**3GPP TSG- Meeting #C3-246512**

**Orlando, US, 18 – 22 November, 2024 (Revision of C3-246053)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.522** | **CR** |  | **rev** | **1** | **Current version:** | **19.0.0** |  |
|  | | | | | | | | |
| *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:*** | Support for traffic routing outcome in event notification of TrafficInfluence API | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CEWiT, Nokia | | | | | | | | | |
| ***Source to TSG:*** | CT3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI19, | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The UP\_PATH\_CHANGE event notification of TrafficInfluence API of NEF is not provisioned to indicate AF the outcome of the requested traffic routing.  In case of AF requesting traffic Influence with single or multiple trafficFilters, and subscribes to UP path change notification via NEF, there are possibilities of all requested traffic flows to be successfully routed or failed to be routed. Also, there is a chance of partial success scenario, where some flows are successfully routed, while others fail. Hence, it will be useful for the AF to know the outcome of the requested traffic routing through UP path change notification, Such that it can take action accordingly.  Currently, the notification from SMF through NEF conveys that the UP path has changed for the request, along with the source and target DNAI with the its related N6 Traffic routing information, if AF has subscribed for it.  Based on the received LS reply from SA2 (C3-246020), there is no restriction in stage 2 for conveying the outcome of the requested traffic routing through to AF.  This CR proposes to extend the support of both positive and negative outcome of the requested traffic routing using a new event TRAFF\_ROUTE\_REQ\_OUTCOME to AF. It includes the related filter information of successfully and/or failed to be installed flows through NEF EventNotification data model. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Addition of overall heading for “Handling of Event notification” as clause 4.4.7.4. 2. Heading number updation and description of handling of UP path management event notification in clause 4.4.7.4.1 3. Addition of new clause 4.4.7.4.2 for the addition of description to add support for handling subscription for TRAFF\_ROUTE\_REQ\_OUTCOME and notification for the same from SMF. 4. Addition of datatype “TraffRouteReqOutcome” in the reused data types in clause 5.4.3.2 5. Addition of attribute “traffRouteReqOutcome” in the “EventNotification” datatype in clause 5.4.3.3.4. 6. Addition of enumeration value “TRAFF\_ROUTE\_REQ\_OUTCOME” in the clause 5.4.3.4.3 7. Addition of new feature “TraffRouteReqOutcome” in the Used Features in clause 5.4.4. 8. Corresponding OpenAPI changes in A.2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | If not approved, the outcome of AF requested traffic routing cannot be sent to it. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.4.7.4, 4.4.7.4.1(new), 4.4.7.4.2(new), 5.4.3.2, 5.4.3.3.4, 5.4.3.4.3, 5.4.4, A.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This CR introduces a backward compatible new feature to the OpenAPI description of the TrafficInfluence API. This CR is to be considered together along with other CRs, CR#1285, CR#0692, CR#0303 and CR#0560. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \*

#### 4.4.7.4 Handling of Event Notification

#### 4.4.7.4.1 Handling of UP path management event notification

If the NEF receives a UP path management event notification from the SMF indicating that the subscribed event UP path change has been detected as defined in 3GPP TS 29.508 [26], then the NEF shall provide a notification by sending an HTTP POST message that shall include the EventNotification data type at least with the subscribed event (e.g. UP Path has changed) to the AF identified by the notification destination received during creation or modification of the Individual Traffic Influence Subscription resource and, optionally, by the AF Transaction Identifier received during the creation of the Individual Traffic Influence Subscription resource. The NEF may include in the EventNotification data type further information as defined in clause 5.4.3.3.4. If a URI for AF acknowledgement within the "ackUri" attribute is provided by the SMF in the event notification as defined in 3GPP TS 29.508 [26], the NEF shall also provide a URI for AF acknowledgement within the "afAckUri" attribute in the EventNotification data.

Upon receipt of the event notification, the AF shall respond with a "204 No Content" status code to confirm the received event notification.

Afterwards, if a URI for AF acknowledgement within the "afAckUri" attribute is received during the UP path management event notification, the AF may determine that an application layer relocation is needed, and may then send an HTTP POST request as acknowledgement for the UP path management event notification to inform the NEF about the result of application layer relocation. If the application layer is ready and/or the application relocation is completed, within the payload of the HTTP POST request, the AF shall include the AfAckInfo data type with the "afStatus" attribute set to "SUCCESS" and may provide within the AfResultInfo data the N6 traffic routing information associated to the target DNAI as "trafficRoute" attribute and, if the "ULBuffering" feature is supported, an indication that buffering of uplink traffic to the target DNAI is needed as "upBuffInd" attribute and, if the "EASIPreplacement" feature is supported, EAS IP replacement information as "easIpReplaceInfos" attribute; otherwise, the AF shall indicate the failure by including the AfAckInfo data type in the payload with the "afStatus" attribute sets to the corresponding failure cause. The NEF Northbound interface transaction identifier generated by the AF shall also be provided as the "afTransId" attribute within the AfAckInfo data if the AF has previously provided it.

Upon receipt of the AF acknowledgement, the NEF shall respond with a "204 No Content" status code to confirm the received acknowledgement, and forward the AF acknowledgement to the SMF as described in 3GPP TS 29.508 [26].

#### 4.4.7.4.2 Handling of Traffic routing requirements enforcement outcome event notification

When the feature "TraffRouteReqOutcome" is supported and if the AF has requested for subscription of "TRAFF\_ROUTE\_REQ\_OUTCOME", then the NEF subscribes to SMF for the event "TRAFF\_ROUTE\_REQ\_OUTCOME" by including the attribute "traffRouteReqOutcomeSub" in "AfRoutingRequirement" data type as described in 3GPP TS 29.514 [7].

If the NEF receives an event notification from the SMF indicating that the subscribed event "TRAFF\_ROUTE\_REQ\_OUTCOME" has been detected, then the NEF shall provide a notification by sending an HTTP POST message that shall include the EventNotification data type as defined in clause 5.4.3.3.4.

Upon receipt of the event notification, the AF shall respond with a "204 No Content" status code to confirm the received event notification.

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

#### 5.4.3.2 Reused data types

The data types reused by the TrafficInfluence API from other specifications are listed in table 5.4.3.2-1.

Table 5.4.3.2-1: Re-used Data Types

|  |  |  |
| --- | --- | --- |
| Data type | Reference | Comments |
| Dnai | 3GPP TS 29.571 [8] | Identifies a DNAI. |
| DnaiChangeType | 3GPP TS 29.571 [8] | Describes the types of DNAI change. |
| Dnn | 3GPP TS 29.571 [8] | Identifies a DNN. |
| DurationSec | 3GPP TS 29.571 [8] | Identifies a period of time in units of seconds. |
| EasIpReplacementInfo | 3GPP TS 29.571 [8] | Represents EAS IP replacement information. |
| EthFlowDescription | 3GPP TS 29.514 [7] | Contains the Ethernet data flow information. (NOTE) |
| ExternalGroupId | 3GPP TS 29.122 [4] | External Group Identifier for a user group. |
| FlowInfo | 3GPP TS 29.122 [4] | Contains the IP data flow information. |
| GeographicalArea | Clause 5.17.3.3.4 | Identifies a geographical area. |
| Gpsi | 3GPP TS 29.571 [8] | Identifies a GPSI. |
| Ipv4Addr | 3GPP TS 29.122 [4] | Identifies an IPv4 address. |
| Ipv6Addr | 3GPP TS 29.122 [4] | Identifies an IPv6 address. |
| Ipv6Prefix | 3GPP TS 29.571 [8] | Identifies an IPv6 Prefix. |
| Link | 3GPP TS 29.122 [4] | Identifies a referenced resource. |
| MacAddr48 | 3GPP TS 29.571 [8] | Identifies a MAC address. |
| Metadata | 3GPP TS 29.571 [8] | Contains opaque information for the service functions in the N6-LAN that is provided by AF and transparently sent to UPF. |
| PlmnId | 3GPP TS 29.571 [8] | Identifies a PLMN Identifier. |
| Port | 3GPP TS 29.122 [4] | Identifies a port number. |
| ReportingInformation | 3GPP TS 29.523 [22] | Represents the event reporting requirements. |
| RouteToLocation | 3GPP TS 29.571 [8] | Describes the traffic routes to the locations of the application. |
| Snssai | 3GPP TS 29.571 [8] | Identifies the S-NSSAI. |
| SupportedFeatures | 3GPP TS 29.571 [8] | Used to negotiate the applicability of the optional features defined in table 5.4.4-1. |
| TemporalValidity | 3GPP TS 29.514 [7] | Indicates the time interval(s) during which the AF request is to be applied |
| TrafficCorrelationInfo | 3GPP TS 29.519 [23] | Contains the information for traffic correlation. |
| TraffRouteReqOutcome | 3GPP TS 29.508 [26] | Indicates the installation outcome of requested traffic routing requirement by AF in the traffic routing requirement installation outcome event notification. |
| Uinteger | 3GPP TS 29.571 [8] | Unsigned integer. |
| UintegerRm | 3GPP TS 29.571 [8] | This data type is defined in the same way as the "Uinteger" data type, but with the OpenAPI "nullable: true" property. |
| WebsockNotifConfig | 3GPP TS 29.122 [4] | Contains the configuration parameters to set up notification delivery over Websocket protocol. |
| NOTE: In order to support a set of MAC addresses with a specific range in the traffic filter, feature MacAddressRange as specified in clause 5.4.4 shall be supported. | | |

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

##### 5.4.3.3.4 Type: EventNotification

Table 5.4.3.3.4-1: Definition of type EventNotification

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | P | | Cardinality | | Description | | Applicability  (NOTE 1) | |
| afTransId | | string | | O | | 0..1 | | Identifies an NEF Northbound interface transaction, generated by the AF. | |  | |
| dnaiChgType | | DnaiChangeType | | C | | 0..1 | | Identifies the type of notification regarding UP path management event. Shall be present if the "subscribedEvent" sets to "UP\_PATH\_CHANGE". | |  | |
| sourceTrafficRoute | | RouteToLocation | | O | | 0..1 | | Identifies the N6 traffic routing information associated to the source DNAI.  May be present if the "subscribedEvent" sets to "UP\_PATH\_CHANGE" and/or "TRAFF\_ROUTE\_REQ\_OUTCOME". (NOTE 3) | |  | |
| subscribedEvent | | SubscribedEvent | | M | | 1 | | Identifies a UP path management event the AF requested to be notified of. | |  | |
| targetTrafficRoute | | RouteToLocation | | O | | 0..1 | | Identifies the N6 traffic routing information associated to the target DNAI.  May be present if the "subscribedEvent" sets to "UP\_PATH\_CHANGE" and/or "TRAFF\_ROUTE\_REQ\_OUTCOME". (NOTE 3) | |  | |
| sourceDnai | | Dnai | | O | | 0..1 | | Source DN Access Identifier. Shall be included for events "UP\_PATH\_CHANGE" and "TRAFF\_ROUTE\_REQ\_OUTCOME" if the DNAI changed.  (NOTE 2, NOTE 3). | |  | |
| targetDnai | | Dnai | | O | | 0..1 | | Target DN Access Identifier. Shall be included for events "UP\_PATH\_CHANGE" and "TRAFF\_ROUTE\_REQ\_OUTCOME" if the DNAI changed.  (NOTE 2, NOTE 3). | |  | |
| traffRouteReqOutcome | | TraffRouteReqOutcome | | O | | 0..1 | | Identifies the installation outcome of requested traffic routing containing the traffic filter information that are successfully and/or failed to be installed.  Shall be present if the "subscribedEvent" sets to "TRAFF\_ROUTE\_REQ\_OUTCOME". | | TraffRouteReqOutcome | |
| candidateDnais | | array(Dnai) | | O | | 1..N | | The candidate DNAI(s) for the PDU Session. May be included for event "UP\_PATH\_CHANGE". | | CommonEASDNAI | |
| candDnaisPrioInd | | boolean | | O | | 0..1 | | If provided and set to "true", it indicates that the candidate DNAIs provided in the "candidateDnais" attribute are in descending priority order, i.e. the lower the array index the higher the priority of the respective DNAI. If omitted, the default value is "false". It may only be provided if the "candidateDnais" attribute is provided and the "dnaiChgType" attribute is set to the value "EARLY". | | CommonEASDNAI | |
| easRediscoverInd | | boolean | | O | | 0..1 | | Indication of EAS re-discovery. If present and set to "true", it indicates the EAS re-discovery is performed, e.g. due to change of common EAS. Default value is "false" if omitted.  May be included for event "UP\_PATH\_CHANGE". | | CommonEASDNAI | |
| gpsi | | Gpsi | | O | | 0..1 | | Identifies a user. | |  | |
| srcUeIpv4Addr | | Ipv4Addr | | O | | 0..1 | | The IPv4 Address of the served UE for the source DNAI. | |  | |
| srcUeIpv6Prefix | | Ipv6Prefix | | O | | 0..1 | | The Ipv6 Address Prefix of the served UE for the source DNAI. | |  | |
| tgtUeIpv4Addr | | Ipv4Addr | | O | | 0..1 | | The IPv4 Address of the served UE for the target DNAI. | |  | |
| tgtUeIpv6Prefix | | Ipv6Prefix | | O | | 0..1 | | The Ipv6 Address Prefix of the served UE for the target DNAI. | |  | |
| ueMac | | MacAddr48 | | O | | 0..1 | | UE MAC address of the served UE. | |  | |
| afAckUri | | Link | | O | | 0..1 | | The URI provided by the NEF for the AF acknowledgement.  May only be included for event "UP\_PATH\_CHANGE". | | URLLC | |
| offloadPlmnId | | PlmnId | | O | | 0..1 | | If the event is "UP\_PATH\_CHANGE" and the UE has moved to a serving PLMN where local traffic offloading is allowed, this attribute contains the identifier of the serving PLMN. | | HR-SBO | |
| hDnn | | Dnn | | O | | 0..1 | | If the event is "UP\_PATH\_CHANGE" and the UE has moved to a serving PLMN where local traffic offloading is allowed, this attribute contains the DNN at the Home PLMN. | | HR-SBO | |
| hSnssai | | Snssai | | O | | 0..1 | | If the the event is "UP\_PATH\_CHANGE" and UE has moved to a serving PLMN where local traffic offloading is allowed, this attribute contains the S-NSSAI at the Home PLMN. | | HR-SBO | |
| suppFeatures | | SupportedFeatures | | C | | 0..1 | | List of Traffic Influence negotiated features as described in clause 5.4.4.  This parameter shall be supplied by the NEF when it determines that it needs to update the supported features that were negotiated during the resource creation due to a notification received by the SMF which contained updated supported features on the SMF side. | | HR-SBO | |
| NOTE 1: Properties marked with a feature as defined in clause 5.4.4 are applicable as described in clause 5.2.7 of 3GPP TS 29.122 [4]. If no feature is indicated, the related property applies for all the features.  NOTE 2: If the DNAI is not changed while the N6 traffic routing information is changed, the "sourceDnai" attribute and "targetDnai" attribute shall not be provided.  NOTE 3: The change from the UP path status where no DNAI applies to a status where a DNAI applies indicates the activation of the related AF request and therefore only the target DNAI and N6 traffic routing information is provided in the event notification; the change from the UP path status where a DNAI applies to a status where no DNAI applies indicates the de-activation of the related AF request and therefore only the source DNAI and N6 traffic routing information is provided in the event notification. | | | | | | | | | | | |

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

##### 5.4.3.4.3 Enumeration: SubscribedEvent

The enumeration SubscribedEvent represents the type of UP path management events for which the AF requests to be notified. It shall comply with the provisions defined in table 5.4.3.4.3-1.

Table 5.4.3.4.3-1: Enumeration SubscribedEvent

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| UP\_PATH\_CHANGE | The AF requests to be notified when the UP path changes for the PDU session. |  |
| TRAFF\_ROUTE\_REQ\_OUTCOME | The AF requests to be notified about the installation outcome of the requested traffic routing requirements. | TraffRouteReqOutcome |

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

### 5.4.4 Used Features

The table below defines the features applicable to the TrafficInfluence API. Those features are negotiated as described in clause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.4.4-1: Features used by TrafficInfluence API

|  |  |  |
| --- | --- | --- |
| Feature number | Feature Name | Description |
| 1 | Notification\_websocket | The delivery of notifications over Websocket is supported as described in 3GPP TS 29.122 [4]. This feature requires that the Notification\_test\_event feature is also supported. |
| 2 | Notification\_test\_event | The testing of notification connection is supported as described in 3GPP TS 29.122 [4]. |
| 3 | URLLC | This feature indicates support of Ultra Reliable Low Latency Communication (URLLC) requirements (i.e. AF application relocation acknowledgement and UE address(es) preservation). |
| 4 | MacAddressRange | Indicates the support of a set of MAC addresses with a specific range in the traffic filter. |
| 5 | AF\_latency | This feature indicates support for Edge relocation considering user plane latency. |
| 6 | EASDiscovery | This feature indicates the support of EAS (re)discovery. |
| 7 | EASIPreplacement | This feature indicates the support of provisioning of EAS IP replacement info. |
| 8 | ExposureToEAS | This feature indicates support for the indication provided by the AF of direct event notification of QoS monitoring events from the UPF to the Local NEF or the AF in 5GC. |
| 9 | SimultConnectivity | This feature indicates support of temporary simultaneous connectivity over source and target PSA at edge relocation. |
| 10 | ULBuffering | This feature indicates support for Uplink buffering indication for edge relocation. |
| 11 | EDGEAPP | This feature controls the support of EDGE applications related functionalities (e.g. support the provisioning of event reporting requirements). |
| 12 | SFC | This feature indicates support for application function influence on service function chaining(s). |
| 13 | FinerGranUEs | This feature indicates support for handling of more granular set of UEs. |
| 14 | CommonEASDNAI | This feature controls the support of the common EAS/DNAI selection. |
| 15 | HR-SBO | This feature indicates the support of HR-SBO scenarios. |
| 16 | MultiTrafficInflu | This feature indicates the support for providing more than one set of traffic filters and the corresponding N6 traffic routing requirements for traffic influence. |
| 17 | TraffRouteReqOutcome | This feature indicates the support for providing the installation outcome of AF requested traffic routing in the traffic route requirement installation outcome event notification. The event notification may contain the filter information which are successfully and/or failed to be installed. |
| Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification".  Description: A clear textual description of the feature. | | |

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

A.2 TrafficInfluence API

openapi: 3.0.0

info:

title: 3gpp-traffic-influence

version: 1.3.0

description: |

API for AF traffic influence

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externalDocs:

description: >

3GPP TS 29.522 V18.6.0; 5G System; Network Exposure Function Northbound APIs.

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.522/'

security:

- {}

- oAuth2ClientCredentials: []

servers:

- url: '{apiRoot}/3gpp-traffic-influence/v1'

variables:

apiRoot:

default: https://example.com

description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

paths:

/{afId}/subscriptions:

parameters:

- name: afId

in: path

description: Identifier of the AF

required: true

schema:

type: string

get:

summary: read all of the active subscriptions for the AF

operationId: ReadAllSubscriptions

tags:

- Traffic Influence Subscription

responses:

'200':

description: OK.

content:

application/json:

schema:

type: array

items:

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

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29122\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

post:

summary: Creates a new subscription resource

operationId: CreateNewSubscription

tags:

- Traffic Influence Subscription

requestBody:

description: Request to create a new subscription resource

required: true

content:

application/json:

schema:

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

callbacks:

notificationDestination:

'{$request.body#/notificationDestination}':

post:

requestBody: # contents of the callback message

required: true

content:

application/json:

schema:

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

callbacks:

afAcknowledgement:

'{$request.body#/afAckUri}':

post:

requestBody: # contents of the callback message

required: true

content:

application/json:

schema:

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

responses:

'204':

description: No Content (successful acknowledgement)

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29122\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29122\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29122\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

responses:

'204':

description: No Content (successful notification)

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29122\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29122\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29122\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

responses:

'201':

description: Created (Successful creation of subscription)

content:

application/json:

schema:

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

headers:

Location:

description: Contains the URI of the newly created resource.

required: true

schema:

type: string

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29122\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29122\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29122\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

/{afId}/subscriptions/{subscriptionId}:

parameters:

- name: afId

in: path

description: Identifier of the AF

required: true

schema:

type: string

- name: subscriptionId

in: path

description: Identifier of the subscription resource

required: true

schema:

type: string

get:

summary: read an active subscriptions for the SCS/AS and the subscription Id

operationId: ReadAnSubscription

tags:

- Individual Traffic Influence Subscription

responses:

'200':

description: OK (Successful get the active subscription)

content:

application/json:

schema:

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

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'406':

$ref: 'TS29122\_CommonData.yaml#/components/responses/406'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

put:

summary: Fully updates/replaces an existing subscription resource

operationId: FullyUpdateAnSubscription

tags:

- Individual Traffic Influence Subscription

requestBody:

description: Parameters to update/replace the existing subscription

required: true

content:

application/json:

schema:

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

responses:

'200':

description: OK (Successful update of the subscription)

content:

application/json:

schema:

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

'204':

description: No Content

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29122\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29122\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29122\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

patch:

summary: Partially updates/replaces an existing subscription resource

operationId: PartialUpdateAnSubscription

tags:

- Individual Traffic Influence Subscription

requestBody:

required: true

content:

application/merge-patch+json:

schema:

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

responses:

'200':

description: OK. The subscription was modified successfully.

content:

application/json:

schema:

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

'204':

description: No Content

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29122\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29122\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29122\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

delete:

summary: Deletes an already existing subscription

operationId: DeleteAnSubscription

tags:

- Individual Traffic Influence Subscription

responses:

'204':

description: No Content (Successful deletion of the existing subscription)

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{tokenUrl}'

scopes: {}

schemas:

TrafficInfluSub:

description: Represents a traffic influence subscription.

type: object

properties:

afServiceId:

type: string

description: Identifies a service on behalf of which the AF is issuing the request.

afAppId:

type: string

description: Identifies an application.

afTransId:

type: string

description: Identifies an NEF Northbound interface transaction, generated by the AF.

appReloInd:

type: boolean

description: >

Identifies whether an application can be relocated once a location of

the application has been selected.

dnn:

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

snssai:

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

externalGroupId:

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

externalGroupIds:

type: array

items:

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

minItems: 1

description: Each element identifies a group of users.

extSubscCats:

type: array

items:

type: string

minItems: 1

anyUeInd:

type: boolean

description: >

Identifies whether the AF request applies to any UE. This attribute shall

set to "true" if applicable for any UE, otherwise, set to "false".

subscribedEvents:

type: array

items:

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

minItems: 1

description: Identifies the requirement to be notified of the event(s).

gpsi:

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

ipv4Addr:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Ipv4Addr'

ipDomain:

type: string

ipv6Addr:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Ipv6Addr'

macAddr:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/MacAddr48'

dnaiChgType:

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

notificationDestination:

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

requestTestNotification:

type: boolean

description: >

Set to true by the SCS/AS to request the NEF to send a test notification

as defined in clause 5.2.5.3. Set to false or omitted otherwise.

websockNotifConfig:

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

self:

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

trafficDataSets:

type: object

additionalProperties:

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

minProperties: 2

description: >

Contains multiple sets of traffic filters with the corresponding N6 traffic

routing requirements. The key of the map shall be the value of the setId attribute of

the TrafficDataSet data structure.

trafficFilters:

type: array

items:

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

minItems: 1

description: Identifies IP packet filters.

ethTrafficFilters:

type: array

items:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

minItems: 1

description: Identifies Ethernet packet filters.

trafficRoutes:

type: array

items:

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

minItems: 1

description: Identifies the N6 traffic routing requirement.

sfcIdDl:

type: string

description: >

Reference to a pre-configured steering of user traffic to service function chain in

downlink.

sfcIdUl:

type: string

description: >

Reference to a pre-configured steering of user traffic to service function chain in

uplink.

metadata:

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

tfcCorrInd:

type: boolean

tempValidities:

type: array

items:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/TemporalValidity'

validGeoZoneIds:

type: array

items:

type: string

minItems: 1

description: >

Identifies a geographic zone that the AF request applies only to the traffic

of UE(s) located in this specific zone.

deprecated: true

geoAreas:

type: array

items:

$ref: 'TS29522\_AMPolicyAuthorization.yaml#/components/schemas/GeographicalArea'

minItems: 1

description: Identifies geographical areas within which the AF request applies.

afAckInd:

type: boolean

addrPreserInd:

type: boolean

simConnInd:

type: boolean

description: >

Indicates whether simultaneous connectivity should be temporarily

maintained for the source and target PSA.

simConnTerm:

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

maxAllowedUpLat:

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

easIpReplaceInfos:

type: array

items:

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

minItems: 1

description: Contains EAS IP replacement information.

easRedisInd:

type: boolean

description: >

Indicates the EAS rediscovery is required for the application if it is included

and set to "true".

eventReq:

$ref: 'TS29523\_Npcf\_EventExposure.yaml#/components/schemas/ReportingInformation'

eventReports:

type: array

items:

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

minItems: 1

candDnaiInd:

type: boolean

description: >

Indication of reporting candidate DNAI(s). If it is included and set to "true", the

candidate DNAI(s) for the PDU session need to be reported. Otherwise set to "false" or

omitted.

tfcCorreInfo:

$ref: 'TS29519\_Application\_Data.yaml#/components/schemas/TrafficCorrelationInfo'

plmnId:

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

portNumber:

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

suppFeat:

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

allOf:

- oneOf:

- required: [afAppId]

- required: [trafficFilters]

- required: [ethTrafficFilters]

- required: [trafficDataSets]

- oneOf:

- required: [ipv4Addr]

- required: [ipv6Addr]

- required: [macAddr]

- required: [gpsi]

- required: [externalGroupId]

- required: [anyUeInd]

anyOf:

- not:

required: [subscribedEvents]

- required: [notificationDestination]

TrafficInfluSubPatch:

description: >

Represents parameters to request the modification of a traffic influence

subscription resource.

type: object

properties:

appReloInd:

type: boolean

description: >

Identifies whether an application can be relocated once a location of

the application has been selected.

nullable: true

trafficDataSets:

type: object

additionalProperties:

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

minProperties: 1

description: >

Contains one or several set(s) of traffic filters with the corresponding N6 traffic

routing requirements. The key of the map shall be the value of the setId attribute of

the TrafficDataSet data structure.

trafficFilters:

type: array

items:

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

minItems: 1

description: Identifies IP packet filters.

ethTrafficFilters:

type: array

items:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

minItems: 1

description: Identifies Ethernet packet filters.

trafficRoutes:

type: array

items:

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

minItems: 1

description: Identifies the N6 traffic routing requirement.

sfcIdDl:

type: string

description: >

Reference to a pre-configured steering of user traffic to service function chain in

downlink.

nullable: true

sfcIdUl:

type: string

description: >

Reference to a pre-configured steering of user traffic to service function chain in

uplink.

nullable: true

metadata:

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

tfcCorrInd:

type: boolean

nullable: true

tempValidities:

type: array

items:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/TemporalValidity'

minItems: 1

nullable: true

validGeoZoneIds:

type: array

items:

type: string

minItems: 1

description: >

Identifies a geographic zone that the AF request applies only to the traffic

of UE(s) located in this specific zone.

nullable: true

deprecated: true

geoAreas:

type: array

items:

$ref: 'TS29522\_AMPolicyAuthorization.yaml#/components/schemas/GeographicalArea'

minItems: 1

description: Identifies geographical areas within which the AF request applies.

nullable: true

afAckInd:

type: boolean

nullable: true

addrPreserInd:

type: boolean

nullable: true

simConnInd:

type: boolean

description: >

Indicates whether simultaneous connectivity should be temporarily maintained

for the source and target PSA.

simConnTerm:

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

maxAllowedUpLat:

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

easIpReplaceInfos:

type: array

items:

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

minItems: 1

description: Contains EAS IP replacement information.

nullable: true

easRedisInd:

type: boolean

description: >

Indicates the EAS rediscovery is required for the application if it is included

and set to "true".

notificationDestination:

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

eventReq:

$ref: 'TS29523\_Npcf\_EventExposure.yaml#/components/schemas/ReportingInformation'

tfcCorreInfo:

$ref: 'TS29519\_Application\_Data.yaml#/components/schemas/TrafficCorrelationInfo'

EventNotification:

description: Represents a traffic influence event notification.

type: object

properties:

afTransId:

type: string

description: Identifies an NEF Northbound interface transaction, generated by the AF.

dnaiChgType:

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

sourceTrafficRoute:

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

subscribedEvent:

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

targetTrafficRoute:

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

sourceDnai:

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

targetDnai:

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

traffRouteReqOutcome:

$ref: 'TS29508\_Nsmf\_EventExposure.yaml#/components/schemas/TraffRouteReqOutcome'

candidateDnais:

type: array

items:

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

minItems: 1

description: The candidate DNAI(s) for the PDU Session.

candDnaisPrioInd:

type: boolean

description: >

If provided and set to true, it indicates that the candidate DNAIs provided

in the candidateDnais attribute are in descending priority order, i.e.,

the lower the array index the higher the priority of the respective DNAI.

If omitted, the default value is false.

easRediscoverInd:

type: boolean

description: >

Indication of EAS re-discovery. If present and set to "true", it indicates the EAS

re-discovery is performed, e.g. due to change of common EAS. Default value is "false" if

omitted. May be included for event "UP\_PATH\_CHANGE".

gpsi:

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

srcUeIpv4Addr:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Ipv4Addr'

srcUeIpv6Prefix:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv6Prefix'

tgtUeIpv4Addr:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Ipv4Addr'

tgtUeIpv6Prefix:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv6Prefix'

ueMac:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/MacAddr48'

afAckUri:

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

offloadPlmnId:

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

hDnn:

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

hSnssai:

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

suppFeatures:

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

required:

- dnaiChgType

- subscribedEvent

AfResultInfo:

description: Identifies the result of application layer handling.

type: object

properties:

afStatus:

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

trafficRoute:

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

upBuffInd:

type: boolean

description: >

If present and set to "true" it indicates that buffering of uplink traffic

to the target DNAI is needed.

easIpReplaceInfos:

type: array

items:

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

minItems: 1

description: Contains EAS IP replacement information.

required:

- afStatus

AfAckInfo:

description: Represents acknowledgement information of a traffic influence event notification.

type: object

properties:

afTransId:

type: string

ackResult:

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

gpsi:

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

required:

- ackResult

TrafficDataSet:

description: >

Represents a set of traffic filters and the corresponding N6 traffic routing requirements.

properties:

setId:

type: string

trafficFilters:

type: array

items:

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

minItems: 1

ethTrafficFilters:

type: array

items:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

minItems: 1

trafficRoutes:

type: array

items:

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

minItems: 1

required:

- setId

- trafficRoutes

oneOf:

- required: [trafficFilters]

- required: [ethTrafficFilters]

TrafficDataSetRm:

description: >

This data type is defined in the same way as the TrafficDataSet data, but with the OpenAPI

nullable property set to true. Removable attributes trafficFilters and ethTrafficFilters and

trafficRoutes are defined as nullable in the OpenAPI.

properties:

setId:

type: string

trafficFilters:

type: array

items:

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

minItems: 1

nullable: true

ethTrafficFilters:

type: array

items:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

minItems: 1

nullable: true

trafficRoutes:

type: array

items:

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

minItems: 1

nullable: true

nullable: true

required:

- setId

SubscribedEvent:

anyOf:

- type: string

enum:

- UP\_PATH\_CHANGE

- TRAFF\_ROUTE\_REQ\_OUTCOME

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but

is not used to encode content defined in the present version of this API.

description: |

Represents the type of UP path management events for which the AF requests to be notified.

Possible values are:

- UP\_PATH\_CHANGE: The AF requests to be notified when the UP path changes for

the PDU session.

- TRAFF\_ROUTE\_REQ\_OUTCOME: The AF requests to be notified about the installation outcome of

the requested traffic routing requirements.

AfResultStatus:

anyOf:

- type: string

enum:

- SUCCESS

- TEMPORARY\_CONGESTION

- RELOC\_NO\_ALLOWED

- OTHER

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but

is not used to encode content defined in the present version of this API.

description: |

Represents the status of application handling result.

Possible values are:

- SUCCESS: The application layer is ready or the relocation is completed.

- TEMPORARY\_CONGESTION: The application relocation fails due to temporary congestion.

- RELOC\_NO\_ALLOWED: The application relocation fails because application relocation

is not allowed.

- OTHER: The application relocation fails due to other reason.

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