**3GPP TSG-CT WG4 Meeting #105-eC4-214abc**

**E-Meeting, 17th – 27th August 2021 *was* C4-214481**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.503** | **CR** | **0715** | **rev** | **1** | **Current version:** | **17.3.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Partial success on EE subscription | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | C4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI17, 5G\_CIoT | | | | |  | ***Date:*** | | | 2021-08-09 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Some of the events monitoring may succeed and others may fail because of the different configuration or authentication data, there are no clear solution on this scenario, see detail in discussion paper C4-214480. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Extend the response body of Subscribe service operation of EE service to include the information about the failed Monitoring Configurations and failed cause of them | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Some of the events monitoring may succeed and others may fail because of the different configuration or authentication data, there are no clear solution on this scenario, and different implementation will cause the interworking issues between the different vendors. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.5.2.2.2, 6.4.6.1, 6.4.6.2.9, 6.4.6.2.xx(new), 6.2.6.3.xx(new), 6.4.6.3.2, A.5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 compatibile new feature to the OpenAPI specification files of TS29503\_Nudm\_EE API | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Rev1:   1. Fixed cardinality issue of failedCause in table 6.4.6.2.xx-1 | | | | | | | | |

\* \* \* Begin of Changes \* \* \* \*

##### 5.5.2.2.2 Subscription to Notification of event occurrence

Figure 5.5.2.2.2-1 shows a scenario where the NF service consumer sends a request to the UDM to subscribe to notifications of event occurrence (see also 3GPP TS 23.502 [3] figure 4.15.3.2.2-1 step 1 and 3GPP TS 23.502 [3] Figure 4.15.3.2.3b-1 step 1). The request contains a callback URI, the type of event that is monitored and additional information e.g. event filters and reporting options.



Figure 5.5.2.2.2-1: NF service consumer subscribes to notifications

1. The NF service consumer sends a POST request to the parent resource (collection of subscriptions) (.../{ueIdentity}/ee-subscriptions), to create a subscription as present in message body. The values ueIdentity shall take are specified in Table 6.4.3.2.2-1. The request may contain an expiry time, suggested by the NF Service Consumer, representing the time upto which the subscription is desired to be kept active and the time after which the subscribed event(s) shall stop generating notifications, the indication on whether the subscription applies also to EPC.   
  
If MTC Provider information and/or AF ID are received in the request, the UDM shall check whether the MTC Provider and/or the AF is allowed to perform this operation for the UE or for the group of UEs or Any UE which is indicated in the Resource URI variable ueIdentity; otherwise, the UDM shall skip the MTC provider and/or AF authorization check.

2a. On success, the UDM responds with "201 Created" with the message body containing a representation of the created subscription. The Location HTTP header shall contain the URI of the created subscription. If the event subscription was for a group of UEs:

- The "maxNumOfReports" in the "reportingOptions" IE shall be applicable to each UE in the group;

- The UDM shall return the number of UEs in that group in the "numberOfUes" IE.

The NF service consumer shall keep track of the maximum number of reports reported for each UE in the event report and when "maxNumOfReports\*numberOfUes" limit is reached, the NF service consumer shall initiate the unsubscription of the notification towards the UDM (see clause 5.5.2.3.2).

If the event subscription was for a list events, the "maxNumOfReports" in the "reportingOptions" IE shall be applicable to each event. The NF service consumer shall keep track of the maximum number of reports reported for each event in the event report and when "maxNumOfReports\*number of events" limit is reached, the NF service consumer shall initiate the unsubscription of the notification towards the UDM (see clause 5.5.2.3.2).

The response, based on operator policy, may contain the expiry time, as determined by the UDM, after which the subscription becomes invalid. Before the subscription is going to expire, if the NF Service Consumer wants to keep receiving notifications, it shall modify the subscription in the UDM with a new expiry time. The NF Service Producer shall not provide the same expiry time for many subscriptions in order to avoid all of them expiring and recreating the subscription at the same time. If the expiry time is not included in the response, the NF Service Consumer shall not associate an expiry time for the subscription.

If the indication on whether the subscription applies also to EPC is included in the request, the response shall include the indication on whether the subscription was also successful in EPC domain.

If some of the requested monitoring configurations fails, the response may include the failedMonitoringConfigs to indicate the failed cause of the failed monitoring configurations.

2b. If the user does not exist, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

2c. If there is no valid subscription data for the UE, i.e. based on the UE's subscription information monitoring of the requested EventType is not allowed, or the requested EventType is not supported, or when MTC Provider or AF are not allowed to perform this operation for the UE, HTTP status code "403 Forbidden" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

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

#### 6.4.6.1 General

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

Table 6.4.6.1-1 specifies the data types defined for the Nudm\_EE service API.

Table 6.4.6.1-1: Nudm\_EE specific Data Types

|  |  |  |
| --- | --- | --- |
| Data type | Clause defined | Description |
| EeSubscription | 6.4.6.2.2 | A subscription to Notifications |
| MonitoringConfiguration | 6.4.6.2.3 | Monitoring Configuration |
| MonitoringReport | 6.4.6.2.4 | Monitoring Report |
| Report | 6.4.6.2.5 |  |
| ReportingOptions | 6.4.6.2.6 |  |
| ChangeOfSupiPeiAssociationReport | 6.4.6.2.7 |  |
| RoamingStatusReport | 6.4.6.2.8 |  |
| CreatedEeSubscription | 6.4.6.2.9 |  |
| LocationReportingConfiguration | 6.4.6.2.10 |  |
| CnTypeChangeReport | 6.4.6.2.11 |  |
| ReachabilityForSmsReport | 6.4.6.2.12 |  |
| DatalinkReportingConfiguration | 6.4.6.2.13 | Reporting configuration for events related to data link |
| CmInfoReport | 6.4.6.2.14 | Reporting UE's Connection Management State information per access type |
| LossConnectivityCfg | 6.4.6.2.15 | Configuration for loss of connectivity event |
| PduSessionStatusCfg | 6.4.6.2.16 | Reporting configuration for events related to PDU session Status |
| ReachabilityReport | 6.4.6.2.17 | Reachability report |
| ReachabilityForDataConfiguration | 6.4.6.2.18 | Reachability for Data Configuration |
| EeMonitoringRevoked | 6.4.6.2.19 | Revoked monitoring events information |
| MonitoringEvent | 6.4.6.2.20 | Monitoring Event |
| MaxNumOfReports | 6.4.6.3.2 | Maximum number of reports |
| ReferenceId | 6.4.6.3.2 | Reference Identity |
| EventType | 6.4.6.3.3 | Event type of UDM Event Exposure service |
| LocationAccuracy | 6.4.6.3.4 | Location Accuracy definition |
| CnType | 6.4.6.3.5 | Core Network Type |
| AssociationType | 6.4.6.3.6 |  |
| EventReportMode | 6.4.6.3.7 |  |
| ReachabilityForSmsConfiguration | 6.4.6.3.8 |  |
| ReachabilityForDataReportConfig | 6.4.6.3.9 |  |
| RevokedCause | 6.4.6.3.10 | Revocation Cause for the monitoring event |
| FailedMonitoringConfiguration | 6.4.6.2.xx | Failed Monitoring Configuration in the EE subscription |
| FailedCause | 6.4.6.3.xx | Failed cause of the failed Monitoring Configuration in the EE subscription |

Table 6.4.6.1-2 specifies data types re-used by the Nudm\_EE service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nudm\_EE service API.

Table 6.4.6.1-2: Nudm\_EE re-used Data Types

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data type | | Reference | | Comments | |
| Uri | | 3GPP TS 29.571 [7] | | Uniform Resource Identifier | |
| SupportedFeatures | | 3GPP TS 29.571 [7] | | see 3GPP TS 29.500 [4] clause 6.6 | |
| DateTime | | 3GPP TS 29.571 [7] | |  | |
| Pei | | 3GPP TS 29.571 [7] | |  | |
| PlmnId | | 3GPP TS 29.571 [7] | |  | |
| Gpsi | | 3GPP TS 29.571 [7] | |  | |
| AccessType | | 3GPP TS 29.571 [7] | |  | |
| PatchResult | | 3GPP TS 29.571 [7] | |  | |
| DddTrafficDescriptor | | 3GPP TS 29.571 [7] | |  | |
| SamplingRatio | | 3GPP TS 29.571 [7] | |  | |
| DurationSec | | 3GPP TS 29.571 [7] | |  | |
| DlDataDeliveryStatus | | 3GPP TS 29.571 [7] | | Downlink data delivery status | |
| Dnn | | 3GPP TS 29.571 [7] | | Data Network Name with Network Identifier only. | |
| Snssai | | 3GPP TS 29.571 [7] | | Single NSSAI | |
| DiameterIdentity | | 3GPP TS 29.571 [7] | | Diameter Identify (FQDN) | |
| CmInfo | | 3GPP TS 29.518 [36] | | Describe the Connection Management state information for an access type | |
| MtcProviderInformation | | 3GPP TS 29.571 [7] | | MTC Provider Information | |
| NfInstanceId | | 3GPP TS 29.571 [7] | | Network Function Instance Identifier | |
| NotificationFlag | | 3GPP TS 29.571 [7] | | Notification flag | |
| UeReachability | | 3GPP TS 29.518 [36] | | Describes the reachability of the UE | |

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

##### 6.4.6.2.9 Type: CreatedEeSubscription

Table 6.4.6.2.9-1: Definition of type CreatedEeSubscription

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| eeSubscription | EeSubscription | M | 1 | This IE shall contain the representation of the created event subscription. |
| numberOfUes | Uinteger | C | 0..1 | This IE shall be included if the event subscription is for a group of UEs. When present, this IE shall represent the number of UEs in the group. |
| eventReports | array(MonitoringReport) | O | 1..N | This IE when present, shall contain the status of events that are requested for immediate reporting as well, if those events are available at the time of subscription.  If an event requested for immediate reporting is detected by another NF (e.g. AMF) and directly notified to the NF consumer, the status of the event shall not be included in this IE. |
| epcStatusInd | boolean | C | 0..1 | This IE indicates whether the subscription was also successful in EPC domain or not.  true: the subscription was also successful in EPC domain.  false: the subscription was not successful in EPC domain.  This IE shall be included if epcAppliedInd is true in the subscription request. |
| failedMonitoringConfigs | map(FailedMonitoringConfiguration) | O | 1..N | A map (list of key-value pairs where ReferenceId converted from integer to string serves as key; see clause 6.4.6.3.2) of FailedMonitoringConfiguration;  see clause 6.4.6.2.xx.  This IE is used to indicate the failed subscriptions of event monitoring configuration and the failed cause for them. |

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

##### 6.4.6.2.xx Type: FailedMonitoringConfiguration

Table 6.4.6.2.xx-1: Definition of type FailedMonitoringConfiguration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| eventType | EventType | M | 1 | Contains the Event type, see clause 6.4.6.3.3 |
| failedCause | FailedCause | M | 1 | Contains the failed cause of the subscription of the event monitoring. |

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

##### 6.4.6.3.xx Enumeration: FailedCause

Table 6.4.6.3.xx-1: Enumeration FailedCause

|  |  |
| --- | --- |
| Enumeration value | Description |
| "AF\_NOT\_ALLOWED" | This AF is not allowed to perform monitoring for the requested event type. |
| "MTC\_PROVIDER\_NOT\_ALLOWED" | MTC Provider is now allowed to perform monitoring for the requested event type. |
| "MONITORING\_NOT\_ALLOWED" | The subscriber does not have the necessary subscription for monitoring with the requested Event Type. |
| "UNSUPPORTED\_MONITORING\_EVENT\_TYPE" | The required event type is unsupported. |
| "UNSUPPORTED\_MONITORING\_REPORT\_OPTIONS" | The monitoring configuration for the required event type contains unsupported report options. |
| "UNSPECIFIED" | The failed cause is unspecified. |

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

##### 6.4.6.3.2 Simple data types

The simple data types defined in table 6.4.6.3.2-1 shall be supported.

Table 6.4.6.3.2-1: Simple data types

|  |  |  |
| --- | --- | --- |
| Type Name | Type Definition | Description |
| MaxNumOfReports | integer | Maximum number of reports.  Minimum: 1 |
| ReferenceId | integer | ReferenceId is used as key in a map of MonitoringConfigurations; see clause 6.4.6.2.2.  ReferenceId is also used as key in a map of MonitoringEvents; see clause 6.4.6.2.20.  ReferenceId is used as key in a map of FailedMonitoringConfiguration; see clause 6.4.6.2.9.  The numeric value should not be higher than 2^64-1 (i.e. it should be possible to convey it in an unsigned 64 integer Information Element, used in other protocols), if interworking with the Event Exposure framework in EPC is required. |

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

## A.5 Nudm\_EE API

openapi: 3.0.0

***(… text not shown for clarity …)***

# COMPLEX TYPES:

CreatedEeSubscription:

type: object

required:

- eeSubscription

properties:

eeSubscription:

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

numberOfUes:

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

eventReports:

type: array

items:

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

minItems: 1

epcStatusInd:

type: boolean

failedMonitoringConfigs:

description: A map (list of key-value pairs where referenceId converted from integer to string serves as key; see clause 6.4.6.3.2) of FailedMonitoringConfiguration

type: object

additionalProperties:

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

minProperties: 1

FailedMonitoringConfiguration:

description: Contains the event type and failed cause of the failed Monitoring Configuration in the EE subscription

type: object

required:

- eventType

- failedCause

properties:

eventType:

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

failedCause:

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

***(… text not shown for clarity …)***

# ENUMS:

ReachabilityForSmsConfiguration:

anyOf:

- type: string

enum:

- REACHABILITY\_FOR\_SMS\_OVER\_NAS

- REACHABILITY\_FOR\_SMS\_OVER\_IP

- type: string

EventType:

anyOf:

- type: string

enum:

- LOSS\_OF\_CONNECTIVITY

- UE\_REACHABILITY\_FOR\_DATA

- UE\_REACHABILITY\_FOR\_SMS

- LOCATION\_REPORTING

- CHANGE\_OF\_SUPI\_PEI\_ASSOCIATION

- ROAMING\_STATUS

- COMMUNICATION\_FAILURE

- AVAILABILITY\_AFTER\_DDN\_FAILURE

- CN\_TYPE\_CHANGE

- DL\_DATA\_DELIVERY\_STATUS

- PDN\_CONNECTIVITY\_STATUS

- UE\_CONNECTION\_MANAGEMENT\_STATE

- type: string

LocationAccuracy:

anyOf:

- type: string

enum:

- CELL\_LEVEL

- RAN\_NODE\_LEVEL

- TA\_LEVEL

- N3IWF\_LEVEL

- UE\_IP

- UE\_PORT

- type: string

CnType:

anyOf:

- type: string

enum:

- SINGLE\_4G

- SINGLE\_5G

- DUAL\_4G5G

- type: string

AssociationType:

anyOf:

- type: string

enum:

- IMEI\_CHANGE

- IMEISV\_CHANGE

- type: string

EventReportMode:

anyOf:

- type: string

enum:

- PERIODIC

- ON\_EVENT\_DETECTION

- type: string

ReachabilityForDataReportConfig:

anyOf:

- type: string

enum:

- DIRECT\_REPORT

- INDIRECT\_REPORT

- type: string

RevokedCause:

anyOf:

- type: string

enum:

- NOT\_ALLOWED

- type: string

FailedCause:

anyOf:

- type: string

enum:

- AF\_NOT\_ALLOWED

- MTC\_PROVIDER\_NOT\_ALLOWED

- MONITORING\_NOT\_ALLOWED

- UNSUPPORTED\_MONITORING\_EVENT\_TYPE

- UNSUPPORTED\_MONITORING\_REPORT\_OPTIONS

- UNSPECIFIED

- type: string

description: Indicates the Failed cause of the failed Monitoring Configuration in the EE subscription

***(… text not shown for clarity …)***

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