and

c) the current network slice status information within the "nSStatusInfo" attribute shall be provided, wherein:

i) if the event reporting is threshold based (i.e., the "tgtNsThreshold" was provided within the MonitoringEventSubscription data type), the "nSStatusInfo" attribute shall contain a confirmation for reaching the targeted threshold value, i.e., by sending the current number of registered UEs, or if "eNSAC" feature is also supported, the current number of UEs with at least one PDU session/PDN connection, or the current number of established PDU Sessions, for the network slice identified by the "snssai" attribute provided during the corresponding subscription creation/update; and

ii) if the event reporting is periodical (i.e., the "repPeriod" was provided within the MonitoringEventSubscription data type), the "nSStatusInfo" attribute shall provide the current network slice status information, i.e., the current number of registered UEs, or if "eNSAC" feature is also supported, the current number of UEs with at least one PDU session/PDN connection, or the current number of established PDU Sessions, for the network slice identified by the "snssai" attribute provided during the corresponding subscription creation/update;

NOTE 6: The handling of threshold-based notifications is described in clause 4.15.3.2.10 of 3GPP TS 23.502 [2].

NOTE 7: If the NEF interacts with multiple NSACFs for the requested S-NSSAI, the NEF performs the aggregation of the received network slice status reports from all these NSACFs and determines based on that whether a notification towards the subscribing AF needs to be sent or not (i.e., the reporting conditions to trigger a notification towards the AF are fulfilled or not).

and

6) in order to unsubscribe from network slice status reporting:

A) the AF shall either:

a) send an HTTP DELETE request to the NEF targeting the corresponding "Individual Monitoring Event Subscription" resource, as defined in clause 5.3.3.3.3.5 of 3GPP TS 29.122 [4]; or

b) send an HTTP PUT/PATCH request to the NEF targeting the corresponding "Individual Monitoring Event Subscription" resource to remove the subscription to network slice status reporting related event(s) from the list of subscribed events together with the related information, as defined in clauses 5.3.3.3.3.2 and 5.3.3.3.3.3 of 3GPP TS 29.122 [4];

and

B) if needed, the NEF shall interact with the concerned NSACF(s) to delete the associated subscription(s) to notifications by invoking the Nnsacf\_SliceEventExposure\_Unsubscribe service operation as specified in 3GPP TS 29.536 [47];

- if the "enNB1\_5G" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, then:

- the AF may require immediate reporting for the subscribed event(s) by providing the "immediateRep" attribute set to "true" within the MonitoringEventSubscription data structure in the corresponding subscription creation/update request; and

- if there are available report(s) for the subscribed event(s) at the NEF, the corresponding subscription creation/update response shall contain these available report(s) within the "monitoringEventReport" attribute, and/or if the "enNB" feature is supported, the "addnMonEventReports" attribute, of the MonitoringEventSubscription data structure;

- if the "UEId\_retrieval" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support AF specific UE ID retrieval:

1) the AF may request AF specific UE ID retrieval for an individual UE, by providing the UE's IP address in the "ueIpAddr" attribute or the UE's MAC address in the "ueMacAddr" attribute within the MonitoringEventSubscription data type;

2) the AF may also provide the DNN, within the "dnn" attribute, and/or the S-NSSAI, within the "snssai" attribute, in the MonitoringEventSubscription data type;

3) upon reception of the corresponding subscription request message from the AF, the NEF shall check whether the AF is authorized to perform this operation or not:

- if the AF's request for AF specific UE ID retrieval is not authorized, the NEF shall respond to the AF with a "403 Forbidden" status code with the response body including the ProblemDetails data structure containing the "cause" attribute set to the "REQUEST\_NOT\_AUTHORIZED" application error indicating AF authorisation failure; and

- if the AF request is for AF specific UE ID retrieval authorized by the NEF, then if the DNN and/or S-NSSAI information is not available in the request, the NEF shall determine the corresponding DNN and/or S-NSSAI information based on the received requesting AF Identifier, and if provided, the MTC Provider Information;

4) the NEF shall then interact with the BSF using the UE address and IP domain (if the UE IPv4 address is provided), DNN and/or S-NSSAI to retrieve the session binding information of the UE by invoking the Nbsf\_Management\_Discovery service operation as described in 3GPP TS 29.521 [9];

5) if the NEF receives an error response from the BSF, the NEF shall respond to the AF with a proper error status code. If the NEF received from the BSF an error response including a "ProblemDetails" data structure with the "cause" attribute indicating an application error, the NEF shall relay this error response to the AF with a corresponding application error. If no SUPI matching the provided UE information is returned by the BSF, the NEF shall respond to the AF with a "404 Not Found" status code with the response body including a ProblemDetails data structure containing the "cause" attribute set to the "UE\_NOT\_FOUND" application error to indicate that the requested UE address is not found;

6) upon success and a SUPI is returned by the BSF, the NEF shall then interact with the UDM to retrieve the AF specific UE Identifier using the received SUPI and at least one of the Application Port ID, MTC Provider Information or AF Identifier information by invoking Nudm\_SDM\_Get service as described in clause 5.2.2.2 of 3GPP TS 29.503 [17];

7) upon success, the UDM responds to the NEF with an AF specific UE Identifier represented as an External Identifier for the UE which is uniquely associated with the MTC provider Information and/or AF Identifier. The NEF shall then respond to the AF with the received information, i.e. the AF specific UE Identifier represented as an External Identifier that was received from the UDM;

8) if the NEF receives an error response from the UDM, the NEF shall respond to the AF with a proper error status code. If the NEF received from the UDM an error response including a "ProblemDetails" data structure with the "cause" attribute indicating an application error, the NEF shall relay this error response to the AF with a corresponding application error. If the UDM indicates that the requested UE Identifier is not available in the subscription data, the NEF shall respond to the AF with a "404 Not Found" error status code with the response body including a ProblemDetails data structure containing the "cause" attribute set to the "UE\_ID\_NOT\_AVAILABLE" application error to indicate that the AF specific UE ID is not available;

NOTE 8: The case where the UE's IP address provided by the AF to the NEF corresponds to an IP address that has been NATed (Network and Port Address Translation) is not supported in this release of the specification.

- if the "GMEC" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support group status change event reporting (e.g., the group member list is updated to add new group member(s) or remove existing group member(s)):

- the AF shall send an HTTP POST request to the NEF targeting the "Monitoring Event Subscriptions" collection resource defined in clause 5.3.3.2.3.4 of 3GPP TS 29.122 [4] to request the creation of a subscription with the the request body including the MonitoringEventSubscription data structure that shall contain:

- the external group identifier, to identify the targeted group (e.g. 5G VN group), within the "externalGroupId" attribute; and

- the "monitoringType" attribute set to "GROUP\_MEMBER\_LIST\_CHANGE" to indicate that the AF requests to be notified of the Group Members List changes event reporting;

- the AF may also update/modify an existing subscription to add group status change reporting event(s) to the list of monitored event(s) or update/modify its properties by sending and an HTTP PUT/PATCH request to the NEF targeting the corresponding "Individual Monitoring Event Subscription" resource, as defined in clause 5.3.3.3.3.2/5.3.3.3.3.3 of 3GPP TS 29.122 [4], including the above-mentioned attributes when relevant;

- the NEF shall then further interact with the UDM to create or update the associated subscription(s) to notifications by invoking the relevant service operations of the Nudm\_EventExposure API as specified in 3GPP TS 29.503 [17];

- upon reception of a successful response from the UDM, the NEF shall respond to the AF as defined in clause 5.3.3.2.3.4, 5.3.3.3.3.2 or 5.3.3.3.3.3 of 3GPP TS 29.122 [4];

- when the NEF receives group status List change event report(s) via notification(s) from the UDM as defined in 3GPP TS 29.503 [17], the NEF shall in turn notify the AF by sending an HTTP POST request message as defined in clause 5.3.3A.2.3 of 3GPP TS 29.122 [4] as follows:

- within an array element of the "monitoringEventReports" attribute (encoded via the MonitoringEventReport data structure) of the MonitoringNotification data type:

- the "monitoringType" attribute shall be set to "GROUP\_MEMBER\_LIST\_CHANGE" (i.e., the same value received during the HTTP POST or PUT/PATCH request that created or updated/modified the subscription); and

- the information on the change(s) to the group members list shall be provided within the "groupMembListChanges" attribute;

and

- in order to unsubscribe from group status change event(s) reporting:

- if the AF subscribed to other monitoring event(s) in addition to the group status change event(s) reporting, the AF shall update/modify the corresponding subscription to remove the group status change event(s) reporting from the list of the subscribed monitoring event(s);

- if the AF subscribed only to group status change reporting event(s) or the AF desires to unsubscribe from all the monitoring event(s) that it has subscribed to via this monitoring event subscription, then:

- the AF shall send an HTTP DELETE (or PUT/PATCH) request message to the NEF targeting the corresponding "Individual Monitoring Event Subscription" resource, as defined in clause 5.3.3.3 of 3GPP TS 29.122 [4], to request the deletion (or update) of the related existing "Individual Monitoring Event Subscription" resource;

- the NEF shall then interact with the UDM to request the deletion of the associated subscription(s) by invoking the relevant service operation of the Nudm\_EventExposure API as specified in 3GPP TS 29.503 [17]; and

- upon reception of a successful response from the UDM, the NEF shall delete (or update accordingly) the targeted subscription and respond to the AF as defined in clause 5.3.3.3 of 3GPP TS 29.122 [4];

- if the "AppDetection\_5G" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support application traffic detection (e.g., start/stop of application traffic) monitoring event(s) reporting:

- the AF shall send either:

- an HTTP POST request to the NEF targeting the "Monitoring Event Subscriptions" resource to request the creation of a subscription as defined in clause 5.3.3.2.3.4 of 3GPP TS 29.122 [4]; or

- an HTTP PUT/PATCH request to the NEF targeting an existing "Individual Monitoring Event Subscription" resource to request the update of an existing subscription as defined in clause 5.3.3.3.3.2 or 5.3.3.3.3.3 of 3GPP TS 29.122 [4];

- the MonitoringEventSubscription data structure (or the requested modifications to the MonitoringEventSubscription data structure when HTTP PATCH is used) shall include the targeted application traffic, i.e., any UE application traffic associated with the S-NSSAI, provided within the "snssai" attribute, and the DNN provided within the "dnn" attribute, for the application(s) identified by the "appIds" attribute;

- the monitoring type of the MonitoringEventSubscription data structure shall be set to the "APPLICATION\_START" or "APPLICATION\_STOP";

- upon reception of the subscription request message from the AF, the NEF shall check whether the AF is authorized to perform this operation or not:

- if the AF is not authorized, the NEF shall respond to the AF with an HTTP "403 Forbidden" status code with the response body including the ProblemDetails data structure containing the "cause" attribute set to the "REQUEST\_NOT\_AUTHORIZED" application error; or

- if the AF is authorized, the NEF shall subscribe to the requested application traffic detection event(s) reporting at the concerned PCF(s) (locally configured at the NEF for the authorized DNN/S-NSSAI) using the Npcf\_EventExposure\_Subscribe service operation as defined in clause 4.2.2.2 of 3GPP TS 29.523 [22];

and

- when the NEF receives an event notification from the PCF(s) via the Npcf\_EventExposure\_Notify service operation as defined in clause 4.2.4 of 3GPP TS 29.523 [22] indicating that the subscribed event(s) has(ve) been detected, the NEF shall send a corresponding notification to the AF by sending an HTTP POST request message to the AF with each of the corresponding MonitoringEventReport data structure(s) (provided within the "monitoringEventReports" attribute of the MonitoringNotification data structure) containing:

- the reported event (i.e., "APPLICATION\_START" or "APPLICATION\_STOP") within the "monitoringType" attribute;

- the identifier of the detected application within the "appId" attribute, if the "appIds" attribute within the corresponding subscription resource contains more than one array element (i.e., more than one application identifier); and

- the PDU session information related to the detected application within the "pduSessInfo" attribute, if available.

- if the "DataTransfer" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support AF request for Session inactivity time, Traffic volume and UL/DL data rate events monitoring event notification, the AF shall send an HTTP POST request to the NEF targeting the "Monitoring Event Subscriptions" resource (defined in clause 5.3.3.2.3.4 of 3GPP TS 29.122 [4]) to request the creation of a subscription or send an HTTP PUT/PATCH message to the NEF to the "Individual Monitoring Event Subscription" resource as defined in clause 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription as follows:

1) targeting list of UE(s) in the MonitoringEventSubscription data type setting the monitoring type as "SESSION\_INACTIVITY\_TIME", "TRAFFIC\_VOLUME" and/or "UL\_DL\_DATA\_RATE"; and

2) upon reception of the corresponding subscription request message from the AF, the NEF shall check whether the AF is authorized to perform this operation or not;

and

- if the "Energy" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support AF request for Energy consumption information notification, the AF shall send an HTTP POST request to the NEF targeting the "Monitoring Event Subscriptions" resource (defined in clause 5.3.3.2.3.4 of 3GPP TS 29.122 [4]) to request the creation of a subscription or send an HTTP PUT/PATCH message to the NEF to the "Individual Monitoring Event Subscription" resource as defined in clause 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription as follows:

1) targeting a UE in the MonitoringEventSubscription data type setting the monitoring type as "UE\_ENERGY", "PDU\_SESSION\_ENERGY", "UE\_SNSSAI\_ENERGY" and/or "SERVICE\_DATA\_FLOW\_ENERGY"; and:

a) if threshold based reporting is requested, the corresponding threshold level(s) are provided within the "enrgRepThres" attribute;

b) if periodic reporting is requested, a reporting periodicity within the "repPeriod" attribute shall be provided;

2) upon reception of the corresponding subscription request message from the AF, the NEF shall check whether the AF is authorized to perform this operation or not.

Editor’s note: The applicability of time window for energy consumption exposure is FFS.

NOTE 9: When the "enNB" feature defined in clause 5.3.4 of 3GPP TS 29.122 [4] is supported, the above provisions related to the "monitoringType" attribute apply also to the "addnMonTypes" attribute, and the monitoring type(s) to be subscribed can be provided via the "monitoringType" attribute, and if there are more than one monitoring type to be subscribed, the "addnMonTypes" attribute as well.

NOTE 10: In the above provisions, subscribing to a monitoring event can be done either by creating a new "Individual Monitoring Event Subscription" resource or updating an existing "Individual Monitoring Event Subscription" resource (e.g., add the monitoring event to the list of subscribed monitoring events, replace the existing monitoring event with this new monitoring event). Similarly, unsubscribing from a monitoring event can be done either by deleting the corresponding "Individual Monitoring Event Subscription" or updating the corresponding existing "Individual Monitoring Event Subscription" (e.g., remove the monitoring event from the list of subscribed monitoring events).

\*\*\* 2nd Change \*\*\*

## 5.3 Reused APIs

This clause describes the northbound APIs which are applicable for both EPS and 5GS.

Table 5.3-1: Reused APIs applicable for both EPS and 5GS

|  |  |
| --- | --- |
| API Name | Differences |
| ResourceManagementOfBdt | - The following 5G-only features defined in clause 5.4.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "LocBdt\_5G", "Group\_Id", "BdtNotification\_5G", "AspId\_5G" and "Energy". |
| PfdManagement | - The following 5G-only features defined in clause 5.11.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "FailureLocation\_5G". |
| MonitoringEvent | - The following 5G-only features defined in clause 5.3.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "Number\_of\_UEs\_in\_an\_area\_notification\_5G", "Downlink\_data\_delivery\_status\_5G", "Availability\_after\_DDN\_failure\_notification\_enhancement", "eLCS", "eLCS\_en", "NSAC", "MULTIQOS", "EDGEAPP", "UEId\_retrieval", "Loss\_of\_connectivity\_notification\_5G", "GMEC", "enNB1\_5G", "AppDetection\_5G", "eNSAC", "Ranging\_SL", "DataTransfer","Energy", "RVAS\_5G" and "PduSesRatType".- For the "Pdn\_connectivity\_status" feature, APN is equivalent to DNN; the non-IP PDN type is equivalent to the unstructured PDU session type; and the enumeration InterfaceIndication value "PDN\_GATEWAY" stands for PDU session anchored in UPF in 5G. |
| DeviceTriggering |  |
| CpProvisioning | - The following 5G-only features defined in clause 5.10.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "ExpectedUMT\_5G", "ExpectedUmtTime\_5G", "ScheduledCommType\_5G", "UEId\_retrieval", "ExpectedUmtTime\_Add", "AppExpUeBehaviour" and "ConfAccuLevels". |
| ChargeableParty | - The following 5G-only features defined in clause 5.5.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "EthChgParty\_5G", "MacAddressRange\_5G", "ToSTC\_5G".- The "LOSS\_OF\_BEARER", "RECOVERY\_OF\_BEARER" and "RELEASE\_OF\_BEARER" events do not apply for 5G. |
| AsSessionWithQoS | - The following 5G-only features defined in clause 5.14.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "EthAsSessionQoS\_5G", "QoSMonitoring\_5G", "PacketDelayFailureReport", "MacAddressRange\_5G", "AlternativeQoS\_5G", "TSC\_5G", "DisableUENotification\_5G", "ExposureToEAS", "AltQosWithIndParams\_5G", "EnEthAsSessionQoS\_5G", "enNB\_5G", "AltQoSProfilesSupportReport", "ExtQoS\_5G", "EnTSCAC", "L4S", "MultiMedia", "PowerSaving", "EnQoSMon", "PDUSetHandling", "RTLatency", "ToSTC\_5G", "QoSTiming\_5G", "ListUE\_5G", "GMEC", "QoSMonCapRepo", "MpxMedia", "N6DelayMeasurement", "TrafficCharChange", "HeaderHandling", "OnPathN6MediaInfo", "RateLimitReport", "EnPDUSetHandling", "AcceptableQosDetails" and "EnQoSMon\_v2".- The "LOSS\_OF\_BEARER", "RECOVERY\_OF\_BEARER" and "RELEASE\_OF\_BEARER" events do not apply for 5G. |
| MsisdnLessMoSms |  |
| NpConfiguration | - The following 5G-only features defined in clause 5.13.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "NpExpiry\_5G", "UEId\_retrieval". |
| NIDD |  |
| RacsParameterProvisioning |  |
| ECRControl | - The following 5G-only features defined in clause 5.12.4 of 3GPP TS 29.122 [4] may be supported only by the NEF: "ECR\_WB\_5G". |

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