**3GPP TSG CT WG3 Meeting #113eC3-210076**

**E-Meeting, 25th – 29th January 2021 *(revision of C3-21xxxx)***

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| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **29.551** | **CR** | 0058 | **rev** | **-** | **Current version:** | **17.1.0** |  |
|  |
| *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:***  | Support of stateless NFs |
|  |  |
| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | 5G\_eSBA |  | ***Date:*** | 2021-01-29 |
|  |  |  |  |  |
| ***Category:*** | **A** |  | ***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 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:*** | To support Stateless NF, it was agreed in TS 29.500, 6.5.3.2 and 6.5.3.3 during the last CT4 and CT3 e-meetings (cf. reply LS in C3-205495):* Stateless NF as service consumer:
	+ When the NF service consumer is changed, and if the new NF service consumer does not support handling notifications as specified in the above bullet 5, the new NF service consumer should update the NF service producers with the new Notification URI. For explicit subscriptions, this is achieved by updating the existing subscription or creating a new subscription, depending on the NF service producer's API. For implicit subscriptions, this is carried out via a service update request message
	+ Each NF service consumer within the NF (service) set shall be prepared to receive notifications from the NF service producer, either by handling the notifications to the Notification URI constructed according to the above bullet 5 with its own address as authority part, by handling the notifications to the Notification URI notified in the above bullet 6, or by replying with an HTTP 3xx redirect pointing to a new NF service consumer or with another HTTP error.
* Stateless NF as service producer:
	+ When the NF service producer changes, the new NF service producer may include an updated binding indication in a notification/callback request sent to the NF service consumer. The new NF service producer may also generate a new resource URI and return it to the NF service consumer upon reception of a service request related to the resource from that NF service consumer, e.g. the new NF service producer may reply with an HTTP 3xx redirect status code pointing to the new location of the resource.
 |
|  |  |
| ***Summary of change:*** | OpenAPI file is updated with the support of 307 and 308 responses for the GET, DELETE and PUT of Individual PFD subscription and POST method of Callback URI.The support of the redirection is specified in the concerned service procedures.  |
|  |  |
| ***Consequences if not approved:*** | Lack of full support of the functionality required to become stateless NFs |
|  |  |
| ***Clauses affected:*** | 4.2.2.2, 4.2.3.3, 4.2.4.2, 4.2.4.3, 4.2.5.2, 5.3.3.1, 5.3.5.3.1, 5.3.5.3.2, 5.5.2.3.1, 5.5.3.3.1, 5.7.1, 5.8, 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 backwards compatible correction to the OpenAPI file. |
|  |  |
| ***This CR's revision history:*** |  |

**Additional discussion(if needed):**

**…**

**Proposed changes:**

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

#### 4.2.2.2 Retrieval of PFDs by the full pull

This procedure, as shown in Figure 4.2.2.2-1, is used to retrieve PFDs for an application identifier from the PFDF by the full pull for requested application identifier(s). This procedure enables the NF service consumer to retrieve PFDs for an Application Identifier(s) from the PFDF:

- when a PCC rule with this application identifier is provided/activated by the PCF and the PFDs provided by the PFDF are not available at the NF service consumer;

- when the caching timer for an application identifier elapses and a PCC rule for this application identifier is still active.

When the SMF removes the last PCC rule that refers to the corresponding application identifier, or when the caching timer expires and no PCC rule refers to the application identifier, the SMF may remove the PFD(s) related with the application identifier.

The PFDs retrieved from PFDF take precedence over any PFDs pre-configured in the SMF. If all PFDs retrieved from the PFDF are removed for an application identifier, the pre-configured PFDs shall be applied again for the application identifier.



Figure 4.2.2.2-1: Retrieval of PFDs by the full pull

1. The NF service consumer (e.g. SMF) shall send a GET request to the resource representing the PFDs for the requested application identifier(s):

- for PFDs of an individual application identifier, the request URI shall be set to "{apiRoot}/nnef‑pfdmanagement/v1/applications/{appId}"; and

- for PFD of a collection of application identifiers, the request URI shall be set to "{apiRoot}/nnef‑pfdmanagement/v1/applications/" with query parameters indicating the requested application identifier(s).

2. On success, an HTTP "200 OK" response shall be returned, with the payload body containing a representation of an "Individual application PFD" resource or a "PFD of applications" resource for the requested application identifier(s). The NF service consumer shall replace the stored PFD(s) retrieved from the PFDF with the new received PFD(s) for the requested application identifier(s). If the PFD(s) of one or more requested application identifier(s) are not provided in the response, the NF service consumer shall remove the PFD(s) of these requested application identifier(s) and re-apply the pre-configured PFDs.

If errors occur when processing the HTTP GET request, the PFDF shall send an HTTP error response or, if the feature "ES3XX" is supported, an HTTP redirect response as specified in subclause 5.7. For "404 Not Found", the NF service consumer shall remove the PFD(s) of the requested application identifier(s) in the NF service consumer and re-apply the pre-configured PFDs.

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

#### 4.2.3.3 Subscription update for event notifications on PFDs change

This procedure, as shown in Figure 4.2.3.3-1, is used to update an existing subscription to notifications on events when the PFDs for application identifier(s) change.



Figure 4.2.3.3-1: Update of a subscription for event notifications on PFDs change

1. If the feature PfdChgSubsUpdate is supported, the NF service consumer (e.g. SMF) shall send a PUT request to the resource URI representing the targeted PFD subscription resource "{apiRoot}/nnef‑pfdmanagement/v1/subscriptions/{subscriptionId}". The request payload body shall include:

- subscribed application identifier(s) optionally; and;

- an URI where to receive the requested notifications as "notifyUri" attribute.

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

2. If the feature PfdChgSubsUpdate is supported and the request is accepted, the PFDF shall:

- update the subscription; and

- send an HTTP "200 OK" response, with the payload body containing a representation of the updated subscription.

 Otherwise, if errors occur when processing the HTTP PUT request, the PFDF shall send an HTTP error response or, if the feature "ES3XX" is supported, an HTTP redirect response as specified in subclause 5.7.

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

#### 4.2.4.2 Notification of PFD change



Figure 4.2.4.2-1: Notification of PFD change

1. The PFDF shall send a POST request to the NF service consumer (e.g. SMF) targeting the URI "{notifyUri}, where {notifyUri} is the notification URI provided during the creation of the subscription resource as specified in subclause 4.2.3.2. The payload body of the POST request shall contain one or more PfdChangeNotification data structure(s).

2 If the notification is accepted, the NF service consumer shall reply with:

- "204 No Content" indicating the successful provisioning of all PFDs; or

- "200 OK" and the payload body of the response shall contain "PfdChangeReport" data structure with detailed information of failed application(s).

 Otherwise, if errors occur when processing the HTTP POST request, the NF service consumer shall send an HTTP error response or, if the feature "ES3XX" is supported, an HTTP redirect response as specified in subclause 5.7.

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

#### 4.2.4.3 Notification PUSH



Figure 4.2.4.3-1: Notification PUSH

1. If the NotificationPush feature defined in subclause 5.8 is supported, and when the PFDF only notifies the NF service consumer to retrieve or remove the PFDs for application identifier(s), then the PFDF shall send a POST request to the NF service consumer (e.g. SMF) with "{notifyUri}/notifypush" as URI (where the "notifyUri" was previously supplied by the NF service consumer) and one or more NotificationPush data structure as request body. Each NotificationPush data structure shall include the application identifier(s) within the "appIds" attribute, the "pfdOp" attribute set to the value "RETRIEVE" or "REMOVE" and may include the "allowedDelay" attribute containing the allowed delay time if received when the "pfdOp" attribute is set to "RETRIEVE".

2 If the NF service consumer (e.g. SMF) accepts the received POST request, the NF service consumer shall send an HTTP "204 No Content" response.

After the successful processing of the HTTP POST request, if the PFDF requests the SMF to retrieve the PFD(s) with the "pfdOp" attribute set to the value "RETRIEVE", the NF service consumer (e.g. SMF) shall invoke the Nnef\_PFDmanagement\_Fetch Service Operation defined in subclause 4.2.2 to retrieve the PFD(s) for the application identifier(s). If the "allowedDelay" attribute is provided for one or more application(s), the NF service consumer (e.g SMF) shall retrieve the PFD within the allowed delay time, if the PFDF requests the SMF to remove the PFD(s) with the "pfdOp" attribute set to the value "REMOVE", the SMF shall remove the PFD(s) for the application identifier(s) and re-apply the pre-configured PFDs.

If errors occur when processing the HTTP POST request, the NF service consumer shall send an HTTP error response or, if the feature "ES3XX" is supported, an HTTP redirect response as specified in subclause 5.7.

Editor’s Note: Whether the PFDF needs to indicate the SMF how to retrieve the PFD(s) (i.e. by invoking full pull or partial pull procedure) in the notificaito push is FFS.

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

#### 4.2.5.2 Unsubscribe from event notifications on PFDs change



Figure 4.2.5.2-1: Unsubscribe from event notifications on PFDs change

1. The NF Service Consumer (e.g. SMF) shall send a DELETE request to the resource URI representing the individual PFD subscription. The request body shall be empty.

2. If the request is accepted, an HTTP "204 No Content" response shall be returned. The response body shall be empty.

Otherwise, if errors occur when processing the HTTP DELETE request, the PFDF consumer shall send an HTTP error response or, if the feature "ES3XX" is supported, an HTTP redirect response as specified in subclause 5.7.

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

##### 5.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.3.3.3.1-1.

Table 5.3.3.3.1-1: URI query parameters supported by the GET method on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| supported-features | SupportedFeatures | O | 0..1 | To filter irrelevant responses related to unsupported features. |

This method shall support the request data structures specified in table 5.3.3.3.1-2 and the response data structures and response codes specified in table 5.3.3.3.1-3.

Table 5.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| n/a |  |  |  |

Table 5.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Responsecodes | Description |
| PfdDataForApp | M | 1 | 200 OK | A representation of PFDs for an application in the request URI is returned. |
| ProblemDetails | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual PFD subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PFDF (service) instance. Applicable if the feature "ES3XX" is supported. |
| ProblemDetails | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual PFD subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PFDF (service) instance.Applicable if the feature "ES3XX" is supported. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [5] for the GET method shall also apply. |

Table 5.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PFDF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

Table 5.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PFDF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

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

##### 5.3.5.3.1 DELETE

This method shall support the URI query parameters specified in table 5.3.5.3.1-1.

Table 5.3.5.3.1-1: URI query parameters supported by the DELETE method on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| n/a |  |  |  |  |

This method shall support the request data structures specified in table 5.3.5.3.1-2 and the response data structures and response codes specified in table 5.3.5.3.1-3.

Table 5.3.5.3.1-2: Data structures supported by the DELETE Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| n/a |  |  |  |

Table 5.3.5.3.1-3: Data structures supported by the DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Responsecodes | Description |
| n/a |  |  | 204 No Content | The PfdSubscription resource matching the subscriptionId was deleted successfully. |
| ProblemDetails | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual PFD subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PFDF (service) instance. Applicable if the feature "ES3XX" is supported. |
| ProblemDetails | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual PFD subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PFDF (service) instance.Applicable if the feature "ES3XX" is supported. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [5] for the DELETE method shall also apply. |

Table 5.3.5.3.1-4: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PFDF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

Table 5.3.5.3.1-5: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PFDF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

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

##### 5.3.5.3.2 PUT

This method shall support the URI query parameters specified in table 5.3.5.3.2-1.

Table 5.3.5.3.2-1: URI query parameters supported by the PUT method on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| n/a |  |  |  |  |

This method shall support the request data structures specified in table 5.3.5.3.2-2 and the response data structures and response codes specified in table 5.3.5.3.2-3.

Table 5.3.5.3.2-2: Data structures supported by the PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| PfdSubscription | M | 1 | Update a PfdSubscription resource. |

Table 5.3.5.3.2-3: Data structures supported by the PUT Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Responsecodes | Description |
| PfdSubscription | M | 1 | 200 OK | The update of a PfdSubscription resource is confirmed and a representation of that resource is returned. |
| ProblemDetails | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual PFD subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PFDF (service) instance. Applicable if the feature "ES3XX" is supported. |
| ProblemDetails | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual PFD subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative PFDF (service) instance.Applicable if the feature "ES3XX" is supported. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [5] for the PUT method shall also apply. |

Table 5.3.5.3.2-4: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PFDF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

Table 5.3.5.3.2-5: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located in an alternative PFDF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected |

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

##### 5.5.2.3.1 POST

This method shall support the URI query parameters specified in table 5.5.2.3.1-1.

Table 5.5.2.3.1-1: URI query parameters supported by the POST method on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| n/a |  |  |  |  |

This method shall support the request data structures specified in table 5.5.2.3.1-2 and the response data structures and response codes specified in table 5.5.2.3.1-3.

Table 5.5.2.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| array(PfdChangeNotification) | M | 1..N | Provides PFD change information. |

Table 5.5.2.3.1-3: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| n/a |  |  | 204 No Content | The PFD operation in the notification is performed successfully, i.e. all PFD changes are accepted by the SMF. |
| array(PfdChangeReport) | M | 1..N | 200 OK | The PFD operation in the notification is performed and the PfdChangeReport indicates failure reason for each failed application in the partial success. |
| ProblemDetails | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during PFD Change Notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.Applicable if the feature "ES3XX" is supported. |
| ProblemDetails | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during PFD Change Notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.Applicable if the feature "ES3XX" is supported. |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | The server encountered an unexpected condition that prevented it from fulfilling the request. PFDs for all applications are not accepted by the SMF. (NOTE 2) |
| NOTE 1: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [5] for the POST method shall also apply.NOTE 2: Failure cases are described in subclause 5.7. |

Table 5.5.2.3.1-4: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

Table 5.5.2.3.1-5: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

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

##### 5.5.3.3.1 POST

This method shall support the URI query parameters specified in table 5.5.3.3.1-1.

Table 5.5.3.3.1-1: URI query parameters supported by the POST method on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| n/a |  |  |  |  |

This method shall support the request data structures specified in table 5.5.3.3.1-2 and the response data structures and response codes specified in table 5.5.3.3.1-3.

Table 5.5.3.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| array(NotificationPush) | M | 1..N | Provides the information for the NF service consumer to retrieve and/or remove the PFDs. |

Table 5.5.3.3.1-3: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| n/a |  |  | 204 No Content | Notification PUSH is accepted. |
| ProblemDetails | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during PFD Change Notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.Applicable if the feature "ES3XX" is supported. |
| ProblemDetails | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during PFD Change Notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.Applicable if the feature "ES3XX" is supported. |
| NOTE 1: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [5] for the POST method shall also apply.NOTE 2: Failure cases are described in subclause 5.7. |

Table 5.5.3.3.1-4: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

Table 5.5.3.3.1-5: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

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

### 5.7.1 General

HTTP error handling shall be supported as specified in subclause 5.2.4 of 3GPP TS 29.500 [5].

For the Nnef\_PFDmanagement API, HTTP error responses shall be supported as specified in subclause 4.8 of 3GPP TS 29.501 [6].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [5] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [5].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [5] for HTTP redirections shall be supported if the feature "ES3XX" is supported.

In addition, the requirements in the following subclauses shall apply.

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

## 5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Nnef\_PFDmanagement API. They shall be negotiated using the extensibility mechanism defined in subclause 6.6 of 3GPP TS 29.500 [5].

Table 5.8-1: Supported Features

|  |  |  |
| --- | --- | --- |
| Feature number | Feature Name | Description |
| 1 | PartialUpdate | The PFDF can use this feature for partial update of PFDs. |
| 2 | DomainNameProtocol | This feature supports the additional protocol matching condition for the domain name in PFD data. |
| 3 | PfdChgSubsUpdate | The SMF can use this feature for updating the PFD change subscription. |
| 4 | NotificationPush | The PFDF can use this feature to notify the SMF to retrieve the PFDs. |
| 5 | PartialPull | The SMF can use this feature to retrieve the PFDs by the partial update. |
| x1 | ES3XX | Extended Support for 3xx redirections. This feature indicates the support of redirection for any service operation, according to Stateless NF procedures as specified in subclauses 6.5.3.2 and 6.5.3.3 of 3GPP TS 29.500 [5] and according to HTTP redirection principles for indirect communication, as specified in subclause 6.10.9 of 3GPP TS 29.500 [5].  |

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

# A.2 Nnef\_PFDmanagement API

openapi: 3.0.0

info:

 title: Nnef\_PFDmanagement Service API

 version: 1.2.0-alpha.2

 description: |

 Packet Flow Description Management Service.

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#

externalDocs:

 description: 3GPP TS 29.551 v17.1.0, 5G System; Packet Flow Description Management Service

 url: 'http://www.3gpp.org/ftp/Specs/archive/29\_series/29.551/'

#

servers:

 - url: '{apiRoot}/nnef-pfdmanagement/v1'

 variables:

 apiRoot:

 default: https://example.com

 description: apiRoot as defined in subclause 4.4 of 3GPP TS 29.501

security:

 - {}

 - oAuth2ClientCredentials:

 - nnef-pfdmanagement

paths:

 /applications:

 get:

 summary: Retrieve PFDs for all applications or for one or multiple applications with query parameter.

 tags:

 - PFD of applications

 operationId: Nnef\_PFDmanagement\_AllFetch

 parameters:

 - name: application-ids

 description: The required application identifier(s) for the returned PFDs.

 in: query

 required: true

 schema:

 type: array

 items:

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

 minItems: 1

 - name: supported-features

 in: query

 description: To filter irrelevant responses related to unsupported features

 schema:

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

 responses:

 '200':

 description: The PFDs for one or more application identifier(s) in the request URI are returned.

 content:

 application/json:

 schema:

 type: array

 items:

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

 minItems: 0

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '406':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/406'

 '414':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/414'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 /applications/partial-pull:

 post:

 summary: retrieve the PFD(s) by partial update

 operationId: Nnef\_PFDmanagement\_AppFetchPartialUpdate

 tags:

 - PFD of applications by partial update

 requestBody:

 required: true

 content:

 application/json:

 schema:

 type: array

 items:

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

 minItems: 1

 responses:

 '200':

 description: OK. Changed PFD(s) is returned

 content:

 application/json:

 schema:

 type: array

 items:

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

 minItems: 1

 '204':

 description: The PFD(s) is not changed

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 /applications/{appId}:

 get:

 summary: Retrieve the PFD for an application.

 tags:

 - Individual application PFD

 operationId: Nnef\_PFDmanagement\_IndAppFetch

 parameters:

 - name: appId

 description: The required application identifier(s) for the returned PFDs.

 in: path

 required: true

 schema:

 type: string

 - name: supported-features

 in: query

 description: To filter irrelevant responses related to unsupported features

 schema:

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

 responses:

 '200':

 description: A representation of PFDs for an application in the request URI is returned.

 content:

 application/json:

 schema:

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

 '307':

 description: Temporary Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 description: 'An alternative URI of the resource located on an alternative PFDF (service) instance.'

 required: true

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the request is redirected'

 schema:

 type: string

 '308':

 description: Permanent Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 description: 'An alternative URI of the resource located on an alternative PFDF (service) instance.'

 required: true

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the request is redirected'

 schema:

 type: string

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '406':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/406'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '414':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/414'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 /subscriptions:

 post:

 summary: Subscribe the notification of PFD changes.

 tags:

 - PFD subscriptions

 operationId: Nnef\_PFDmanagement\_CreateSubscr

 requestBody:

 description: a PfdSubscription resource to be created.

 required: true

 content:

 application/json:

 schema:

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

 callbacks:

 PfdChangeNotification:

 '{request.body#/notifyUri}':

 post:

 summary: Notification of PFD change.

 tags:

 - PfdChangeNotification data

 operationId: Nnef\_PFDmanagement\_Notify

 requestBody:

 required: true

 content:

 application/json:

 schema:

 type: array

 items:

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

 minItems: 1

 responses:

 '200':

 description: The PFD operation in the notification is performed and the PfdChangeReport indicates failure reason.

 content:

 application/json:

 schema:

 type: array

 items:

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

 minItems: 1

 '204':

 description: The PFD operation in the notification is performed successfully.

 '307':

 description: Temporary Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 required: true

 description: 'A URI pointing to the endpoint of an alternative NF consumer (service) instance towards which the notification should be redirected.'

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the notification request is redirected'

 schema:

 type: string

 '308':

 description: Permanent Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 required: true

 description: 'A URI pointing to the endpoint of an alternative NF consumer (service) instance towards which the notification should be redirected.'

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the notification request is redirected'

 schema:

 type: string

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 NotificationPush:

 '{request.body#/notifyUri}/notifypush':

 post:

 summary: Notification Push.

 tags:

 - NotificationPush data

 operationId: Nnef\_PFDmanagement\_PushNotify

 requestBody:

 required: true

 content:

 application/json:

 schema:

 type: array

 items:

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

 minItems: 1

 responses:

 '204':

 description: Notificaiton PUSH is accepted.

 '307':

 description: Temporary Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 required: true

 description: 'A URI pointing to the endpoint of an alternative NF consumer (service) instance towards which the notification should be redirected.'

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the notification request is redirected'

 schema:

 type: string

 '308':

 description: Permanent Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 required: true

 description: 'A URI pointing to the endpoint of an alternative NF consumer (service) instance towards which the notification should be redirected.'

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the notification request is redirected'

 schema:

 type: string

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 responses:

 '201':

 description: The creation of a PfdSubscription resource is confirmed and a representation of that resource is returned.

 content:

 application/json:

 schema:

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

 headers:

 Location:

 description: 'Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnef-pfdmanagement/v1/subscriptions/{subscriptionId}'

 required: true

 schema:

 type: string

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 /subscriptions/{subscriptionId}:

 put:

 summary: Updates/replaces an existing subscription resource

 tags:

 - Individual PFD subscription

 operationId: Nnef\_PFDmanagement\_ModifySubscr

 parameters:

 - name: subscriptionId

 description: Identify the subscription.

 in: path

 required: true

 schema:

 type: string

 requestBody:

 description: Parameters to update/replace the existing subscription

 required: true

 content:

 application/json:

 schema:

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

 responses:

 '200':

 description: OK (Successful update of the subscription)

 content:

 application/json:

 schema:

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

 '307':

 description: Temporary Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 description: 'An alternative URI of the resource located on an alternative PFDF (service) instance.'

 required: true

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the request is redirected'

 schema:

 type: string

 '308':

 description: Permanent Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 description: 'An alternative URI of the resource located on an alternative PFDF (service) instance.'

 required: true

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the request is redirected'

 schema:

 type: string

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '411':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/411'

 '413':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/413'

 '415':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/415'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

 delete:

 summary: Delete a subscription of PFD change notification.

 tags:

 - Individual PFD subscription

 operationId: Nnef\_PFDmanagement\_Unsubscribe

 parameters:

 - name: subscriptionId

 description: Identify the subscription.

 in: path

 required: true

 schema:

 type: string

 responses:

 '204':

 description: The PfdSubscription resource matching the subscriptionId was deleted successfully.

 '307':

 description: Temporary Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 description: 'An alternative URI of the resource located on an alternative PFDF (service) instance.'

 required: true

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the request is redirected'

 schema:

 type: string

 '308':

 description: Permanent Redirect

 content:

 application/problem+json:

 schema:

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

 headers:

 Location:

 description: 'An alternative URI of the resource located on an alternative PFDF (service) instance.'

 required: true

 schema:

 type: string

 3gpp-Sbi-Target-Nf-Id:

 description: 'Identifier of the target NF (service) instance towards which the request is redirected'

 schema:

 type: string

 '400':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/400'

 '401':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/401'

 '403':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/403'

 '404':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/404'

 '429':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/429'

 '500':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/500'

 '503':

 $ref: 'TS29571\_CommonData.yaml#/components/responses/503'

 default:

 $ref: 'TS29571\_CommonData.yaml#/components/responses/default'

components:

 securitySchemes:

 oAuth2ClientCredentials:

 type: oauth2

 flows:

 clientCredentials:

 tokenUrl: '{nrfApiRoot}/oauth2/token'

 scopes:

 nnef-pfdmanagement: Access to the Nnef\_PFDmanagement API

 schemas:

#

# STRUCTURED DATA TYPES

#

 PfdContent:

 type: object

 properties:

 pfdId:

 type: string

 description: Identifies a PDF of an application identifier.

 flowDescriptions:

 type: array

 items:

 type: string

 minItems: 1

 description: Represents a 3-tuple with protocol, server ip and server port for UL/DL application traffic.

 urls:

 type: array

 items:

 type: string

 minItems: 1

 description: Indicates a URL or a regular expression which is used to match the significant parts of the URL.

 domainNames:

 type: array

 items:

 type: string

 minItems: 1

 description: Indicates an FQDN or a regular expression as a domain name matching criteria.

 dnProtocol:

 $ref: 'TS29122\_PfdManagement.yaml#/components/schemas/DomainNameProtocol'

 PfdDataForApp:

 type: object

 properties:

 applicationId:

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

 pfds:

 type: array

 items:

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

 minItems: 1

 cachingTime:

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

 pfdTimestamp:

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

 required:

 - applicationId

 PfdSubscription:

 type: object

 properties:

 applicationIds:

 type: array

 items:

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

 minItems: 1

 notifyUri:

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

 supportedFeatures:

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

 required:

 - notifyUri

 - supportedFeatures

 PfdChangeNotification:

 type: object

 properties:

 applicationId:

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

 removalFlag:

 type: boolean

 default: false

 partialFlag:

 type: boolean

 default: false

 pfds:

 type: array

 items:

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

 minItems: 1

 required:

 - applicationId

 NotificationPush:

 type: object

 properties:

 appIds:

 type: array

 items:

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

 minItems: 1

 allowedDelay:

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

 pfdOp:

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

 required:

 - appIds

 PfdChangeReport:

 type: object

 properties:

 pfdError:

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

 applicationId:

 type: array

 items:

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

 minItems: 1

 required:

 - pfdError

 - applicationId

 PfdOperation:

 anyOf:

 - type: string

 enum:

 - RETRIEVE

 - REMOVE

 - type: string

 ApplicationForPfdRequest:

 type: object

 properties:

 applicationId:

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

 pfdTimestamp:

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

 required:

 - applicationId

 - pfdTimestamp

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