**3GPP TSG-CT3 Meeting #112e C3-205056\_r1**

**E-Meeting, 04th – 13th November 2020**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **29.523** | **CR** | **0032** | **rev** | **1** | **Current version:** | **16.3.0** |  |
|  |
| *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:***  | Essential corrections and alignments |
|  |  |
| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | SBIProtoc16 |  | ***Date:*** | 2020-10-?? |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | The following corrections and alignments are necessary:* As per Table 5.2.5.1-1 of TS 23.502 and Table 6.2.2.1-1 of TS 23.288, the NWDAF is also one of the identified possible consumers of the Npcf\_EventExposure service.
* "ReportingInformation" data type is used in other use cases (e.g. Naf\_EventExposure), other than the PCF EE use case specified here. The description of its attributes has hence to stay general and not refer only to the policy event exposure use case.
* The "Resource URI" column of Table 5.3.1-1 should contain a "<relative URI below root>" instead of a full resource URI, as per the API TS skeleton provided in TS 29.501.
* The "Notifications overview" table and the "Target URI" clause need to be updated to align with the SBI TS skeleton provided in TS 29.501.
 |
|  |  |
| ***Summary of change:*** | * Add the NWDAF as an identified NF service consumer of the Npcf\_EventExposure service.
* Change the description of some attributes of the "ReportingInformation" data type to make it generic, i.e. not tied to the policy event exposure use case.
* Update the "Resource URI" column of Table 5.3.1-1 by replacing the full resource URI with the associated "<relative URI below root>", i.e. by removing the part "{apiRoot}/<apiName>/<apiVersion>".
* Update the "Notifications overview" table and the "Target URI" clause to align with the updated SBI TS skeleton provided in TS 29.501.
* Some additional editorial corrections to improve the text.
 |
|  |  |
| ***Consequences if not approved:*** | Necessary corrections are not applied. |
|  |  |
| ***Clauses affected:*** | 3.2, 4.1.1, 4.1.2, 4.1.3.2, 4.2.1, 4.2.2.2, 4.2.2.3, 4.2.3.2, 4.2.4.1, 4.2.4.2, 5.3.1, 5.5.1, 5.5.2.2, 5.6.2.4 |
|  |  |
|  | **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 does not impact OpenAPI specification files. |
|  |  |
| ***This CR's revision history:*** | Rev 1:* Revert the changes on "subclause" (to "clause") to keep the existing wording.
* Add AMF, UDM, UDR, SMF, NWDAF and OAM abbreviations in clause 3.2.
* Update the changes to the resource URIs in clause 5.3.3.4.1 and clause 5.3.1 by removing the solidus.
* Revert some unecessary changes in clause 4.2.2.3 and clause 4.2.4.2 and additional editorial changes to clause 4.1.3.2.
 |

\* \* \* Start of changes \* \* \* \*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AF Application Function

AMF Access and Mobility Management Function

API Application Programming Interface

ATSSS Access Traffic Steering, Switching and Splitting

DNN Data Network Name

ePDG evolved Packet Data Gateway

GPSI Generic Public Subscription Identifier

HTTP Hypertext Transfer Protocol

MA Multi-Access

NEF Network Exposure Function

NID Network Identifier

NF Network Function

NRF Network Repository Function

NWDAF Network Data Analytics Function

OAM Operation And Maintenance

PCF Policy Control Function

RFSP RAT Frequency Selection Priority

S-NSSAI Single Network Slice Selection Assistance Information

SMF Session Management Function

SNPN Stand-alone Non-Public Network

SUPI Subscription Permanent Identifier

UDM Unified Data Management

UDR Unified Data Repository

URSP UE Route Selection Policy

\* \* \* Next changes \* \* \* \*

4.1.1 Overview

The Policy Event Exposure Service, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.503 [4], is provided by the Policy Control Function (PCF).

This service:

- allows NF service consumers to subscribe to, modify and unsubscribe from policy control events; and

- notifies NF service consumers with a corresponding subscription about observed events on the PCF.

The types of observed events include:

- PLMN identifier notification; and

- Access type change.

The target of the event reporting may include a group of UE(s) or any UE (i.e. all UEs). When an event occurs, to which the NF service consumer has subscribed, the PCF reports the requested information to the NF service consumer based on the event reporting information definition requested by the NF service consumer (see 3GPP TS 23.502 [3], subclause 4.15.1).

\* \* \* Next changes \* \* \* \*

4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Policy and Charging related 5G architecture and signalling flows are also described in 3GPP TS 29.513 [8].

The Policy Event Exposure Service (Npcf\_EventExposure) is part of the Npcf service-based interface exhibited by the Policy Control Function (PCF).

The known NF service consumer of the Npcf\_EventExposure service are the Network Exposure Function (NEF) and the Network Data Analytics Function (NWDAF).

The Npcf\_EventExposure service is provided by the PCF and consumed by NF service consumers (e.g. NEF, NWDAF), as shown in figure 4.1.2-1 for the SBI representation model and in figure 4.1.2-2 for reference point representation model.

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**Figure 4.1.2-1: Npcf\_EventExposure service Architecture, SBI representation**



**Figure 4.1.2-2: Npcf\_EventExposure service Architecture, reference point representation**

\* \* \* Next changes \* \* \* \*

4.1.3.2 NF Service Consumers

As indicated in clause 4.1.2 above, the known NF service consumer of the Npcf\_EventExposure service are the Network Exposure Function (NEF) and the Network Data Analytics Function (NWDAF).

The Network Exposure Function (NEF) is a functional element that supports the following functionalities:

- The NEF securely exposes network capabilities and events provided by 3GPP NFs to AF.

- The NEF provides a means for the AF to securely provide information to 3GPP network and can authenticate, authorize and assist in throttling the AF.

- The NEF translates the information received from the AF to the one sent to internal 3GPP NFs, and vice versa.

- The NEF supports exposing information (collected from other 3GPP NFs) to the AF.

The Network Data Analytics Function (NWDAF) is a NF that provides network data analytics services to 5GC NFs and OAM. It supports for this purpose the following functionalities:

- The NWDAF performs data collection based on subscription to events provided by AMF, SMF, PCF, UDM, AF (directly or via NEF), and OAM.

- The NWDAF retrieves information from data repositories (e.g. UDR via UDM for subscriber-related information).

- The NWDAF retrieves information about NFs (e.g. from NRF for NF-related information).

- The NWDAF provides on demand network data analytics to consumers (e.g. 5GC NFs, OAM).

\* \* \* Next changes \* \* \* \*

4.2.1 Introduction

Service operations defined for the Npcf\_EventExposure Service are shown in table 4.2.1-1.

**Table 4.2.1-1: Npcf\_EventExposure Service Operations**

|  |  |  |
| --- | --- | --- |
| **Service Operation Name** | **Description** | **Initiated by** |
| Npcf\_EventExposure\_Subscribe | This service operation is used by an NF service consumer to subscribe for event notifications on a specified policy control event for a group of UE(s) or any UE, or to modify a subscription. | NF service consumer (NEF, NWDAF) |
| Npcf\_EventExposure\_Unsubscribe | This service operation is used by an NF service consumer to unsubscribe from event notifications. | NF service consumer (NEF, NWDAF) |
| Npcf\_EventExposure\_Notify | This service operation is used by the PCF to report UE related policy control event(s) to the NF service consumer which has subscribed to the event report service. | PCF |

\* \* \* Next changes \* \* \* \*

4.2.2.2 Creating a new subscription

Figure 4.2.2.2-1 illustrates the creation of a subscription.

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**Figure 4.2.2.2-1: Creation of a subscription**

To subscribe to event notifications, the NF service consumer shall send an HTTP POST request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/" as request URI as shown in figure 4.2.2.2-1, step 1, and the "PcEventExposureSubsc" data structure as request body.

The "PcEventExposureSubsc" data structure shall include:

- identification of the policy events to subscribe as "eventSubs" attribute;

- indication of the UEs to which the subscription applies via:

a) identification of a group of UE(s) via a "groupId" attribute; or

b) identification of any UE by ommitting the "groupId" attribute.

- a URI where to receive the requested notifications as "notifUri" attribute; and

- a Notification Correlation Identifier assigned by the NF service consumer for the requested notifications as "notifId" attribute.

The "PcEventExposureSubsc" data structure also may include:

- description of the event reporting information as "eventsRepInfo", which may include:

a) event notification method (periodic, one time, on event detection) as "notifMethod" attribute;

b) Maximum Number of Reports as "maxReportNbr" attribute;

c) Monitoring Duration as "monDur" attribute;

d) repetition period for periodic reporting as "repPeriod" attribute;

e) immediate reporting indication as "immRep" attribute;

f) sampling ratio as "sampRatio" attribute; and/or

g) group reporting guard time as "grpRepTime" attribute.

- if the supported feature "ExtendedSessionInformation" is supported, to filter the AF sessions for which the policy event report shall occur, the identification of the services one or more AF sessions may belong to as "filterServices" attribute, which may include per service identification:

a) a list of ethernet flows in the "servEthFlows" attribute; or

b) a list of IP flows in the "servIpFlows" attribute; and/or

c) an AF application identifier in the "afAppId" attribute.

- to filter the DNNs for which the policy event report shall occur, the identification of the DNNs in the "filterDnns" attribute; and

- to filter the S-NSSAIs for which the policy event report shall occur, the identification of the S-NSSAIs in the "filterSnssais" attribute.

If the PCF cannot successfully fulfil the received HTTP POST request due to an internal PCF error or an error in the HTTP POST request, the PCF shall send an HTTP error response as specified in subclause 5.7.

Upon successful reception of the HTTP POST request with "{apiRoot}/npcf-eventexposure/v1/subscriptions/" as request URI and "PcEventExposureSubsc" data structure as request body, the PCF shall create a new "Individual Policy Events Subscription" resource, store the subscription and send a HTTP "201 Created" response as shown in figure 4.2.2.2-1, step 2. The PCF shall include in the "201 Created" response:

- a Location header field; and

- an "PcEventExposureSubsc" data type in the payload body.

The Location header field shall contain the URI of the created individual application session context resource i.e. "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}".

The "PcEventExposureSubsc" data type payload body shall contain the representation of the created "Individual Policy Events Subscription".

When the "monDur" attribute is included in the response, it represents a server selected expiry time that is equal or less than a possible expiry time in the request.

When the "immRep" attribute is included in the subscription and the subscribed policy control events are available, the PCF shall immediately notify the NF service consumer using the Npcf\_EventExposure\_Notify service operation, as described in subclause 4.2.4.2.

When the sampling ratio as the "sampRatio" attribute is included in the subscription, the PCF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs.

When the group reporting guard time as the "grpRepTime" attribute is included in the subscription, the PCF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then the PCF shall notify the NF service consumer using the Npcf\_EventExposure\_Notify service operation, as described in subclause 4.2.4.2.

\* \* \* Next changes \* \* \* \*

4.2.2.3 Modifying an existing subscription

Figure 4.2.2.3-1 illustrates the modification of an existing subscription.

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**Figure 4.2.2.3-1: Modification of an existing subscription**

To modify an existing subscription to event notifications, the NF service consumer shall send an HTTP PUT request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI, as shown in figure 4.2.2.3-1, step 1, where "{subscriptionId}" is the subscription correlation ID of the existing subscription. The "PcEventExposureSubsc" data structure is included as request body as described in subclause 4.2.2.2.

NOTE 1: An alternate NF service consumer than the one that requested the generation of the subscription resource can send the PUT.

NOTE 2: The "notifUri" attribute within the PcEventExposureSubsc data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

If the PCF cannot successfully fulfil the received HTTP PUT request due to an internal PCF error or an error in the HTTP PUT request, the PCF shall send an HTTP error response as specified in subclause 5.7.

Upon successful reception of an HTTP PUT request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI and "PcEventExposureSubsc" data structure as request body, the PCF shall store the subscription and send an HTTP "200 OK" response with the "PcEventExposureSubsc" data structure as response body, as shown in figure 4.2.2.3-1, step 2.

The "PcEventExposureSubsc" data structure payload body shall contain the representation of the modified "Individual Policy Events Subscription".

When the "monDur" attribute is included in the response, it represents a NF service producer selected expiry time that is equal or less than a possible expiry time received in the request.

When the "immRep" attribute is included in the updated subscription and the subscribed policy control events are available, the PCF shall immediately notify the NF service consumer using the Npcf\_EventExposure\_Notify service operation, as described in subclause 4.2.4.2.

When the sampling ratio as the "sampRatio" attribute is included in the subscription, the PCF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs.

When the group reporting guard time as the "grpRepTime" attribute is included in the subscription, the PCF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then the PCF shall notify the NF service consumer using the Npcf\_EventExposure\_Notify service operation, as described in subclause 4.2.4.2.

\* \* \* Next changes \* \* \* \*

#### 4.2.3.2 Unsubscription from event notifications

Figure 4.2.3.2-1 illustrates the unsubscription from event notifications.



Figure 4.2.3.2-1: Unsubscription from event notifications

To unsubscribe from event notifications, the NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI, as shown in figure 4.2.3.2-1, step 1, where "{subscriptionId}" is the subscription correlation identifier of the existing resource subscription that is to be deleted.

If the PCF cannot successfully fulfil the received HTTP DELETE request due to an internal PCF error or an error in the HTTP DELETE request, the PCF shall send the HTTP error response as specified in subclause 5.7.

Upon successful reception of the HTTP DELETE request with: "{apiRoot}/npcf-eventexposure/v1/subscriptions/{subscriptionId}" as request URI, the PCF shall remove the corresponding subscription and send an HTTP "204 No Content" response as shown in figure 4.2.3.2-1, step 2.

\* \* \* Next changes \* \* \* \*

4.2.4.1 General

The Npcf\_EventExposure\_Notify service operation enables the PCF to notify the NF service consumers that the previously subscribed policy control event occurred.

The following procedure using the Npcf\_EventExposure\_Notify service operation is supported:

- notification about subscribed events.

\* \* \* Next changes \* \* \* \*

#### 4.2.4.2 Notification about subscribed events

Figure 4.2.4.2-1 illustrates the notification about subscribed events.



Figure 4.2.4.2-1: Notification about subscribed events

If the PCF observes policy control related event(s) for which an NF service consumer has subscribed, the PCF shall send an HTTP POST request as shown in figure 4.2.4.2-1, step 1, with the "{notifUri}" as request URI containing the value previously provided by the NF service consumer within the corresponding subscription, and the "PcEventExposureNotif" data structure.

The "PcEventExposureNotif" data structure shall include:

- The notification correlation ID provided by the NF service consumer during the subscription as "notifId" attribute; and

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

1. the Policy Control event as "event" attribute;

2. for an access type change:

a) new access type as "accType" attribute;

b) the new RAT type as "ratType" attribute, if applicable for the notified access type; and

c) if the "ATSSS" feature is supported:

i. if it is the first access type report for a PDU session, and both, 3GPP and non-3GPP access information is available, the "addAccessInfo" attribute. The "addAccessInfo" attribute contains the additional access type information, where the access type is encoded in the "accessType" attribute, and the RAT type is encoded in the "ratType" attribute when applicable for the notified access type;

ii. if it is a subsequent access type change report:

- if a new access type is added to the MA PDU session, the"addAccessInfo" attribute with the added access type encoded in the "accessType" attribute, and the RAT type encoded in the "ratType" attribute when applicable for the notified access type;

- if an access type is released in the MA PDU session, the "relAccessInfo" attribute with the released access type encoded in the "accessType" attribute, and the RAT type encoded in the "ratType" attribute when applicable for the notified access type; and

NOTE: For a MA PDU session, if the "ATSSS" feature is not supported by the AF, the PCF includes the "accessType" attribute and the "ratType" attribute with a currently active combination of access type and RAT type (if applicable for the notifed access type). When both 3GPP and non-3GPP accesses are available, the PCF includes the information corresponding to the 3GPP access.

d) for EPC inteworking scenarios, the ePDG address as "anGwAddr" attribute, if applicable for the notified access type;

3. for a PLMN change:

a) new network identity containing the PLMN Identifier and, if available, the NID in the "plmnId" attribute;

4. the identity of the affected UE in the "supi" attribute and, if available, in the "gpsi" attribute;

5. the time at which the event was observed encoded as "timeStamp" attribute;

6. if available, and if the feature "ExtendedSessionInformation" is supported, information about the PDU session involved in the reported event in the "pduSessInfo" attribute, that shall include:

a) the S-NSSAI of the PDU session in the "snssai" attribute;

b) the DNN of the PDU session in the "dnn" attribute; and

c) the IPv4 address in the "ueIpv4" attribute and/or the IPv6 prefix in the "ueIpv6" attribute, or the Ethernet MAC address in the "ueMac" attribute; and

if the IPv4 address is included in the "ueIpv4" attribute, may include the IP domain in the "ipDomain" attribute;

7. if available, and if the feature "ExtendedSessionInformation" is supported, information about the services involved in the reported event in the indicated PDU session in the "repServices" attribute, which may include per identified service:

a) a list of Ethernet flows in the "servEthFlows" attribute which contains an impacted Ethernet flow number within the "flowNumber" attribute in each EthernetFlowInfo data structure; or

b) a list of IP flows in the "servIpFlows" attribute which contains an impacted IP flow number within the "flowNumber" attribute in each IpFlowInfo data structure; and/or

c) an AF application identifier in the "afAppId" attribute.

If the NF service consumer cannot successfully fulfil the received HTTP POST request due to an internal error or an error in the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in subclause 5.7.

Upon successful reception of the HTTP POST requestwith "{notifUri}" as request URI and a "PcEventExposureNotif" data structure as request body, the NF service consumer shall send a "204 No Content" HTTP response, as shown in figure 4.2.4.2-1, step 2, for a successful processing.

\* \* \* Next changes \* \* \* \*

5.3.1 Resource Structure

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**Figure 5.3.1-1: Resource URI structure of the Npcf\_EventExposure API**

Table 5.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 5.3.1-1: Resources and methods overview**

|  |  |  |  |
| --- | --- | --- | --- |
| **Resource name** | **Resource URI** | **HTTP method or custom operation** | **Description** |
| Policy Control Events Subscriptions | /subscriptions | POST | Subscription to notifications of policy control events and creation of an Individual Policy Control Events Subscription resource. |
| Individual Policy Control Events Subscription | /subscriptions/{subscriptionId} | GET | Reads an Individual Policy Control Events Subscription resource. |
| PUT | Modifies an Individual Policy Control Events Subscription. |
| DELETE | Cancels an individual subscription to notifications of policy control events. |

\* \* \* Next changes \* \* \* \*

5.5.1 General

Notifications shall comply with subclause 6.2 of 3GPP TS 29.500 [5] and subclause 4.6.2.3 of 3GPP TS 29.501 [6].

**Table 5.5.1-1: Notifications overview**

|  |  |  |  |
| --- | --- | --- | --- |
| **Notification** | **Callback URI** | **HTTP method or custom operation** | **Description (service operation)** |
| Policy Control Event Notification | {notifUri} | POST | Notification of policy control event reporting. |

\* \* \* Next changes \* \* \* \*

#### 5.5.2.2 Target URI

The Callback URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.5.2.2-1.

Table 5.5.2.2-1: Callback URI variables

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| notifUri | Uri | The Notification Uri as assigned by the NF service consumer during the subscription service operation and described within the PcEventExposureSubsc data type (see table 5.6.2.2-1). |

\* \* \* Next changes \* \* \* \*

5.6.2.4 Type ReportingInformation

**Table 5.6.2.4-1: Definition of type ReportingInformation**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| immRep | boolean | O | 0..1 | Indication of immediate reporting. If included, when it is set to true it indicates immediate reporting of the subscribed events, if available. Otherwise, reporting will occur when the event is met. |  |
| notifMethod | NotificationMethod | O | 0..1 | Represents the notification method (periodic, one time, on event detection). If "notifMethod" attribute is not supplied, the default value "ON\_EVENT\_DETECTION" applies. |  |
| maxReportNbr | Uinteger | O | 0..1 | Represents the maximum number of reports, after which the subscription ceases to exist (i.e., the reporting ends). It may be present for the "PERIODIC" and on "ON\_EVENT\_DETECTION" notification methods. If omitted, there is no limit. |  |
| monDur | DateTime | C | 0..1 | Represents the time at which the subscription ceases to exist (i.e the subscription becomes invalid and the reporting ends). If omitted, there is no time limit. If present in the subscription request, it shall be present in the subscription response. |  |
| repPeriod | DurationSec | O | 0..1 | Indicates the time interval between successive event notifications.It is supplied for notification method "PERIODIC". |  |
| sampRatio | SamplingRatio | O | 0..1 | Indicates the ratio of the random subset to target UEs, event reports only relates to the subset. |  |
| grpRepTime | DurationSec | O | 0..1 | Indicates the time during which the event reports detected for the concerned UEs are aggregated in a group, in order to be reported together to the NF service consumer. |  |

\* \* \* End of changes \* \* \* \*