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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The present document specifies the stage 3 protocol and data model for the Nupf Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the UPF.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.548[14].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[6] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

[7] 3GPP TR 21.900: "Technical Specification Group working methods".

[8] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[9] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[10] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[11] IETF RFC 9113: "HTTP/2".

[12] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[13] IETF RFC 9457: "Problem Details for HTTP APIs".

[14] 3GPP TS 23.548: "5G System Enhancements for Edge Computing; Stage 2".

[15] 3GPP TS 29.244: "Interface between the Control Plane and the User Plane Nodes; Stage 3".

[16] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[17] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[18] 3GPP TS 24.539: "5G System (5GS); Network to TSN translator (TT) protocol aspects; Stage 3".

[19] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

[20] 3GPP TS 29.122: "Technical Specification Group Core Network and Terminals; T8 reference point for Northbound APIs".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

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

## 3.2 Symbols

None in this release.

## 3.3 Abbreviations

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

AF Application Function

DCCF Data Collection Coordination Function

L-UPF Local User Plane Function

L-NEF Local Network Exposure Function

MFAF Messaging Framework Adaptor Function

NEF Network Exposure Function

NWDAF Network Data Analytics Function

UPF User Plane Function

SMF Session Management Function

TSCTSF Time Sensitive Communication and Time Synchronization Function

TSN Time Sensitive Networking

# 4 Overview

## 4.1 Introduction

Within the 5GC, the UPF offers services to the NEF, AF, SMF, NWDAF, DCCF, MFAF, TSCTSF and TSN AF via the Nupf service based interface (see 3GPP TS 23.501 [2], 3GPP TS 23.502 [3], 3GPP TS 23.288 [17] and 3GPP TS 23.548 [14]).

Figure 4.1-1 provides the reference model (in service based interface representation and in reference point representation), with focus on the UPF.



Figure 4.1-1: Reference model – UPF

The UPF supports the following functionalities which are provided via Service Based Interface:

- Subscription to notifications of events exposed by the UPF;

- Notification about UPF events; and

- Translation of (NATed) Public UE IP address and port to (5GC) Private UE IP address.

# 5 Services offered by the UPF

## 5.1 Introduction

The UPF offers the following services via the Nupf interface:

- Nupf\_EventExposure Service

- Nupf\_GetPrivateUEIPaddr Service

Table 5.1-1 summarizes the SBI services produced by the UPF:

Table 5.1-1: NF Services provided by UPF

|  |  |  |
| --- | --- | --- |
| Service Name | Description | Example Consumers |
| Nupf\_EventExposure | This service exposes UPF related information to other NFs | SMF, NWDAF, NEF, AF, TSCTSF, TSN AF, DCCF, MFAF |
| Nupf\_GetPrivateUEIPaddr | This service provides the private UE IP address information of a PDU session from the (NATed) public IP address and port number | NEF |

Table 5.2-1 summarizes the corresponding APIs defined for this specification.

Table 5.2-1: API Descriptions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Service Name | Clause | Description | OpenAPI Specification File | apiName | **Annex** |
| Nupf\_EventExposure | 6.1 | UPF Event Exposure Service | TS29564\_Nupf\_EventExposure.yaml | nupf-ee | A.2 |
| Nupf\_GetPrivateUEIPaddr | 6.2 | UPF Get Private UE IP address Service | TS29564\_Nupf\_GetPrivateUEIPaddr.yaml | nupf-gueip | A.3 |

## 5.2 Nupf\_EventExposure Service

### 5.2.1 Service Description

#### 5.2.1.1 Service operations

The Nupf\_EventExposure service enables NF service consumers to subscribe to UPF events and/or the UPF to send notifications about UPF events to NF service consumers.

The Nupf\_EventExposure service supports the service operations defined in Table 5.2.1.1-1.

Table 5.2.1.1-1: Service operations supported by the Nupf\_EventExposure service

|  |  |  |  |
| --- | --- | --- | --- |
| Service Operations | Description | Operation  Semantics | Example Consumer(s) |
| Subscribe | Subscribe to UPF events | Subscribe/Notify | NWDAF, SMF, DCCF |
| Unsubscribe | Unsubscribe from UPF events | Subscribe/Notify | NWDAF, SMF, DCCF |
| Notify | Notification about UPF events | Subscribe/Notify | NEF, AF, NWDAF, TSCTSF, TSNAF, DCCF, MFAF |

#### 5.2.1.2 Subscription to UPF events

The UPF exposes UPF events via the Nupf\_EventExposure service as defined in Table 5.2.1.2-1.

Table 5.2.1.2-1: Subscriptions to UPF events

|  |  |  |
| --- | --- | --- |
| Subscription | Protocol used for the subscription  to UPF | Description |
| Subscription via SMF | PFCP | The NF service consumer creates the subscription for the event of interest via the SMF. The SMF instructs the UPF to report the events directly to the NF service consumer via the N4 interface as specified in 3GPP TS 29.244 [15].  Upon occurrence of the event of interest, the UPF sends a notification directly to the NF service consumer using the Nupf\_EventExposure Notify service operation. |
| Nupf\_EventExposure Subscribe | The NF service consumer creates the subscription for the event of interest via the SMF. The SMF subscribes to the UPF using the Nupf\_EventExposure Subscribe service operation.  Upon occurrence of the event of interest, the UPF sends a notification directly to the NF Service Consumer using the Nupf\_EventExposure Notify service operation. |
| Subscription  to UPF | Nupf\_EventExposure Subscribe | The NF service consumer creates the subscription for the event of interest to the UPF using the Nupf\_EventExposure Subscribe service operation.  Upon occurrence of the event of interest, the UPF sends a notification directly to the NF Service Consumer using the Nupf\_EventExposure Notify service operation |

Clause 5.2.1.3 decribes which of the above subscriptions shall be used for each event type supported by the Nupf\_EventExposure service.

#### 5.2.1.3 UPF events supported by the Nupf\_EventExposure service

##### 5.2.1.3.1 General

The Nupf\_EventExposure service supports the events defined in this clause.

See also clauses 4.15.4.5.1 and 5.2.26.2.1 of 3GPP TS 23.502 [3].

##### 5.2.1.3.2 QoS Monitoring

Table 5.2.1.3.2-1: QoS Monitoring event

|  |  |
| --- | --- |
| **Description** | This event provides QoS flow performance information, i.e. QoS monitoring results for the QoS parameter(s) to be measured.  The following QoS parameters may be measured and/or reported:  - Packet delay monitoring: DL, UL and/or Round-Trip packet delay between UE and PSA UPF of specific QoS flow(s) of the PDU session.  - Data rate monitoring: UL and/or DL data rate measurement for a QoS flow.  - Congestion information of a QoS flow on the UL and/or DL directions received from the NG-RAN. |
| **Subscription type** | Subscription via SMF using PFCP |
| **Subscription inputs to UPF** | - QFI(s) of a specific PDU session  - requested QoS measurements  - UPF event consumer notification URI  - Notification correlation ID  - Reporting suggestion information (i.e. Report urgency, Reporting time information)  See clauses 5.24.4 and 5.24.5 of 3GPP TS 29.244 [15]. |
| **Report type** | Continuous (event triggered) Report (for Packet Delay and Congestion Information).  Periodic Report (for Packet Delay) |

##### 5.2.1.3.3 User Data Usage Measures

Table 5.2.1.3.3-1: User Data Usage Measures event

|  |  |
| --- | --- |
| **Description** | This event provides information of user data usage of a PDU session:  - Volume Measurement: measures of data volume exchanged (UL, DL and/or overall) and/or number of packets exchanged (UL, DL and/or overall) with or without application granularity.  - Throughput Measurement: measures of data throughput (UL and DL) measures aggregated for the PDU Session or per application.  - Application related information: URL(s) and/or Domain name(s) detected in the PDU session for the target traffic. |
| **Subscription type** | Subscription via SMF using Nupf\_EventExposure Subscribe, if the target is:  - PDU session(s) of a specific UE or a group of UEs; or  - PDU session(s) of any UE and the subscription includes at least one of the following parameters: AoI, Traffic filtering, BSSID/SSID, Application ID.  Subscription to the UPF, if the target is PDU session(s) of any UE and the subscription does not need to include any of the following parameters: AoI, Traffic filtering, BSSID/SSID, Application ID. |
| **Subscription inputs to UPF** | Required:  - UE IP address or "Any UE"  - UPF event consumer notification URI  Optional:  - DNN(s)  - S-NSSAI(s)  - Application ID(s) or Traffic filtering  - Type of Measurement (i.e. Volume, Throughput, Application related information)  - Granularity of Measurement (i.e. required granularity for the information reported)  - Reporting suggestion information (i.e. Report urgency, Reporting time information)  - Notification correlation ID |
| **Report type** | One-Time Report  Periodic Report |

##### 5.2.1.3.4 User Data Usage Trends

Table 5.2.1.3.4-1: User Data Usage Trends event

|  |  |
| --- | --- |
| **Description** | This event provides statistics related to user data usage of a PDU session:  - Throughput Statistics Measurement (average and/or peak throughput) over the measurement period for the PDU Session or per application |
| **Subscription type** | Subscription via SMF using Nupf\_EventExposure Subscribe, if the target is:  - PDU session(s) of a specific UE or a group of UEs; or  - PDU session(s) of any UE and the subscription includes at least one of the following parameters: AoI, Traffic filtering, BSSID/SSID, Application ID.  Subscription to the UPF, if the target is PDU session(s) of any UE and the subscription does not need to include any of the following parameters: AoI, Traffic filtering, BSSID/SSID, Application ID. |
| **Subscription inputs to UPF** | Required:  - UE IP address or "Any UE"  - UPF event consumer notification URI  Optional:  - DNN(s)  - S-NSSAI(s)  - Application ID(s) or Traffic filtering  - Granularity of Measurement (i.e. required granularity for the information reported)  - Reporting suggestion information (i.e. Report urgency, Reporting time information)  - Notification correlation ID |
| **Report type** | One-Time Report  Periodic Report |

##### 5.2.1.3.5 TSC Management Information

Table 5.2.1.3.5-1: TSC Management Information event

|  |  |
| --- | --- |
| **Description** | This event provides TSC Management Information. |
| **Subscription type** | Subscription via SMF using PFCP |
| **Subscription inputs to UPF** | - UPF event consumer notification URI  - Notification correlation ID  See clauses 5.26.3.2 of 3GPP TS 29.244 [15] and clauses 6.2.1 and 6.3.1 of 3GPP TS 24.539 [18]. |
| **Report type** | Continuous (event triggered) Report. |

### 5.2.2 Service Operations

#### 5.2.2.1 Introduction

The service operations defined for the Nupf\_EventExposure service are as follows:

- Subscribe: It enables an NF service consumer to subscribe to UPF event exposure notifications..

- Unsubscribe: It enables an NF service consumer to unsubscribe from UPF event exposure notifications.

- Notify: It allows the UPF to send event notifications directly to NF service consumers.

NOTE: The Subscribe and Unsubscribe service operations only apply to UPF events that can be subscribed using the Nupf service based interface (see clauses 5.2.1.2 and 5.2.1.3).

#### 5.2.2.2 Subscribe

##### 5.2.2.2.1 General

The Subscribe service operation is used by a NF Service Consumer to subscribe to UPF event exposure notifications, e.g. for the purpose of UPF data collection for a specified PDU session or any UE.

NOTE: NF service consumers can only be SMF, NWDAF or DCCF in this release of the specification.

##### 5.2.2.2.2 Creation of a subscription

An NF Service Consumer shall invoke the Subscribe service operation towards the UPF to create a subscription to monitor at least one UPF event. The NF Service Consumer may subscribe to multiple events in a subscription. A subscription may be associated with one UE's PDU session or with any UE.

The NF Service Consumer shall request to create a new subscription by using the HTTP method POST with the URI of the subscriptions collection, see clause 6.1.3.2.



Figure 5.2.2.2.2-1 Subscription creation

1. The NF Service Consumer shall send a POST request to create a subscription resource in the UPF. The content of the POST request shall contain a representation of the individual subscription resource to be created.

The NF Service Consumer shall include the following information in the HTTP message body:

- NF ID, indicating the identity of the network function instance creating the subscription;

- Target of Event Reporting, indicating the target(s) to be monitored, i.e.

- a specific PDU Session of a UE identified with a UE IP address; or

- any UE (identified by the "anyUE" flag);

- List of UPF events requested to be subscribed;

- Event Reporting Mode, indicating how the events shall be reported (One-time Report or Periodic Report); and

- UPF event consumer notification URI, indicating the address where to send the event notifications generated by the subscription.

The NF Service Consumer may include the following information in the HTTP message body:

- a SUPI, PEI or GPSI identifying a specific UE;

- one or more S-NSSAI(s) and/or DNN(s) of PDU sessions to which the subscription applies;

- one or more Application ID(s) or traffic filters identifying the traffic to be monitored by the subscription (only applicable to a subscription targeting a specific PDU Session of a UE identified with a UE IP address);

- Type of measurement, for UPF events supporting multiple types of measurement (e.g. UserDataUsageMeasures event)

- Granularity of Measurement, indicating that the granularity of the required measurements is per PDU Session, per data flow or per application;

- Reporting period, defining the period for periodic reporting;

- Maximum number of reports, defining the maximum number of reports after which the event subscription ceases to exist;

- Expiry time, suggested by the NF Service Consumer representing the time up to which the subscription is desired to be kept active and the time after which the subscribed event(s) shall stop generating report;

- Reporting suggestion information, i.e. Report urgency indicating whether the event report can be delayed (i.e. it is delay-tolerant) and if so, the Reporting time information defining the last valid reporting time for the UPF to report the detected event;

- Deactivate notification flag, indicating that the notification of the available events shall be muted until the event consumer NF (e.g. NWDAF or DCCF) provides the retrieval notification flag to retrieve the events stored;

- Immediate Report Flag per event, indicating an immediate report to be generated with the current event status; and/or

- Notification Correlation ID, indicating the correlation identity to be signaled in the event notifications generated by the subscription.

- Sampling ratio, defining the random subset of PDU sessions among target PDU sessions, and the UPF only report the event(s) related to the selected subset of PDU sessions;

- partitioningCriteria, defining the criteria for partitioning PDU sessions before applying sampling ratio;

- Muting Exception Instructions, which specify instructions to apply to the subscription and the stored events when an exception occurs at the UPF while the event is muted (e.g., the buffer of stored event reports is full, or the number of stored event reports exceeds a certain number), if the EEMM feature is supported (see clause 6.1.8).

2a. On success (i.e. if the request is accepted), the UPF shall include a HTTP Location header to provide the location of the newly created resource (subscription) together with the status code 201 indicating the requested resource is created in the response message.  
  
If the NF Service Consumer has included more than one events in the event subscription and some of the events cannot be subscribed, the UPF shall accept the request and provide the successfully subscribed event(s) in the CreatedEventSubscription.  
  
If the NF Service Consumer has included the Immediate Report Flag with the value true in the event subscription, and if the current status of the events subscribed are available, the UPF shall include the current status of the events subscribed in the response. Otherwise, the UPF shall generate reports for the events and notify the NF service consumer using the Nupf\_EventExposure\_Notify service operation. If the events with the Immediate Report Flag set to true are subscribed via an SMF, the notification shall be sent to the actual NF service consumer directly, i.e. the current status of the events subscribed shall not be included in the subscription creation response.

If the NF Service Consumer has set the event reporting option to ONE\_TIME and if the UPF has included the current status of the events subscribed in the response, then the UPF shall not do any subsequent event notification for the corresponding events.

The response, based on operator policy and taking into account the expiry time included in the request, may contain the expiry time, as determined by the UPF, after which the subscription becomes invalid. Once the subscription expires, if the NF Service Consumer wants to keep receiving notifications, it shall create a new subscription in the UPF. The UPF shall not provide the same expiry time for many subscriptions in order to avoid all of them expiring and recreating the subscription at the same time. If the expiry time is not included in the response, the NF Service Consumer shall consider the subscription to be valid without an expiry time.

If the sampling ratio ("sampRatio") attribute is included in the subscription without a partitioningCriteria, the UPF shall select a random subset of PDU sessions among target PDU sessions according to the sampling ratio and only report the event(s) related to the selected subset of PDU sessions. If the partitioningCriteria attribute is also included along with sampling ratio, the UPF shall apply the sampling ratio on the group of PDU sessions determined according to the partitioning criteria.

If the "notifFlag" attribute is included and set to "DEACTIVATE" in the request by e.g. the NWDAF or DCCF, the UPF shall mute the event notification and store the available events. Additionally, if the UPF supports the EEMM feature (see clause 6.1.8) and if the NF service consumer includes event muting instructions in the request, the UPF should evaluate the received event muting instructions against to local actions (if configured) and, if the subscription creation request is accepted, the UPF may indicate the following information to the NF service consumer in the response:

- the maximum number of notifications that the UPF expects to be able to store for the subscription;

- an estimate of the duration for which notifications can be buffered.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.2.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.2.3.1-3.

If the UPF supports the EEMM features (see clause 6.1.8), the NF service consumer sets the "notifFlag" attribute to "DEACTIVATE" and event muting instructions in the request, but the UPF cannot accept the received instructions, the UPF may reject the request with a 403 Forbidden response and the application error "MUTING\_EXC\_INSTR\_NOT\_ACCEPTED".

##### 5.2.2.2.3 Modification of a subscription

The service operation is invoked by a NF Service Consumer, towards the UPF, when it needs to modify an existing subscription previously created at the UPF.

The NF Service Consumer shall modify the subscription by using the HTTP method PATCH with the URI of the individual subscription resource (see clause 6.1.3.3) to be modified.



Figure 5.2.2.2.3-1: Modification of a subscription

1. The NF service consumer shall send a PATCH request to the resource representing a subscription. The modification may be for the events subscribed or for updating the event report options, or the NF Id.

2a. On success, the request is accepted, and all the modification instructions in the PATCH request have been implemented, the UPF shall respond with "204 No Content".

2b. On success, the request is accepted, but some of the modification instructions in the PATCH request have been discarded, the UPF shall respond with "200 OK" including PatchResult to indicate the failed modifications.

2c. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.3.3.2-3 shall be returned. For a 4xx/5xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.1.3.3.3.2-3.

#### 5.2.2.2A Unsubscribe

##### 5.2.2.2A.1 General

The Unsubscribe service operation is invoked by a NF Service Consumer towards the UPF to delete an existing subscription previously created at the UPF.

The NF Service Consumer shall unsubscribe from a subscription by using the HTTP method DELETE with the URI of the individual subscription resource (see clause 6.1.3.3) to be deleted.



Figure 5.2.2.2A.1-1 Unsubscribing from UPF events

1. The NF Service Consumer shall send a DELETE request to delete an existing subscription resource in the UPF.

2a. On success (i.e. if the request is accepted), the UPF shall reply with the status code 204 in the response message to indicate that the resource identified by the subscription ID has been successfully deleted.

2b. On failure or redirection, one of the HTTP status code listed in Table 6.1.3.3.3.1-3 shall be returned. For a 4xx/5xx response, the message body shall contain a ProblemDetails structure with the "cause" attribute set to one of the application error listed in Table 6.1.3.3.3.1-3.

#### 5.2.2.3 Notify

##### 5.2.2.3.1 General

The Notify service operation is invoked by the UPF, to send a notification, towards the notification URI, when certain event included in the subscription has taken place.

For the events "USER\_DATA\_USAGE\_MEASURES" and "USER\_DATA\_USAGE\_TRENDS", the UPF shall use the HTTP method POST, using the notification URI received in the subscription creation as specified in clause 5.2.2.2.2, including e.g. the subscription ID, Event ID(s) for which event has happened, notification correlation ID provided by the NF service consumer at the time of event subscription, to send a notification.

If the subscription is targeting PDU sessions of any UE, i.e. the "anyUe" is set to true, the UPF shall perform the requested measurements per PDU session and send notification(s) with multiple NotificationItem IEs within the NotificationData wherein each NotificationItem shall correspond to a report on one subscribed event per PDU session. See Figure 5.2.2.3.2-1. If the subscription request included a sampling ratio, the notification may include the sampling ratio achieved by the UPF.

For the events "QOS\_MONITORING" and "TSC\_MNGT\_INFO", the UPF shall use the HTTP method POST, using the notification URI received from the SMF via N4 interface, see clause 5.33.5 of 3GPP TS 29.244 [15].

For the event "USER\_DATA\_USAGE\_MEASURES", the event notification may contain following information:

- Volume Measurement: measures of data volume exchanged (UL, DL and/or overall) and/or number of packets exchanged (UL, DL and/or overall).

- Throughput Measurement: measures of data throughput (UL and DL).

- Application related Information: URLs and/or Domain names and Domain name protocols detected in the traffic identified by the information included in the subscription request, e.g. an application id.

When the granularity of the measurement is per data flow, the notification includes the packet filter set and the Applications Identifier if available.

For the event "USER\_DATA\_USAGE\_TRENDS", the event notification may contain following information:

- Throughput Statistic Measurement (average and/or peak throughput) over the measurement.

When the granularity of the measurement is per data flow, the notification includes the packet filter set and the Applications Identifier if available.

For the event "QOS\_MONITORING", this service operation is used by the UPF to send the following kinds of event notification:

- Periodic notification on the downlink packet delay, uplink packet delay, and/or the round trip packet delay between the UPF (PSA) and UE;

- Event triggered notification on the downlink packet delay, uplink packet delay, and/or the round trip packet delay between the UPF (PSA) and UE, i.e. when the packet delay exceeds a defined threshold;

- Notification on the downlink packet delay, uplink packet delay, and/or the round trip packet delay between the UPF (PSA) and UE when the PDU session is released.

- Event triggered notification of congestion information of the QoS flow on the UL and/or DL directions received from the NG-RAN, upon a change of the congestion information.

For the event "TSC\_MNGT\_INFO", the event notification may contain the following information:

- Port Management Information Container(s) for one or more NW-TT ports and/or

- a User Plane Node Management Information Container;

The event notification shall also contain the following information:

- the related NW-TT port number(s), if Port Management Information Container(s) is present; and

- the notification correlation ID received from the SMF, if any.

##### 5.2.2.3.2 UPF sends notification on subscribed events



Figure 5.2.2.3.2-1: UPF sends notification on subscribed events

1. The UPF shall send a POST request to the eventNotificationUri as provided by the SMF during the provisioning of Session Reporting Rule (see clause 7.5.2.9 of 3GPP TS 29.244 [15]) or received in the subscription creation as specified in clause 5.2.2.2.2.

2a. Upon success, the NF Service Consumer responds with "204 No Content".

2b. On failure or redirection:

- If the NF Service Consumer does not consider the "eventNotificationUri" as a valid notification URI, the NF Service Consumer shall return "404 Not Found" status code with the ProblemDetails IE providing details of the error.

- In the case of redirection, the NF service consumer shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another NF service consumer endpoint.

## 5.3 Nupf\_GetPrivateUEIPaddr Service

### 5.3.1 Service Description

The Nupf\_GetPrivateUEIPaddr Service enables the UPF to provide the UE IP address information of a PDU session, e.g. to provide the (private) UE IP address when being queried with a NATed UE IP Address, to the NF service consumer, e.g. a NEF.

Table 5.3.1-1 lists the service operations that are supported by the Nupf\_GetPrivateUEIPaddr service.

Table 5.3.1-1: Service operations supported by the Nupf\_GetPrivateUEIPaddr service

|  |  |  |  |
| --- | --- | --- | --- |
| Service Operations | Description | Operation  Semantics | Example Consumers |
| Get | Retrieve the UE IP address information of a PDU session, to get e.g., UE's private IP address and optionally the associated IP domain. | Request / Response | NEF |

### 5.3.2 Service Operations

#### 5.3.2.1 Introduction

See Table 5.3.1-1 for an overview of the service operations supported by the Nupf\_GetPrivateUEIPaddr service.

#### 5.3.2.2 Get

##### 5.3.2.2.1 General

The Get service operation is used in the following procedure:

- AF specific UE ID retrieval as specified in clause 4.15.10 of 3GPP TS 23.502 [3]

This service operation is consumed by querying the "ue-ip-info" resource. The request is sent to the UPF hosting the IP address in the query.



Figure 5.3.2.2.1-1: Retrieval of UE IP Info for a PDU session

1. The NF Service Consumer shall send an HTTP GET request to the resource URI of "ue-ip-info". The input filter criteria for the discovery request shall be included in query parameters, e.g. the UE (public) IP address and Port Number, and optionally DNN and S-NSSAI.

2a. On success, "200 OK" shall be returned. The response body shall include a UeIpInfo object which contains relevant attributes matching the query parameters included in the request message.

2b. On failure, one of the HTTP status code listed in Table 6.2.3.2.3.1-3 shall be returned. For a 4xx/5xx response, the message body may contain a ProblemDetails structure with the "cause" attribute set to one of the application errors listed in Table 6.2.3.2.3.1-3, where applicable.  
On redirection, "307 Temporary Redirect" or "308 Permanent Redirect" shall be returned. A RedirectResponse IE may be included in the content of POST response.

# 6 API Definitions

## 6.1 Nupf\_EventExposure Service API

### 6.1.1 API URI

The Nupf\_EventExposure shall use the Nupf\_EventExposure API.

The API URI of the Nupf\_EventExposure API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>**

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].

- The <apiName>shall be "nupf-ee".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

### 6.1.2 Usage of HTTP

#### 6.1.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Nupf\_EventExposure API is contained in Annex A.

#### 6.1.2.2 HTTP standard headers

##### 6.1.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

##### 6.1.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

#### 6.1.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported.

In this release of this specification, no custom headers specific to the Nupf\_EventExposure service are defined.

### 6.1.3 Resources

#### 6.1.3.1 Overview



Figure 6.1.3.1-1: Resource URI structure of the nupf-ee API

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

|  |  |  |  |
| --- | --- | --- | --- |
| Resource name | Resource URI | HTTP method or custom operation | Description  (service operation) |
| EventExposureSubscriptions  (Collection) | /ee-subscriptions | POST | Subscribe service operation, creating a new subscription . |
| Individual subscription  (Document) | /ee-subscriptions/{subscriptionId} | DELETE | Unsubscribe service operation |
| PATCH | Subscribe service operation, modification of a subscription |

#### 6.1.3.2 Resource: EventExposureSubscriptions

##### 6.1.3.2.1 Description

This resource represents a collection of subscriptions created by NF service consumers of Nupf\_EventExposure service.

This resource is modelled as the Collection resource archetype (see clause C.2 of 3GPP TS 29.501 [5]).

##### 6.1.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nupf-ee/<apiVersion>/ee-subscriptions**

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 6.1.1 |
| apiVersion | string | See clause 6.1.1 |

##### 6.1.3.2.3 Resource Standard Methods

6.1.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.1.3.2.3.1-1.

Table 6.1.3.2.3.1-1: URI query parameters supported by the POST method on this resource

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

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

Table 6.1.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| CreateEventSubscription | M | 1 | Content of the Subscribe request to create a subscription. |

Table 6.1.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| CreatedEventSubscription | M | 1 | 201 Created | Represents successful creation of an UPF Event Subscription |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection.  (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection.  (NOTE 2) |
| ProblemDetails | O | 0..1 | 403 Forbidden | Indicates the creation of subscription has failed due to application error.  The "cause" attribute may be used to indicate one of the following application errors:  - PDU\_SESSION\_NOT\_SERVED\_BY\_UPF  - MUTING\_EXC\_INSTR\_NOT\_ACCEPTED |
| NOTE 1: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply, with response body containing an object of ProblemDetails data type (see clause 5.2.7 of 3GPP TS 29.500 [4]).  NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4]. | | | | |

Table 6.1.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/nupf-ee/<apiVersion>/ee-subscriptions/{subscriptionId} |

Table 6.1.3.2.3.1-5: Headers supported by the 307 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

Table 6.1.3.2.3.1-6: Headers supported by the 308 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

##### 6.1.3.2.4 Resource Custom Operations

None.

#### 6.1.3.3 Resource: Individual subscription

##### 6.1.3.3.1 Description

This resource represents an individual of subscription created by NF service consumers of Nupf\_EventExposure service.

This resource is modelled as the Document resource archetype (see clause C.1 of 3GPP TS 29.501 [5]).

##### 6.1.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nupf-ee/<apiVersion>/ee-subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

Table 6.1.3.3.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 6.2.1 |
| apiVersion | string | See clause 6.2.1. |
| subscriptionId | string | String identifies an individual subscription to the UPF event exposure service |

##### 6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 DELETE

This method shall support the URI query parameters specified in table 6.1.3.3.3.1-1.

Table 6.1.3.3.3.1-1: 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 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.3.3.1-2: Data structures supported by the DELETE Request Body on this resource

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

Table 6.1.3.3.3.1-3: Data structures supported by the DELETE Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content |  |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection.  (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection.  (NOTE 2) |
| ProblemDetails | O | 0..1 | 404 Not Found | Indicates the modification of subscription has failed due to application error.  The "cause" attribute may be used to indicate one of the following application errors:  - SUBSCRIPTION\_NOT\_FOUND |
| NOTE 1: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply, with response body containing an object of ProblemDetails data type (see clause 5.2.7 of 3GPP TS 29.500 [4]).  NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4]. | | | | |

Table 6.1.3.3.3.1-4: Headers supported by the 307 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

Table 6.1.3.3.3.1-5: Headers supported by the 308 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

6.1.3.3.3.2 PATCH

This method shall support the URI query parameters specified in table 6.1.3.3.3.2-1.

Table 6.1.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource

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

This method shall support the request data structures specified in table 6.1.3.3.3.2-2 and the response data structures and response codes specified in table 6.1.3.3.3.2-3.

Table 6.1.3.3.3.2-2: Data structures supported by the PATCH Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| array(PatchItem) | M | 1..N | Items describe the modifications to the Event Subscription |

Table 6.1.3.3.3.2-3: Data structures supported by the PATCH Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | Upon success, an empty response body shall be returned. (NOTE 2) |
| PatchResult | M | 1 | 200 OK | Upon success, the execution report is returned. (NOTE 2) |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection.  (NOTE 3) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection.  (NOTE 3) |
| ProblemDetails | O | 0..1 | 403 Forbidden | One or more attributes are not allowed to be modified.  The "cause" attribute may be used to indicate one of the following application errors:  - MODIFICATION\_NOT\_ALLOWED, see 3GPP TS 29.500 [4] table 5.2.7.2-1.  - MUTING\_EXC\_INSTR\_NOT\_ACCEPTED |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate one of the following application errors:  - SUBSCRIPTION\_NOT\_FOUND, see 3GPP TS 29.500 [4] table 5.2.7.2-1. |
| NOTE 1: The mandatory HTTP error status code for the PATCH method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply, with response body containing an object of ProblemDetails data type (see clause 5.2.7 of 3GPP TS 29.500 [4]).  NOTE 2: If all the modification instructions in the PATCH request have been implemented, the UPF shall respond with 204 No Content response; if some of the modification instructions in the PATCH request have been discarded, the UPF shall respond with PatchResult.  NOTE 3: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4]. | | | | |

Table 6.1.3.3.3.2-4: Headers supported by the 307 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. It is implementation specific how the alternative URI is determined. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

Table 6.1.3.3.3.2-5: Headers supported by the 308 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. It is implementation specific how the alternative URI is determined. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected |

##### 6.1.3.3.4 Resource Custom Operations

None.

### 6.1.4 void

### 6.1.5 Notifications

#### 6.1.5.1 General

Notifications shall comply to clause 6.2 of 3GPP TS 29.500 [4] and clause 4.6.2.3 of 3GPP TS 29.501 [5].

Table 6.1.5.1-1: Notifications overview

|  |  |  |  |
| --- | --- | --- | --- |
| Notification | Callback URI | HTTP method or custom operation | Description  (service operation) |
| Event Notification | {eventNotificationUri} (This URI is either provided by NF service consumer via Nupf interface, or it is provided via N4 interface during the provisioning of Session Reporting Rule) | POST | Notify about the events that UPF exposes and to which the NF service consumer may subscribe to. |

#### 6.1.5.2 Event Notification

##### 6.1.5.2.1 Description

The Event Notification is used by the UPF to report one or several observed Events to a NF service consumer that has subscribed to such Notifications.

##### 6.1.5.2.2 Target URI

The POST method shall be used for Event Notification and the URI shall be the Event Notification URI provided by the SMF during the provisioning of Session Reporting Rule, see clause 5.33.5 of 3GPP TS 29.244 [15], or by NF Service Consumer during creation of the subscription as specified in clause 5.2.2.2.2.

Resource URI: **{eventNotificationUri}**

Support of URI query parameters is specified in table 6.1.5.2.2-1.

Table 6.1.5.2.2-1: Callback URI variables

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

Support of request data structures is specified in table 6.1.5.2.2-2, and support of response data structures and response codes is specified in table 6.1.5.2.2-3.

Table 6.1.5.2.2-2: Data structures supported by the POST Request Body

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NotificationData | M | 1 | Representation of the event notification. |

Table 6.1.5.2.2-3: Data structures supported by the POST Response Body

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | This case represents a successful notification of the event. |
| ProblemDetails | O | 0..1 | 404 Not Found | If the NF Service Consumer considers the "eventNotificationUri" and/or "Notification Correlation ID" is not recognized, the NF Service Consumer shall return "404 Not Found" status code |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection.  (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection.  (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] other than those specified in the table above also apply, with a ProblemDetails data type (see clause 5.2.7 of 3GPP TS 29.500 [4]).  NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4]. | | | | |

Table 6.1.5.2.2-4: Headers supported by the 307 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to the endpoint of the NF service consumer instance to which the request should be sent. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF instance ID towards which the notification is redirected |

Table 6.1.5.2.2-5: Headers supported by the 308 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | A URI pointing to the endpoint of the NF service consumer instance to which the request should be sent. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF instance ID towards which the notification is redirected |

### 6.1.6 Data Model

#### 6.1.6.1 General

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

Table 6.1.6.1-1 specifies the data types defined for the Nupf\_EventExposure service.

Table 6.1.6.1-1: Nupf\_EventExposure specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| NotificationData | 6.1.6.2.2 | The list of NotificationItems |  |
| NotificationItem | 6.1.6.2.3 | Represents a report on one subscribed event |  |
| QosMonitoringMeasurement | 6.1.6.2.4 | QoS Monitoring Measurement information |  |
| UserDataUsageMeasurements | 6.1.6.2.5 | User Data Usage Measurements |  |
| VolumeMeasurement | 6.1.6.2.6 | Volume Measurement |  |
| ThroughputMeasurement | 6.1.6.2.7 | Throughput Measurement |  |
| ApplicationRelatedInformation | 6.1.6.2.8 | Application Related Information |  |
| ThroughputStatisticMeasurement | 6.1.6.2.9 | Throughput Statistic Measurement |  |
| DomainInformation | 6.1.6.2.10 | Domain Name and Domain Name Protocol |  |
| UpfEventSubscription | 6.1.6.2.11 | Represents an individual event subscription resource on UPF |  |
| UpfEventMode | 6.1.6.2.12 | Describes how the reports shall be generated for a subscribed event |  |
| UpfEvent | 6.1.6.2.13 | Describes an event to be subscribed |  |
| CreateEventSubscription | 6.1.6.2.14 | Data within a create UPF event subscription request |  |
| CreatedEventSubscription | 6.1.6.2.15 | Data within a create UPF event subscription response |  |
| ReportingSuggestionInformation | 6.1.6.2.16 | Reporting Suggestion Information |  |
| TscManagementInfo | 6.1.6.2.17 | TSC Management Information |  |
| EventType | 6.1.6.3.3 | Event Type |  |
| UpfEventTrigger | 6.1.6.3.4 | Describes how the UPF generates the report for the event |  |
| MeasurementType | 6.1.6.3.5 | Type of Measurement |  |
| GranularityOfMeasurement | 6.1.6.3.6 | Granularity Of Measurement |  |
| DnProtocol | 6.1.6.3.7 | Domain Name Protocol |  |
| ReportingUrgency | 6.1.6.3.8 | Reporting Urgency |  |

Table 6.1.6.1-2 specifies data types re-used by the Nupf\_EventExposure service from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nupf\_EventExposure service.

Table 6.1.6.1-2: Nupf\_EventExposure re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| DateTime | 3GPP TS 29.571 [16] | Date time |  |
| Dnn | 3GPP TS 29.571 [16] | DNN |  |
| Gpsi | 3GPP TS 29.571 [16] | GPSI |  |
| Snssai | 3GPP TS 29.571 [16] | S-NSSAI |  |
| Uint32 | 3GPP TS 29.571 [16] | Uint32 |  |
| MacAddr48 | 3GPP TS 29.571 [16] | MAC Address |  |
| Ipv4Addr | 3GPP TS 29.571 [16] | IPv4 address |  |
| Ipv6Prefix | 3GPP TS 29.571 [16] | IPv6 address prefix |  |
| Uint64 | 3GPP TS 29.571 [16] | Unsigned 64-bit integer |  |
| BitRate | 3GPP TS 29.571 [16] | Bit rate |  |
| PacketRate | 3GPP TS 29.571 [16] | Packet rate |  |
| TrafficVolume | 3GPP TS 29.571 [16] | Traffic Volume |  |
| ApplicationId | 3GPP TS 29.571 [16] | The application identifier. |  |
| DurationSec | 3GPP TS 29.571 [16] |  |  |
| NotificationFlag | 3GPP TS 29.571 [16] | Notification flag. |  |
| PartitioningCriteria | 3GPP TS 29.571 [16] | Used to partition UEs before applying sampling. |  |
| ProblemDetails | 3GPP TS 29.571 [16] |  |  |
| SamplingRatio | 3GPP TS 29.571 [16] | Sampling Ratio. |  |
| Uri | 3GPP TS 29.571 [16] |  |  |
| IpAddr | 3GPP TS 29.571 [16] |  |  |
| SupportedFeatures | 3GPP TS 29.571 [16] |  |  |
| Supi | 3GPP TS 29.571 [16] |  |  |
| Pei | 3GPP TS 29.571 [16] |  |  |
| Uinteger | 3GPP TS 29.571 [16] | Unsigned Integer |  |
| PortManagementContainer | 3GPP TS 29.512 [19] | PMIC |  |
| BridgeManagementContainer | 3GPP TS 29.512 [19] | UMIC |  |
| FlowInformation | 3GPP TS 29.512 [19] | IP or Ethernet Flow Information |  |
| PatchItem | 3GPP TS 29.571 [16] | Patch item of JSON PATCH |  |
| PatchResult | 3GPP TS 29.571 [16] | Patch result of JSON PATCH |  |
| MutingExceptionInstructions | 3GPP TS 29.571 [16] | Muting exception instructions. |  |
| MutingNotificationsSettings | 3GPP TS 29.571 [16] | Muting notifications settings. |  |

#### 6.1.6.2 Structured data types

##### 6.1.6.2.1 Introduction

This clause defines the structures to be used in resource representations.

##### 6.1.6.2.2 Type: NotificationData

Table 6.1.6.2.2-1: Definition of type NotificationData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| notificationItems | array(NotificationItem) | M | 1..N | The list of NotificationItem, each entry corresponds to a report on one subscribed event per PDU session. |  |
| correlationId | string | C | 0..1 | The UPF shall include this attribute in the notification if the "Notification Correlation ID" IE was received via N4 interface (see clause 7.5.2.9 of 3GPP TS 29.244 [15]) |  |
| achievedSampRatio | SamplingRatio | O | 0..1 | This IE may be included for an event subscription for any UE to indicate the ratio of the random subset of target PDU sessions achieved by the UPF. |  |

##### 6.1.6.2.3 Type: NotificationItem

Table 6.1.6.2.3-1: Definition of type NotificationItem

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| eventType | EventType | M | 1 | The event type of the event for which the notification is generated. |  |
| ueIpv4Addr | Ipv4Addr | C | 0..1 | IPv4 address of the UE (NOTE 1) |  |
| ueIpv6Prefix | Ipv6Prefix | C | 0..1 | IPv6 address prefix of the UE (NOTE 1) |  |
| ueMacAddr | MacAddr48 | O | 0..1 | MAC address of the UE.  (NOTE 2) |  |
| dnn | Dnn | O | 0..1 | When present, this attribute indicates the DNN of the PDU session for which the notification is generated. |  |
| snssai | Snssai | O | 0..1 | When present, this attribute indicates the S-NSSAI of the PDU session for which the notification is generated. |  |
| gpsi | Gpsi | O | 0..1 | When present, this attribute indicates the GPSI of the UE for which the notification is generated. |  |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |  |
| timeStamp | DateTime | M | 1 | The value represents the UTC time when the information in this report was generated. |  |
| startTime | DateTime | O | 0..1 | When present, this attribute shall provide the timestamp when the information measured for generating this report was started. |  |
| qosMonitoringMeasurement | QosMonitoringMeasurement | C | 0..1 | This attribute shall be present if eventType is set to "QOS\_MONITORING". |  |
| userDataUsageMeasurements | array(UserDataUsageMeasurements) | C | 1..N | This IE shall be present if eventType is set to "USER\_DATA\_USAGE\_MEASURES" or "USER\_DATA\_USAGE\_TRENDS". |  |
| tscMngtInfo | TscManagementInfo | C | 0..1 | This attribute shall be present if eventType is set to "TSC\_MNGT\_INFO". |  |
| NOTE 1: At least one of ueIpv4Addr and ueIpv6Prefix shall be present if the subscription applies to an IP PDU session.  NOTE 2: An NF service consumer subscribing to receive QoS Monitoring Measurement report for an ethernet PDU session shall accept the NotificationItem having neither ueIpv4Addr nor ueIpv6Prefix. | | | | | |

##### 6.1.6.2.4 Type: QosMonitoringMeasurement

Table 6.1.6.2.3-1: Definition of type QosMonitoringMeasurement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| flowInfos | array(FlowInformation) | C | 1..N | When present, this IE shall contain an array of Ethernet or IP flow packet filter information corresponding to the QoS flow.  (NOTE) |  |
| appIds | array(ApplicationId) | C | 1..N | When present, this IE shall contain an array of application identifiers corresponding to the QoS flow.  (NOTE) |  |
| dlPacketDelay | Uint32 | O | 0..1 | When present, the value of this attribute is set to the measured downlink packet delay in millisecond (ms). |  |
| ulPacketDelay | Uint32 | O | 0..1 | When present, the value of this attribute is set to the measured uplink packet delay in millisecond (ms). |  |
| rtrPacketDelay | Uint32 | O | 0..1 | When present, the value of this attribute is set to the measured round trip packet delay in millisecond (ms). |  |
| measureFailure | boolean | C | 0..1 | This IE shall be present to report packet delay measurement failure.  When present, it shall be set to true to indicate the report is sent due to packet delay measurement failure. This IE is named as the "PLMF" flag over PFCP interface. See also clauses 5.24.4.3 and 8.2.171 in 3GPP TS 29.244 [15]. |  |
| dlAveThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the average data throughput in downlink direction as specified in clause 5.39.3.4 of 3GPP TS 29.244 [15]. |  |
| ulAveThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the average data throughput in uplink direction as specified in clause 5.39.3.4 of 3GPP TS 29.244 [15]. |  |
| dlCongestion | string | O | 0..1 | When present, this IE shall contain Downlink congestion information. |  |
| ulCongestion | string | O | 0..1 | When present, this IE shall contain Uplink congestion information. |  |
| defaultQosFlowInd | boolean | C | 0..1 | The IE shall be present when the SMF has indicated that the QoS Monitoring is for a QoS flow associated with the default QoS rule in the QoS Monitoring per QoS flow Control Information as specified in 3GPP TS 29.244 [15].  When present, this IE shall indicate whether the QoS measurements is for a QoS flow associated with the default QoS rule.  - true: Qos Monitoring Measurement is for a QoS flow associated with the default QoS rule;  - false(default): Qos Monitoring Measurement is not for a QoS flow associated with the default QoS rule. |  |
| NOTE: Either the flowInfos IE or the appIds IE should be present, not both. | | | | | |

Editor's note: the encoding of the dlCongestion and ulCongestion IEs is FFS.

##### 6.1.6.2.5 Type: UserDataUsageMeasurements

Table 6.1.6.2.5-1: Definition of type UserDataUsageMeasurements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| appId | ApplicationId | C | 0..1 | When present, this IE shall contain the application identifier. This IE shall be included if the requested granularity of measurement was set to "PER\_APPLICATION".  This IE may be present if the requested granularity of measurement was set to "PER FLOW".  (NOTE) |
| flowInfo | FlowInformation | C | 0..1 | When present, this IE shall contain the IP or Ethernet data flow information. This IE shall be included if the requested granularity of measurement was set to "PER FLOW".  (NOTE) |
| volumeMeasurement | VolumeMeasurement | C | 0..1 | This attribute shall be present if eventType is set to "USER\_DATA\_USAGE\_MEASURES" and measurementType is set to "VOLUME\_MEASUREMENT". |
| throughputMeasurement | ThroughputMeasurement | C | 0..1 | This attribute shall be present if eventType is set to "USER\_DATA\_USAGE\_MEASURES" and measurementType is set to "THROUGHPUT\_MEASUREMENT". |
| applicationRelatedInformation | ApplicationRelatedInformation | C | 0..1 | This attribute shall be present if eventType is set to "USER\_DATA\_USAGE\_MEASURES" and measurementType is set to "APPLICATION\_RELATED\_INFORMATION". |
| throughputStatisticMeasurements | ThroughputStatisticMeasurement | C | 0..1 | This attribute shall be present if eventType is set to "USER\_DATA\_USAGE\_TRENDS". |
| NOTE: Either the appId or the flowInfo may be present, not both. When neither appId nor flowInfo is present, the measurements (i.e., the volumeMeasurement and/or the throughputMeasurement, and/or the applicationRelatedInformation and/or the throughputStatisticMeasurements) shall correspond to the user plane measurements of the PDU session. When appId is present, the measurements shall correspond to user plane measurements of the application identified by the appId. When flowInfo is present, the measurement shall correspond to user plane measurements for the data flow identified by the flowInfo. | | | | |

##### 6.1.6.2.6 Type: VolumeMeasurement

Table 6.1.6.2.6-1: Definition of type VolumeMeasurement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| totalVolume | TrafficVolume | O | 0..1 | When present, this IE shall indicate the total volume (bytes) of user plane traffic for both the uplink and downlink directions. |
| ulVolume | TrafficVolume | O | 0..1 | When present, this IE shall indicate the volume (bytes) of user plane traffic for the uplink direction. |
| dlVolume | TrafficVolume | O | 0..1 | When present, this IE shall indicate the volume (bytes) of user plane traffic for the downlink direction. |
| totalNbOfPackets | Uint64 | O | 0..1 | When present, this IE shall indicate the total number of user plane packets for both uplink and downlink directions. |
| ulNbOfPackets | Uint64 | O | 0..1 | When present, this IE shall indicate the number of user plane packets for the uplink direction. |
| dlNbOfPackets | Uint64 | O | 0..1 | When present, this IE shall indicate the number of user plane packets for the downlink direction. |

##### 6.1.6.2.7 Type: ThroughputMeasurement

Table 6.1.6.2.7-1: Definition of type ThroughputMeasurement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| ulThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the measurement of data throughput in uplink direction. |
| dlThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the measurement of data throughput in downlink direction. |
| ulPacketThroughput | PacketRate | O | 0..1 | When present, this IE shall indicate the measurement of packet throughput in uplink direction.  . |
| dlPacketThroughput | PacketRate | O | 0..1 | When present, this IE shall indicate the measurement of packet throughput in downlink direction. |

##### 6.1.6.2.8 Type: ApplicationRelatedInformation

Table 6.1.6.2.8-1: Definition of type ApplicationRelatedInformation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| urls | array(Uri) | O | 1..N | This IE may be present if available. When present, it shall contain a list of URLs detected in the traffic identified by the information included in the subscription request, e.g. an application id. |
| domainInfoList | array(DomainInformation) | O | 1..N | This IE may be present if available. When present, it shall contain a list of Domain information detected in the traffic identified by the information included in the subscription request, e.g. an application id. |

##### 6.1.6.2.9 Type: ThroughputStatisticMeasurement

Table 6.1.6.2.9-1: Definition of type ThroughputStatisticMeasurement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| ulAverageThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the average throughput in uplink direction over the measurement period. |
| dlAverageThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the average throughput in downlink direction over the measurement period. |
| ulPeakThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the peak throughput in uplink direction over the measurement period. |
| dlPeakThroughput | BitRate | O | 0..1 | When present, this IE shall indicate the peak throughput in downlink direction over the measurement period. |
| ulAveragePacketThroughput | PacketRate | O | 0..1 | When present, this IE shall indicate the average packet throughput in uplink direction. |
| dlAveragePacketThroughput | PacketRate | O | 0..1 | When present, this IE shall indicate the average packet throughput in downlink direction. |
| ulPeakPacketThroughput | PacketRate | O | 0..1 | When present, this IE shall indicate the Peak packet throughput in uplink direction. |
| dlPeakPacketThroughput | PacketRate | O | 0..1 | When present, this IE shall indicate the Peak packet throughput in downlink direction. |

##### 6.1.6.2.10 Type: DomainInformation

Table 6.1.6.2.10-1: Definition of type: DomainInformation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| domainName | Fqdn | M | 1 | This IE shall contain a domain name. |
| domainNameProtocol | DnProtocol | O | 0..1 | This IE may be present to contain the Domain Name Protocol. |

##### 6.1.6.2.11 Type: UpfEventSubscription

Table 6.1.6.2.11-1: Definition of type UpfEventSubscription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| eventList | array(UpfEvent) | M | 1..N | Describes the events to be subscribed in subscription request or the events successfully subscribed for this subscription in subscription response. |  |
| eventNotifyUri | Uri | M | 1 | Identifies the recipient of notifications sent by UPF for this subscription |  |
| notifyCorrelationId | string | M | 1 | Identifies the notification correlation ID. The UPF shall include this ID in the notifications. The value of this IE shall be unique per subscription for a given NF service consumer. |  |
| eventReportingMode | UpfEventMode | M | 1 | This IE shall be included to describe how the reports of the event shall be generated. |  |
| nfId | NfInstanceId | M | 1 | Indicates the instance identity of the network function creating the subscription. |  |
| ueIpAddress | IpAddr | C | 0..1 | The IE shall be present if the event subscription is applicable to one UE. The IE shall indicate the UE's PDU Session IP address.  (NOTE) |  |
| supi | Supi | O | 0..1 | Subscription Permanent Identifier |  |
| gpsi | Gpsi | O | 0..1 | Generic Public Subscription Identifier |  |
| pei | Pei | O | 0..1 | Permanent Equipment Identifier |  |
| anyUe | boolean | C | 0..1 | This IE shall be present if the event subscription is applicable to any UE.  When present, it shall be set as follows:  true: the subscription applies to any UE.  false (default): the subscription applies to a specific UE.  (NOTE) |  |
| dnn | Dnn | O | 0..1 | Data Network Name |  |
| snssai | Snssai | O | 0..1 | A single Network Slice Selection Assistance Information. |  |
| NOTE: Either information about a single UE (i.e. ueIpAddress) or anyUe set to true shall be included. | | | | |  |

Editor's Note: Whether one DNN and/or one S-NSSAI shall be present when subscription is for any UE is FFS. The cardinality and description of DNN and S-NSSAI are FFS.

##### 6.1.6.2.12 Type: UpfEventMode

Table 6.1.6.2.12-1: Definition of type UpfEventMode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| trigger | UpfEventTrigger | M | 1 | Describes how the reports are triggered. |  |
| maxReports | integer | C | 0..1 | This IE may be present if the trigger is set to "PERIODIC". When present, this IE shall indicate the maximum number of reports that can be generated by each subscribed event in the subscription.  If the UPF event subscription is for a list of events, this parameter shall be applied to each individual event in the list. |  |
| expiry | DateTime | C | 0..1 | This IE shall be included in an event subscription response, if, based on operator policy and taking into account the expiry time included in the request, the UPF needs to include an expiry time.  This IE may be included in an event subscription request.  When present, this IE shall represent the time after which the subscribed event(s) shall stop generating report and the subscription becomes invalid. If the trigger value included in an event subscription response is "ONE\_TIME" and if an event report is included in the subscription response then the value of the expiry included in the response shall be an immediate timestamp. |  |
| repPeriod | DurationSec | C | 0..1 | This IE shall be present if the trigger is set to "PERIODIC". When present, this IE shall indicate the period time for the event reports.  When the Event Subscription is for "ANY UE", the NF Consumer should set the "repPeriod" to a value which does not lead to a potential overload in the UPF and use sampRatio. |  |
| sampRatio | SamplingRatio | O | 0..1 | This IE may be included in an event subscription request for any UE to indicate the ratio of the random subset of target PDU sessions. Event reports only relate to the subset.  If the UPF event subscription is for a list of UPF event, this parameter shall be applied to each individual event. |  |
| partitioningCriteria | array(PartitioningCriteria) | O | 1..N | This IE may be included in an event subscription request for any UE if the sampRatio IE is provided.  When present, this IE shall define the criteria for determining the PDU sessions for which the sampling ratio shall apply.  (NOTE) |  |
| notifFlag | NotificationFlag | O | 0..1 | Indicates the notification flag, which is used to mute/unmute notifications and to retrieve events stored during a period of muted notifications. |  |
| mutingExcInstructions | MutingExceptionInstructions | O | 0..1 | This IE may be included by NWDAF or DCCF in the event subscription request, if the notifFlag IE is present and set to "DEACTIVATE".  When present, it shall indicate the instructions for the subscription and stored events when an exception (e.g. the buffer of stored event reports is full, or the number of stored event reports exceeds a certain number) occurs at UPF while the events are muted.  See 3GPP TS 23.288 [17], clause 6.2.7.2.  Write-Only: true | EEMM |
| mutingNotSettings | MutingNotificationsSettings | O | 0..1 | This IE may be included in the event subscription response if the event notifications muting is activated.  This IE Indicates the UPF muting notification settings.  See 3GPP TS 23.288 [17], clause 6.2.7.2.  Read-Only: true | EEMM |
| NOTE: In this release of specification, the partitioningCriteria values defined in 3GPP TS 29.571 [16] that apply to UPF Event Exposure are SNSSAI and DNN. | | | | | |

##### 6.1.6.2.13 Type: UpfEvent

Table 6.2.6.2.13-1: Definition of type UpfEvent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| type | EventType | M | 1 | Describes the UPF event type to be reported |  |
| immediateFlag | boolean | O | 0..1 | Indicates if an immediate event report containing the currently available value / status of the event is requested. The report contains the value / status of the event currently available at the UPF at the time of the subscription.  The default value is false. |  |
| measurementTypes | array(MeasurementType) | C | 1..N | This IE shall be present if the type IE is set to " USER\_DATA\_USAGE\_MEASURES".  When present, this IE shall indicate the types of requested measurements. |  |
| appIds | array(ApplicationId) | O | 1..N | Contains the application identifiers.  (NOTE 1, NOTE 2) |  |
| trafficFilters | array(FlowInformation) | O | 1..N | Identifies IP or Ethernet packet filters.  (NOTE 1, NOTE 2) |  |
| granularityOfMeasurement | GranularityOfMeasurement | O | 0..1 | Indicates the granularity of measurement.  (NOTE 2) |  |
| reportingSuggestionInfo | ReportingSuggestionInformation | C | 0..1 | The IE should be present if the event notification can be delayed, i.e. it is delay tolerant. |  |
| NOTE 1: Either the appIds IE or the trafficFilters IE may be present, not both.  NOTE 2: If the appIds or trafficFilters is provided, the granularityOfMeasurement shall not be set to "PER\_SESSION". If neither appIds nor trafficFilters is provided, the granularityOfMeasurement may be set to "PER\_SESSION", "PER\_APPLICATION" or "PER\_FLOW" to request the UPF to provide measurements with the corresponding granularity. | | | | | |

##### 6.1.6.2.14 Type: CreateEventSubscription

Table 6.2.6.2.14-1: Definition of type CreateEventSubscription

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| subscription | UpfEventSubscription | M | 1 | Represents the UPF Event Subscription resource to be created. |
| supportedFeatures | SupportedFeatures | C | 0..1 | This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported. |

##### 6.1.6.2.15 Type: CreatedEventSubscription

Table 6.1.6.2.15-1: Definition of type CreatedEventSubscription

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| subscription | UpfEventSubscription | M | 1 | Represents the newly created UPF Event Subscription resource. |
| subscriptionId | Uri | M | 1 | Represents the URI of the newly created UPF Event Subscription resource. This shall contain an absolute URI set to the Resource URI specified in clause 6.1.3.3.2. (NOTE) |
| reportList | array(NotificationItem) | O | 1..N | Represents the immediate event reports (i.e. the current value / status of the events subscribed), if available. |
| supportedFeatures | SupportedFeatures | C | 0..1 | This IE shall be present if at least one optional feature defined in clause 6.1.8 is supported. |
| NOTE: 3GPP TS 23.502 [3] specifies this attribute as "Subscription Correlation ID". | | | | |

##### 6.1.6.2.16 Type: ReportingSuggestionInformation

Table 6.1.6.2.16-1: Definition of type ReportingSuggestionInformation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| reportingUrgency | ReportingUrgency | M | 1 | Indicates whether the event report is delay tolerant. |
| reportingTimeInfo | DurationSec | C | 0..1 | This IE shall be present if the Reporting urgency information indicates it is delay tolerant. When present, this IE shall define the latest time for the UPF to report the detected event. |

##### 6.1.6.2.17 Type: TscManagementInfo

Table 6.1.6.2.17-1: Definition of type TscManagementInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| pmics | array(PortManagementContainer) | O | 1..N | When present, this IE shall contain a Port Management Information Container for one or more NW-TT ports. |  |
| umic | BridgeManagementContainer | O | 0..1 | When present, this IE shall contain a User Plane Node Management Information Container. |  |

#### 6.1.6.3 Simple data types and enumerations

##### 6.1.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

##### 6.1.6.3.2 Simple data types

No specific simple data types are defined in this release.

##### 6.1.6.3.3 Enumeration: EventType

The enumeration EventType represents the type of event to which the NF service consumer may subscribe to and for which the notification is generated. It shall comply with the provisions defined in table 6.1.5.3.3-1.

Table 6.1.6.3.3-1: Enumeration EventType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| "QOS\_MONITORING" | QoS Monitoring Measurement (see clause 5.2.1.3.2) |  |
| "USER\_DATA\_USAGE\_MEASURES" | User Data Usage Measures (see clause 5.2.1.3.3) |  |
| "USER\_DATA\_USAGE\_TRENDS" | User Data Usage Trends (see clause 5.2.1.3.4) |  |
| "TSC\_MNGT\_INFO" | TSC Management Information |  |

##### 6.1.6.3.4 Enumeration: UpfEventTrigger

Table 6.1.6.3.4-1: Enumeration UpfEventTrigger

|  |  |
| --- | --- |
| Enumeration value | Description |
| "ONE\_TIME" | Defines that UPF should generate report for the event only once. After reporting, the subscription to this event is terminated. |
| "PERIODIC" | Defines that UPF should periodically generate reports for the event, until the subscription to this event ends, due to end of report duration or up to the maximum number of reports or the event being unsubscribed explicitly. |

##### 6.1.6.3.5 Enumeration: MeasurementType

Table 6.1.6.3.5-1: Enumeration MeasurementType

|  |  |
| --- | --- |
| Enumeration value | Description |
| "VOLUME\_MEASUREMENT" | Measures of data volume exchanged (UL, DL and/or overall and/or number of packets exchanged (UL, DL and/or overall).  (NOTE) |
| "THROUGHPUT\_MEASUREMENT" | Measures of data throughput (UL and DL).  (NOTE) |
| "APPLICATION\_RELATED\_INFO" | URL/s and/or Domain name/s detected in the traffic identified by the information included in the subscription request, e.g. an application id.  (NOTE) |
| NOTE: This value may be used for the "USER\_DATA\_USAGE\_MEASURES" event type. | |

##### 6.1.6.3.6 Enumeration: GranularityOfMeasurement

Table 6.1.6.3.6-1: Enumeration GranularityOfMeasurement

|  |  |
| --- | --- |
| Enumeration value | Description |
| "PER\_APPLICATION" | Indicates that the granularity of the requested measurements is per application. |
| "PER\_SESSION" | Indicates that the granularity of the requested measurements is per PDU Session. |
| "PER\_FLOW" | Indicates that granularity of the requested measurements is per data flow. |

##### 6.1.6.3.7 Enumeration: DnProtocol

Table 6.1.6.3.7-1: Enumeration DnProtocol

|  |  |
| --- | --- |
| Enumeration value | Description |
| "DNS\_QNAME" | Identifies the DNS protocol and the question name in DNS query. |
| "TLS\_SNI" | Identifies the Server Name Indication in TLS ClientHello message. |
| "TLS\_SAN" | Identifies the Subject Alternative Name in TLS ServerCertificate message. |
| "TLS\_SCN" | Identifies the Subject Common Name in TLS ServerCertificate message. |

##### 6.1.6.3.8 Enumeration: ReportingUrgency

Table 6.1.6.3.8-1: Enumeration ReportingUrgency

|  |  |
| --- | --- |
| Enumeration value | Description |
| "DELAY\_TOLERANT" | The event report is delay tolerant. |
| "NON\_DELAY\_TOLERANT" | The event report is not delay tolerant. |

### 6.1.7 Error Handling

#### 6.1.7.1 General

For the Nupf\_EventExposure API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] 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 [4].

In addition, the requirements in the following clauses are applicable for the Nupf\_EventExposure API.

#### 6.1.7.2 Protocol Errors

No specific procedures for the Nupf\_EventExposure service are specified in this release.

#### 6.1.7.3 Application Errors

The common application errors defined in the Table 5.2.7.2-1 in 3GPP TS 29.500 [4] may also be used for the Nupf\_EventExposure service, and the following application errors listed in Table 6.1.7.3-1 are specific for the Nupf\_EventExposure service.

Table 6.2.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| PDU\_SESSION\_NOT\_SERVED\_BY\_UPF | 403 Forbidden | Indicates the creation of a subscription towards a PDU session has failed due to an application error when the PDU session is not served by the UPF. |
| MUTING\_EXC\_INSTR\_NOT\_ACCEPTED | 403 Forbidden | Indicates the UPF does not accept the received muting exception instructions. |
| SUBSCRIPTION\_NOT\_FOUND | 404 Not Found | Indicates the deletion of subscription has failed due to an application error when the subscription is not found in the UPF. |

### 6.1.8 Feature negotiation

The optional features listed in table 6.2.8-1 are defined for the Nupf\_EventExposure API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.1.8-1: Supported Features

|  |  |  |  |
| --- | --- | --- | --- |
| Feature number | Feature Name | M/O | Description |
| 1 | EEMM | O | Event Exposure Muting Mechanism  An UPF supporting this feature shall support the handling of event muting exception instructions as specified in clause 6.2.7.2 of 3GPP TS 23.288 [17]. |

### 6.1.9 Security

As indicated in 3GPP TS 33.501 [8], the access to the Nupf\_EventExposure API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If Oauth2 authorization is used, an NF Service Consumer, prior to consuming services offered by the Nupf\_EventExposure API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Nupf\_EventExposure service.

The Nupf\_EventExposure API defines scopes for OAuth2 authorization as specified in 3GPP TS 33.501 [8]; it defines a single scope consisting on the name of the service (i.e., "nupf-ee"), and it does not define any additional scopes at resource or operation level.

### 6.1.10 HTTP redirection

An HTTP request may be redirected to a different UPF service instance when using direct or indirect communications (see 3GPP TS 29.500 [4]).

An SCP that reselects a different UPF producer instance will return the NF Instance ID of the new UPF producer instance in the 3gpp-Sbi-Producer-Id header, as specified in clause 6.10.3.4 of 3GPP TS 29.500 [4].

If an UPF redirects a service request to a different UPF using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new UPF towards which the service request is redirected shall be indicated in the 3gpp-Sbi-Target-Nf-Id header of the 307 Temporary Redirect or 308 Permanent Redirect response as specified in clause 6.10.9.1 of 3GPP TS 29.500 [4].

## 6.2 Nupf\_GetPrivateUEIPaddr Service API

### 6.2.1 Introduction

The Nupf\_GetPrivateUEIPaddr service shall use the Nupf\_GetPrivateUEIPaddr API.

The API URI of the Nupf\_GetPrivateUEIPaddr Service API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URI used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>**

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].

- The <apiName>shall be "nupf\_gueip".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 5.3.

### 6.2.2 Usage of HTTP

#### 6.2.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Nupf\_GetPrivateUEIPaddr API is contained in Annex A.

#### 6.2.2.2 HTTP standard headers

##### 6.2.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

##### 6.2.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

#### 6.2.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported.

### 6.2.3 Resources

#### 6.2.3.1 Overview



Figure 6.2.3.1-1: Resource URI structure of the Nupf\_GetPrivateUEIPaddr API

Table 6.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.2.3.1-1: Resources and methods overview

|  |  |  |  |
| --- | --- | --- | --- |
| Resource name | Resource URI | HTTP method or custom operation | Description |
| UE IP Address Info | /ue-ip-info | GET | Nupf\_GetPrivateUEIPaddr\_Get |

#### 6.2.3.2 Resource: UE IP Address Info

##### 6.2.3.2.1 Description

This resource represents the UE IP Address Info of all the PDU sessions served by the UPF.

This resource is modelled with the Document archetype (see clause C.2 of 3GPP TS 29.501 [5]).

##### 6.2.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nupf\_gueip/<apiVersion>/ue-ip-info**

This resource shall support the resource URI variables defined in table 6.2.3.2.2-1.

Table 6.2.3.2.2-1: Resource URI variables for this resource

|  |  |
| --- | --- |
| Name | Definition |
| apiRoot | See clause 6.2.1 |
| apiVersion | See clause 6.2.1 |

##### 6.2.3.2.3 Resource Standard Methods

6.2.3.2.3.1 GET

This operation retrieves the UE IP Info of a PDU session, which contains the UE's PDU Session (private) IP address, by querying the UPF with the NATed UE's public IP address and an optional Port number.

This method shall support the URI query parameters specified in table 6.2.3.2.3.1-1.

Table 6.2.3.2.3.1-1: URI query parameters supported by the GET method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| ue-ipv4-address | Ipv4Addr | O | 0..1 | UE's IPv4 address |  |
| ue-ipv6-prefix | Ipv6Prefix | O | 0..1 | UE's IPv6 Prefix |  |
| port-number | integer | O | 0..1 | UDP or TCP Port |  |
| dnn | Dnn | O | 0..1 | DNN of the PDU session |  |
| snssai | Snssai | O | 0..1 | S-NSSAI of the PDU session |  |

This method shall support the request data structures specified in table 6.2.3.2.3.1-2 and the response data structures and response codes specified in table 6.2.3.2.3.1-3.

Table 6.2.3.2.3.1-2: Data structures supported by the GET Request Body on this resource

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

Table 6.2.3.2.3.1-3: Data structures supported by the GET Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| UeIpInfo | M | 1 | 200 OK | The response body contains a UeIpInfo for a PDU session which contains attributes that are matching the queryparameter. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection.  (NOTE 2) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection.  (NOTE 2) |
| ProblemDetails | O | 0..1 | 404 Not Found | The "cause" attribute may be used to indicate the following application error:  - NO\_MATCHING UE\_IP\_ADDRESS  See table 6.2.7.3-1 for the description of this error. |
| NOTE 1: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply, with response body containing an object of ProblemDetails data type (see clause 5.2.7 of 3GPP TS 29.500 [4]).  NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4]. | | | | |

Table 6.2.3.2.3.1-4: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |

Table 6.2.3.2.3.1-5: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI of the resource located on an alternative service instance. For the case, when a request is redirected to the same target resource via a different SCP, see clause 6.10.9.1 in 3GPP TS 29.500 [4]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance ID towards which the request is redirected. |

##### 6.2.3.2.4 Resource Custom Operations

None.

### 6.2.4 Custom Operations without associated resources

None

### 6.2.5 Notifications

#### 6.2.5.1 General

None.

### 6.2.6 Data Model

#### 6.2.6.1 General

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

Table 6.2.6.1-1 specifies the data types defined for the Nupf\_GetPrivateUEIPaddr service based interface protocol.

Table 6.2.6.1-1: Nupf\_GetPrivateUEIPaddr specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| UeIpInfo | 6.1.6.2.2 | A UeIpInfo for a PDU session |  |

Table 6.2.6.1-2 specifies data types re-used by the Nupf\_GetPrivateUEIPaddr service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the N<NF> service based interface.

Table 6.2.6.1-2: Nupf\_GetPrivateUEIPaddr re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| Dnn | 3GPP TS 29.571 [16] | DNN |  |
| Snssai | 3GPP TS 29.571 [16] | S-NSSAI |  |
| Ipv4Addr | 3GPP TS 29.571 [16] | IPv4 address |  |
| Ipv6Prefix | 3GPP TS 29.571 [16] | IPv6 address prefix |  |
| Supi | 3GPP TS 29.571 [16] | SUPI |  |
| Gpsi | 3GPP TS 29.571 [16] | GPSI |  |

#### 6.2.6.2 Structured data types

##### 6.2.6.2.1 Introduction

This clause defines the structures to be used in resource representations.

##### 6.2.6.2.2 Type: UeIpInfo

Table 6.2.6.2.2-1: Definition of type UeIpInfo

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| privateIpv4Address | Ipv4Address | O | 0..1 | When present, this IE shall contain the Private IPv4 IP address. |
| ipDomain | string | O | 0..1 | When present, this IE contains the IP domain of the private IPv4 address. |
| privateIpv6Prefix | Ipv6Prefix | O | 0..1 | When present, this IE shall contain the Private IPv6 Prefix. |
| publicIpv4Address | Ipv4Address | O | 0..1 | When present, this IE shall contain the public (NATed) IPv4 IP address. |
| publicIpv6Prefix | Ipv6Prefix | O | 0..1 | When present, this IE shall contain the public (NATed) IPv6 Prefix. |
| portNumber | Uint16 | O | 0..1 | When present, this IE shall contain the port number for the source UDP or TCP port when Port Address Translation is used. |
| dnn | Dnn | O | 0..1 | When present, this IE shall contain the DNN of the PDU Session. |
| snssai | Snssai | O | 0..1 | When present, this IE shall contain the S-NSSAI of the PDU Session. |
| hplmnSnssai | Snssai | O | 0..1 | This IE may be included by a V-UPF acting as (local) PSA for a HR-SBO PDU session.  When present, it shall contain the HPLMN S-NSSAI of the PDU session. |
| supi | Supi | O | 0..1 | When present, this IE shall contain the SUPI of the UE. |
| gpsi | Gpsi | O | 0..1 | When present, this IE shall contain the GPSI of the UE. |

#### 6.2.6.3 Simple data types and enumerations

##### 6.2.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

### 6.2.7 Error Handling

#### 6.2.7.1 General

For the Nupf\_GetPrivateUEIPaddr API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] 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 [4].

In addition, the requirements in the following clauses are applicable for the Nupf\_GetPrivateUEIPaddr API.

#### 6.2.7.2 Protocol Errors

No specific procedures for the Nupf\_GetPrivateUEIPaddr service are specified.

#### 6.2.7.3 Application Errors

The application errors defined for the Nupf\_GetPrivateUEIPaddr service are listed in Table 6.2.7.3-1.

Table 6.2.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| NO\_UE\_IP\_INFO\_FOUND | 404 Not Found | There is no UE IP address matching the query parameters. |

### 6.2.8 Feature negotiation

The optional features in table 6.2.8-1 are defined for the Nupf\_GetPrivateUEIPaddr API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.2.8-1: Supported Features

|  |  |  |
| --- | --- | --- |
| Feature number | Feature Name | Description |
|  |  |  |

### 6.2.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Nupf\_GetPrivateUEIPaddr API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nupf\_GetPrivateUEIPaddr API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Nupf\_GetPrivateUEIPaddr service.

The Nupf\_GetPrivateUEIPaddr API defines a single scope "nupf\_gueip" for the entire service, and it does not define any additional scopes at resource or operation level.

### 6.2.10 HTTP redirection

An HTTP request may be redirected to a different UPF service instance when using direct or indirect communications (see 3GPP TS 29.500 [4]).

An SCP that reselects a different UPF producer instance will return the NF Instance ID of the new UPF producer instance in the 3gpp-Sbi-Producer-Id header, as specified in clause 6.10.3.4 of 3GPP TS 29.500 [4].

If an UPF redirects a service request to a different UPF using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new UPF towards which the service request is redirected shall be indicated in the 3gpp-Sbi-Target-Nf-Id header of the 307 Temporary Redirect or 308 Permanent Redirect response as specified in clause 6.10.9.1 of 3GPP TS 29.500 [4].

Annex A (normative):  
OpenAPI specification

# A.1 General

This Annex specifies the formal definition of the API(s) defined in the present specification. It consists of OpenAPI specifications in YAML format.

This Annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE 1: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see 3GPP TS 29.501 [5] clause 5.3.1 and 3GPP TR 21.900 [7] clause 5B).

# A.2 Nupf\_EventExposure API

openapi: 3.0.0

info:

title: 'UPF Event Exposure Service'

version: 1.1.0-alpha.4

description: |

UPF Event Exposure Service.

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externalDocs:

description: 3GPP TS 29.564 V18.3.0; 5G System; User Plane Function Services; Stage 3.

url: https://www.3gpp.org/ftp/Specs/archive/29\_series/29.564/

servers:

- url: '{apiRoot}/nupf-ee/v1'

variables:

apiRoot:

default: https://example.com

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

security:

- {}

- oAuth2ClientCredentials:

- nupf-ee

paths:

/ee-subscriptions:

post:

summary: Nupf\_EventExposure Subscribe service Operation

operationId: CreateSubscription

tags:

- Subscriptions (Collection)

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'201':

description: Successful creation of an UPF Event Subscription

headers:

Location:

description: 'Contains the URI of the newly created resource, according to the structure: {apiRoot}/nupf-ee/<apiVersion>/ee-subscriptions/{subscriptionId}'

required: true

schema:

type: string

content:

application/json:

schema:

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

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'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'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

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

default:

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

callbacks:

eeNotification:

'{eventNotificationUri}':

# The URI in {eventNotificationUri} is provided via N4 interface during provisioning of Session Reporting Rule or in the Nupf\_EventExposure Subscribe request.

post:

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'204':

description: No Content, Notification was succesfull

'307':

description: Temporary Redirect

content:

application/json:

schema:

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

headers:

Location:

description: 'The URI pointing to the resource located on the redirect target NF service consumer'

required: true

schema:

type: string

'308':

description: Permanent Redirect

content:

application/json:

schema:

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

headers:

Location:

description: 'The URI pointing to the resource located on the redirect target NF service consumer'

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'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

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

default:

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

/ee-subscriptions/{subscriptionId}:

patch:

summary: Nupf\_EventExposure Subscribe Modify service Operation

operationId: ModifySubscription

parameters:

- name: subscriptionId

in: path

required: true

description: Unique ID of the subscription to be modified

schema:

type: string

requestBody:

content:

application/json-patch+json:

schema:

type: array

items:

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

minItems: 1

required: true

responses:

'200':

description: Expected response to a valid request

content:

application/json:

schema:

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

'204':

description: Successful response

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'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'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

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

default:

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

delete:

summary: Nupf\_EventExposure UnSubscribe service Operation

operationId: DeleteSubscription

parameters:

- name: subscriptionId

in: path

required: true

description: Unique ID of the subscription to be deleted

schema:

type: string

responses:

'204':

description: Subsription deleted successfully

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'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'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'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:

nupf-ee: Access to the Nupf\_EventExposure API

schemas:

# API specific definitions

# STRUCTURED DATA TYPES

NotificationData:

description: the list of NotificationItems

type: object

required:

- notificationItems

properties:

notificationItems:

type: array

items:

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

minItems: 1

correlationId:

type: string

achievedSampRatio:

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

NotificationItem:

description: represents a report on one subscribed event

type: object

required:

- eventType

- timeStamp

anyOf:

- required: [ ueIpv4Addr ]

- required: [ ueIpv6Prefix ]

- required: [ ueMacAddr ]

properties:

eventType:

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

ueIpv4Addr:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

ueIpv6Prefix:

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

ueMacAddr:

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

dnn:

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

snssai:

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

gpsi:

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

supi:

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

timeStamp:

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

startTime:

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

qosMonitoringMeasurement:

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

tscMngtInfo:

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

userDataUsageMeasurements:

type: array

items:

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

minItems: 1

UpfEventSubscription:

description: UPF Event Subscription

type: object

properties:

eventList:

type: array

items:

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

minItems: 1

eventNotifyUri:

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

notifyCorrelationId:

type: string

eventReportingMode:

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

nfId:

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

ueIpAddress:

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

supi:

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

gpsi:

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

pei:

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

anyUe:

type: boolean

default: false

dnn:

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

snssai:

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

required:

- eventList

- eventNotifyUri

- notifyCorrelationId

- eventReportingMode

- nfId

UpfEventMode:

description: UPF Event Mode

type: object

properties:

trigger:

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

maxReports:

type: integer

expiry:

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

repPeriod:

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

sampRatio:

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

partitioningCriteria:

type: array

items:

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

minItems: 1

notifFlag:

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

mutingExcInstructions:

writeOnly: true

allOf:

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

mutingNotSettings:

readOnly: true

allOf:

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

required:

- trigger

UpfEvent:

description: UPF Event

type: object

properties:

type:

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

immediateFlag:

type: boolean

default: false

measurementTypes:

type: array

items:

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

minItems: 1

appIds:

type: array

items:

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

minItems: 1

trafficFilters:

type: array

items:

$ref: 'TS29512\_Npcf\_SMPolicyControl.yaml#/components/schemas/FlowInformation'

minItems: 1

granularityOfMeasurement:

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

reportingSuggestionInfo:

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

required:

- type

CreateEventSubscription:

description: Data within UPF Create Event Subscription Request

type: object

properties:

subscription:

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

supportedFeatures:

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

required:

- subscription

CreatedEventSubscription:

description: Data within UPF Create Event Subscription Response

type: object

properties:

subscription:

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

subscriptionId:

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

reportList:

type: array

items:

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

minItems: 1

supportedFeatures:

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

required:

- subscription

- subscriptionId

ReportingSuggestionInformation:

description: Reporting Suggestion Information

type: object

properties:

reportingUrgency:

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

reportingTimeInfo:

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

required:

- reportingUrgency

QosMonitoringMeasurement:

description: QoS Monitoring Measurement information

type: object

properties:

flowInfos:

type: array

items:

$ref: 'TS29512\_Npcf\_SMPolicyControl.yaml#/components/schemas/FlowInformation'

minItems: 1

appIds:

type: array

items:

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

minItems: 1

dlPacketDelay:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uint32'

ulPacketDelay:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uint32'

rtrPacketDelay:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uint32'

measureFailure:

type: boolean

enum:

- true

dlAveThroughput:

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

ulAveThroughput:

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

dlCongestion:

type: string

ulCongestion:

type: string

defaultQosFlowInd:

type: boolean

default: false

# Editor's note: the encoding of the dlCongestion and ulCongestion IEs is FFS

TscManagementInfo:

description: TSC Management Information

type: object

properties:

pmics:

type: array

items:

$ref: 'TS29512\_Npcf\_SMPolicyControl.yaml#/components/schemas/PortManagementContainer'

minItems: 1

umic:

$ref: 'TS29512\_Npcf\_SMPolicyControl.yaml#/components/schemas/BridgeManagementContainer'

UserDataUsageMeasurements:

description: >

User Data Usage Measurements either for the PDU session, or the app-id, or the data flow

type: object

properties:

appId:

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

flowInfo:

$ref: 'TS29512\_Npcf\_SMPolicyControl.yaml#/components/schemas/FlowInformation'

volumeMeasurement:

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

throughputMeasurement:

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

applicationRelatedInformation:

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

throughputStatisticsMeasurement:

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

VolumeMeasurement:

description: Volume Measurement information

type: object

properties:

totalVolume:

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

ulVolume:

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

dlVolume:

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

totalNbOfPackets:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uint64'

ulNbOfPackets:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uint64'

dlNbOfPackets:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uint64'

ThroughputMeasurement:

description: Throughput Measurement information

type: object

properties:

ulThroughput:

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

dlThroughput:

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

ulPacketThroughput:

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

dlPacketThroughput:

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

ApplicationRelatedInformation:

description: Application Related Information

type: object

properties:

urls:

type: array

items:

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

minItems: 1

domainInfoList:

type: array

items:

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

minItems: 1

ThroughputStatisticsMeasurement:

description: Throughput Statistics Measurement

type: object

properties:

ulAverageThroughput:

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

dlAverageThroughput:

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

ulPeakThroughput:

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

dlPeakThroughPut:

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

ulAveragePacketThroughput:

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

dlAveragePacketThroughput:

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

ulPeakPacketThroughput:

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

dlPeakPacketThroughput:

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

DomainInformation:

description: Domain Information

type: object

properties:

domainName:

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

domainNameProtocol:

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

required:

- domainName

# ENUMS

EventType:

description: Event Type

anyOf:

- type: string

enum:

- QOS\_MONITORING

- USER\_DATA\_USAGE\_MEASURES

- USER\_DATA\_USAGE\_TRENDS

- TSC\_MNGT\_INFO

- type: string

UpfEventTrigger:

description: Upf Event Trigger

anyOf:

- type: string

enum:

- ONE\_TIME

- PERIODIC

- type: string

MeasurementType:

description: Measurement Type

anyOf:

- type: string

enum:

- VOLUME\_MEASUREMENT

- THROUGHPUT\_MEASUREMENT

- APPLICATION\_RELATED\_INFO

- type: string

GranularityOfMeasurement:

description: Granularity Of Measurement

anyOf:

- type: string

enum:

- PER\_APPLICATION

- PER\_SESSION

- PER\_FLOW

- type: string

DnProtocol:

description: Domain Name Protocol

anyOf:

- type: string

enum:

- DNS\_QNAME

- TLS\_SNI

- TLS\_SAN

- TLS\_SCN

- type: string

ReportingUrgency:

description: Reporting Urgency

anyOf:

- type: string

enum:

- DELAY\_TOLERANT

- NON\_DELAY\_TOLERANT

- type: string

# SIMPLE TYPES

# A.3 Nupf\_GetPrivateUEIPaddr API

openapi: 3.0.0

info:

version: '1.0.0-alpha.3'

title: 'UPF GET Private UE IP address Service'

description: |

Nupf\_GetPrivateUEIPaddr Service.

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externalDocs:

description: 3GPP TS 29.564 V18.3.0; 5G System; 5G System; User Plane Function Services; Stage 3

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.564/'

servers:

- url: '{apiRoot}/nupf-gueip/v1'

variables:

apiRoot:

default: https://example.com

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

security:

- {}

- oAuth2ClientCredentials:

- nupf-gueip

paths:

/ue-ip-info:

get:

summary: Search UeIpInfo for a PDU session from the UeIpInfo

operationId: SearchUeIpInfo

tags:

- UE IP Info\_Get

parameters:

- name: snssai

in: query

description: Slice of the PDU session

schema:

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

- name: dnn

in: query

description: Dnn of the PDU session

schema:

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

- name: ue-ipv4-address

in: query

description: IPv4 address of the UE

schema:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

- name: ue-ipv6-prefix

in: query

description: IPv6 prefix of the UE

schema:

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

- name: port-number

in: query

description: UDP or TCP port associated with the public address

schema:

type: integer

minimum: 0

maximum: 65535

responses:

'200':

description: Successful response

content:

application/json:

schema:

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

'307':

description: Temporary Redirect

content:

application/json:

schema:

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

headers:

Location:

description: The URI pointing to the resource located on the redirect target UPF

schema:

type: string

'308':

description: Permanent Redirect

content:

application/json:

schema:

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

headers:

Location:

description: The URI pointing to the resource located on the redirect target UPF

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'

'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'

'501':

$ref: 'TS29571\_CommonData.yaml#/components/responses/501'

'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:

nupf-gueip: Access to the Nupf\_GetPrivateUEIPaddr API

schemas:

UeIpInfo:

description: a UE IP Address Info for a PDU session

type: object

properties:

privateIpv4Address:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

ipDomain:

type: string

privateIpv6Prefix:

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

publicIpv4Address:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

publicIpv6Prefix:

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

portNumber:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uint16'

dnn:

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

snssai:

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

hplmnSnssai:

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

supi:

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

gpsi:

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

Annex B (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2021-09 | CT4#105e | C4-214754 |  |  |  | Version after CT4#105-e including agreed pCRs:  C4-214464  C4-214465  C4-214559 | 0.1.0 |
| 2021-10 | CT4#106e | C4-215518 |  |  |  | Version after CT4#106-e including agreed pCRs:  C4-215441  C4-215443  C4-215532  C4-215536 | 0.2.0 |
| 2021-11 | CT4#107e | C4-216471 |  |  |  | Version after CT4#107-e including agreed pCRs:  C4-216524  C4-216525 | 0.3.0 |
| 2021-12 | CT#94e | CP-213167 |  |  |  | V1.0.0 presented for information | 1.0.0 |
| 2022-01 | CT4#107bis-e | C4-220453 |  |  |  | Version after CT4#107bis-e including agreed pCRs:  C4-220146  C4-220147  C4-220148  C4-220149 | 1.1.0 |
| 2022-02 | CT4#108-e | C4-221591 |  |  |  | Editorial corrections of the rapporteur | 1.2.0 |
| 2022-03 | CT#95-e | CP-220106 |  |  |  | TS presented for approval | 2.0.0 |
| 2022-03 | CT#95-e |  |  |  |  | TS approved | 17.0.0 |
| 2022-06 | CT#96-e | CP-221034 | 0001 | 2 | B | Resolving Editor's Note on Notification Information | 17.1.0 |
| 2022-06 | CT#96-e | CP-221051 | 0003 |  | F | 29.564 Rel-17 API version and External doc update | 17.1.0 |
| 2022-09 | CT#97-e | CP-222029 | 0005 |  | F | Description fields | 17.2.0 |
| 2022-09 | CT#97-e | CP-222029 | 0004 | 1 | F | Reporting Packet Delay Measurement Failure to AF/NEF when direct reporting applies | 17.2.0 |
| 2022-09 | CT#97-e | CP-222029 | 0006 | 1 | F | Add MAC address information in NotificationItem | 17.2.0 |
| 2022-09 | CT#97-e | CP-222058 | 0008 |  | F | 29.564 Rel-17 API version and External doc update | 17.2.0 |
| 2023-03 | CT#99 | CP-230034 | 0010 | 1 | B | Service operations of the UPF event exposure service | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0011 | 1 | B | Subscriptions to UPF events | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0012 | 1 | B | UPF events supported by the UPF event exposure service | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0014 | 1 | B | Unsubscribe service operation | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0015 | 1 | B | Resource URI structure of the UPF event exposure API | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0017 | 1 | B | Security of UPF Event Exposure service | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0022 | 1 | B | Service operations of Nupf\_EventExposure service | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0019 | 1 | B | Nupf\_GetPrivateUEIPaddr service operation and API | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0021 | 1 | B | Resource and data type of Nupf\_GetPrivateUEIPaddr service | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0009 | 3 | B | Updates to the Introduction of TS 29.564 | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0013 | 2 | B | Subscribe service operation | 18.0.0 |
| 2023-03 | CT#99 | CP-230034 | 0023 | 2 | B | Resource for Nupf\_EventExposure service | 18.0.0 |
| 2023-03 | CT#99 | CP-230071 | 0029 |  | F | 29.564 Rel-18 API version and External doc update | 18.0.0 |
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| 2023-06 | CT#100 | CP-231035 | 0030 |  | F | Correction on DNN and S-NSSAI in Nupf\_GetPrivateUEIPaddr\_Get Operation | 18.1.0 |
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