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Contents

Intelle	ectual Property Rights	2
Legal	Notice	2
Moda	ıl verbs terminology	2
Forew	vord	6
1	Scope	8
2	References	8
3	Definitions, symbols and abbreviations	9
3.1	Definitions	9
3.2	Symbols	9
3.3	Abbreviations	
4	Overview	9
4.1	Introduction	9
5	Services offered by the UPF	10
5.1	Introduction	
5.2	Nupf_EventExposure Service	11
5.2.1	Service Description	11
5.2.1.1	•	
5.2.1.2	1	
5.2.1.3		
5.2.1.3		
5.2.1.3		
5.2.1.3	č	
5.2.1.3	$\boldsymbol{\varepsilon}$	
5.2.1.3	3.5 TSC Management Information	15
5.2.2	Service Operations	15
5.2.2.1	I Introduction	15
5.2.2.2		
5.2.2.2		
5.2.2.2		
5.2.2.2	1	
5.2.2.2 5.2.2.2		
5.2.2.2		
5.2.2.3	·	
5.2.2.3		
5.2.2.3	3.2 UPF sends notification on subscribed events	20
5.3	Nupf_GetUEPrivateIPaddrAndIdentifiers Service	21
5.3.1	Service Description	21
5.3.2	Service Operations	21
5.3.2.1	•	
5.3.2.2		
5.3.2.2		
6	API Definitions	22
6.1	Nupf_EventExposure Service API	
6.1.1	API URI	
6.1.2	Usage of HTTP	
6.1.2.1		
6.1.2.2		
6.1.2.2		23
6.1.2.2	2.2 Content type	23
6.1.2.3	HTTP custom headers	23
6.1.3	Resources	23
6.1.3.1		-
	© 101 110 W MINISTER MANAGEMENT AND	

6.1.3.2	Resource: EventExposureSubscriptions	24
6.1.3.2.1	Description	
6.1.3.2.2	Resource Definition	
6.1.3.2.3	Resource Standard Methods	
6.1.3.2.4	Resource Custom Operations	
6.1.3.3	Resource: Individual subscription	
6.1.3.3.1	Description	
6.1.3.3.2	Resource Definition	
6.1.3.3.3	Resource Standard Methods	
6.1.3.3.4	Resource Custom Operations	
6.1.4	void	
6.1.5 6.1.5.1	Notifications	
6.1.5.1	Event Notification	
6.1.5.2.1	Description	
6.1.5.2.1	Target URI	
6.1.6	Data Model	
6.1.6.1	General	
6.1.6.2	Structured data types	
6.1.6.2.1	Introduction	
6.1.6.2.2	Type: NotificationData	
6.1.6.2.3	Type: NotificationItem	
6.1.6.2.4	Type: QosMonitoringMeasurement	
6.1.6.2.5	Type: UserDataUsageMeasurements	
6.1.6.2.6	Type: VolumeMeasurement	
6.1.6.2.7	Type: ThroughputMeasurement	
6.1.6.2.8	Type: ApplicationRelatedInformation	
6.1.6.2.9	Type: ThroughputStatisticMeasurement	
6.1.6.2.10		
6.1.6.2.11	Type: UpfEventSubscription	
6.1.6.2.12		
6.1.6.2.13	Type: UpfEvent	
6.1.6.2.14	Type: CreateEventSubscription	45
6.1.6.2.15	Type: CreatedEventSubscription	45
6.1.6.2.16	Type: ReportingSuggestionInformation	45
6.1.6.2.17	Type: TscManagementInfo	45
6.1.6.3	Simple data types and enumerations	
6.1.6.3.1	Introduction	
6.1.6.3.2	Simple data types	
6.1.6.3.3	Enumeration: EventType	
6.1.6.3.4	Enumeration: UpfEventTrigger	
6.1.6.3.5	Enumeration: MeasurementType	
6.1.6.3.6	Enumeration: GranularityOfMeasurement	
6.1.6.3.7	Enumeration: DnProtocol	
6.1.6.3.8	Enumeration: ReportingUrgency	
6.1.7	Error Handling	
6.1.7.1	General	
6.1.7.2	Protocol Errors	
6.1.7.3	Application Errors	
6.1.8	Feature negotiation	
6.1.9	Security	
6.1.10	HTTP redirection	
6.2 6.2.1	Nupf_GetUEPrivateIPaddrAndIdentifiers Service API	
6.2.1		
6.2.2.1	Usage of HTTPGeneral	
6.2.2.1	HTTP standard headers	
6.2.2.2.1	General	
6.2.2.2.1	Content type	
6.2.2.3	HTTP custom headers	
6.2.3	Resources	
6.2.3.1	Overview	
U.2.J.1	○ 101 110 H	

6.2.3.2	Resource: UE IP Address Info	50
6.2.3.2.1	Description	50
6.2.3.2.2	Resource Definition	50
6.2.3.2.3	Resource Standard Methods	50
6.2.3.2.4	Resource Custom Operations	52
6.2.4	Custom Operations without associated resources	52
6.2.5	Notifications	52
6.2.5.1	General	52
6.2.6	Data Model	52
6.2.6.1	General	52
6.2.6.2	Structured data types	52
6.2.6.2.1	Introduction	52
6.2.6.2.2	Type: UeIpInfo	53
6.2.6.3	Simple data types and enumerations	53
6.2.6.3.1	Introduction	53
6.2.7	Error Handling	53
6.2.7.1	General	
6.2.7.2	Protocol Errors	
6.2.7.3	Application Errors	54
6.2.8	Feature negotiation	
6.2.9	Security	
6.2.10	HTTP redirection	54
Annex A	(normative): OpenAPI specification	55
A.1 Gen	neral	55
A.2 Nup	of_EventExposure API	55
A.3 Nup	of_GetUEPrivateIPaddrAndIdentifiers API	63
Annex B ((informative): Change history	67
History		

Foreword

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- 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:

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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

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can indicates that something is possiblecannot 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.
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- 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

NAT Network Address Translation 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.

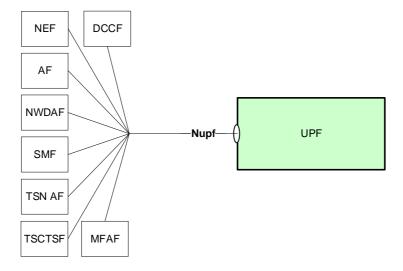


Figure 4.1-1: Reference model - UPF

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_GetUEPrivateIPaddrAndIdentifiers

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_GetUEPrivateIPaddrAndIdentifiers	This service provides the private UE IP address information of a PDU session from the (NATed) public IP address and port number	NEF

Table 5.1-2 summarizes the corresponding APIs defined for this specification.

Table 5.1-2: API Descriptions

Service Name	Claus e	Descriptio n	OpenAPI Specification File	apiNam e	Anne x
Nupf_EventExposure	6.1	UPF Event Exposure Service	TS29564_Nupf_EventExposure.yaml	nupf-ee	A.2
Nupf_GetUEPrivateIPaddr AndIdentifiers	6.2	UPF Get UE Private IP address and Identifiers Service	TS29564_Nupf_GetUEPrivatelPaddrAndl dentifiers.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	Example
		Semantics	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 type	Subscription via Sivir using FFGF
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, 5.24.5 and 5.39 of 3GPP TS 29.244 [15].
Report type	Continuous (event triggered) Report (for Packet Delay, Data Rate and Congestion Information). Periodic Report (for Packet Delay and Data Rate)

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: measurements of data volume exchanged (UL, DL and/or overall) and/or number of packets exchanged (UL, DL and/or overall) determined for the requested Granularity of Measurements.
	 Throughput Measurement: measurements of data throughput (UL and DL) determined for the requested Granularity of Measurements.
	 Application related information: URL(s) and/or Domain information (domain name and protocol) detected for the target traffic. This Type of Measurement requires that Application Id(s) or Traffic Filtering Information is provided (i.e. this measurement is not possible to be applied for all traffic handled by the UPF).
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, BSSID/SSID and DNAI.
	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, BSSID/SSID and DNAI.
Subscription inputs to UPF	Required: - UE IP address or "Any UE" - Type of Measurement (i.e. Volume, Throughput, Application related information) - UPF event consumer notification URI - Notification correlation ID
	Optional: - DNN(s) - S-NSSAI(s) - either Application ID(s) or Traffic filters
	- Granularity of Measurement (i.e. required granularity for the information reported, i.e. per PDU session, per data flow or per application) - Reporting suggestion information (i.e. Report urgency, Reporting time information)
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 Statistic Measurement (average and/or peak throughput) over the measurement period determined for the requested Granularity of Measurements.
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, BSSID/SSID and DNAI. 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, BSSID/SSID and DNAI.
Subscription inputs to UPF	Required: - UE IP address or "Any UE" - UPF event consumer notification URI - Notification correlation ID Optional: - DNN(s) - S-NSSAI(s) - either Application ID(s) or Traffic filters - Granularity of Measurement (i.e. required granularity for the information reported, i.e per PDU session, per data flow or per application) - Reporting suggestion information (i.e. Report urgency, Reporting time information)
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.

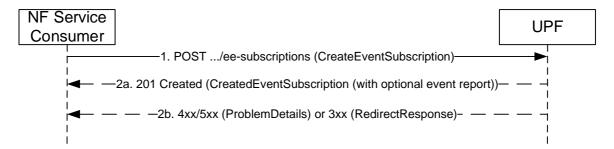


Figure 5.2.2.2.1 Subscription creation

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;
- Type of measurement, for UPF events supporting multiple types of measurement, e.g. for a subscription to the UserDataUsageMeasures event;
- 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:

- one or more S-NSSAI(s) and/or DNN(s) of PDU sessions to which the subscription applies;
- either one or more Application ID(s) or traffic filters identifying the traffic to be monitored by the subscription;

- 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 reports;
- 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 stored events;
- Immediate Report Flag per event, indicating an immediate report to be generated with the current event status;
- 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, in which case the UPF shall only report the event(s) related to the selected subset of PDU sessions;
- partitioningCriteria, defining the criteria for partitioning PDU sessions before applying the sampling ratio; and/or
- 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 in the response message indicating that the requested resource is created.

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".

For a subscription request targeting a PDU session, if the UPF cannot find a unique PDU session due to no DNN and/or S-NSSAI being received in the request, the UPF shall reject the request with a 403 Forbidden response and the application error "REJECTION_DUE_TO_NO_DNN_SNSSAI" (see clause 54.4.1.2 of 3GPP TS 23.502 [3]).

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.

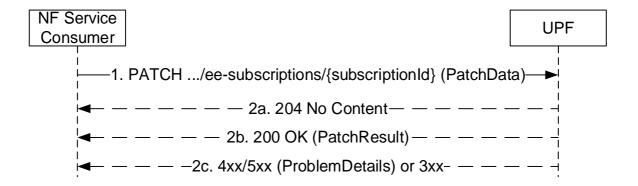


Figure 5.2.2.3-1: Modification of a subscription

- 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.

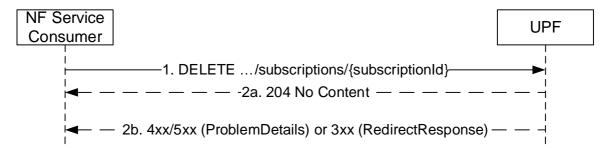


Figure 5.2.2.2A.1-1 Unsubscribing from UPF events

- 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. See Figure 5.2.2.3.2-1.

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 in the subscription creation request, the UPF shall perform the requested measurements for every PDU session that matches the event filter information (i.e. S-NSSAIs, DNNs, either Application ID(s) or traffic filters) 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. 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: measurements of data volume exchanged (UL, DL and/or overall) and/or number of packets exchanged (UL, DL and/or overall) determined for the requested Granularity of Measurements.

- Throughput Measurement: measurements of data throughput (UL and DL) determined for the requested Granularity of Measurements.
- Application related Information: URLs and/or Domain information (Domain name and protocol) detected in the target 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 shall include 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 determined for the requested Granularity of Measurements.

When the granularity of the measurement is per data flow, the notification shall include 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 types of event notifications:

- 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

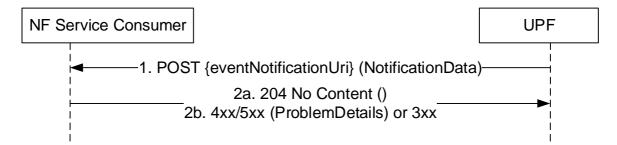


Figure 5.2.2.3.2-1: UPF sends notification on subscribed events

- 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_GetUEPrivateIPaddrAndIdentifiers Service

5.3.1 Service Description

The Nupf_GetUEPrivateIPaddrAndIdentifiers Service enables the UPF to provide the UE IP address information of a PDU session and optionally UE identifiers (e.g. SUPI, GPSI), 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), when the NAT functionality of the UE IP address is deployed within the UPF.

Table 5.3.1-1 lists the service operations that are supported by the Nupf_GetUEPrivateIPaddrAndIdentifiers service.

Table 5.3.1-1: Service operations supported by the Nupf_GetUEPrivatelPaddrAndIdentifiers 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_GetUEPrivateIPaddrAndIdentifiers 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];
- AF traffic influence request without HPLMN DNN, S-NSSAI information for a single UE, private IP address or public IP address owned by VPLMN as specified in clause 4.3.6.5.3 of 3GPP TS 23.502 [3];
- AF traffic influence request without HPLMN DNN, S-NSSAI information for a single UE, UE IP address owned and assigned by HPLMN as specified in clause 4.3.6.5.4 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.

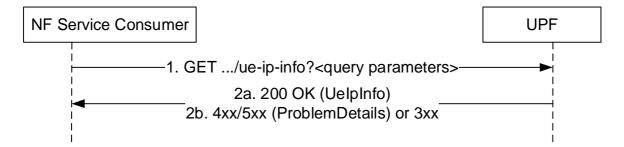


Figure 5.3.2.2.1-1: Retrieval of UE IP Info for a PDU session

- 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

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.:

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

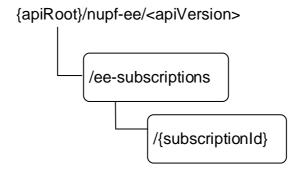


Figure 6.1.3.1-1: Resource URI structure of the nupf-ee API

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		DELETE	Unsubscribe service operation
•	/ee-subscriptions/{subscriptionId}	PATCH	Subscribe service operation,
(Document)			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	Р	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	Р	Cardinality	Description
CreateEventSubs	M	1	Content of the Subscribe request to create a subscription.
cription			

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

Data type	Р	Cardinality	Response codes	Description	
CreatedEventSub scription	М	1	201 Created	Represents successful creation of an UPF Event Subscription	
RedirectRespons e	0	01	307 Temporary Redirect	Temporary redirection. (NOTE 2)	
RedirectRespons e	0	01	308 Permanent Redirect	Permanent redirection. (NOTE 2)	
ProblemDetails	0	01	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 - REJECTION_DUE_TO_NO_DNN_SNSSAI	
ProblemDetails	0	01	501 Not Implemente d	The "cause" attribute may be used to indicate one of the following application errors: - UNSUPPORTED_EVENT_TYPE	
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					

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

NOTE 2: RedirectResponse may be inserted by an SCP, see clause 6.10.9.1 of 3GPP TS 29.500 [4].

Name	Data type	Р	Cardinality	Description
Location	string	М		Contains the URI of the newly created resource, according to
				the structure: {apiRoot}/nupf-ee/ <apiversion>/ee-</apiversion>
				subscriptions/{subscriptionId}

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

Name	Data type	Р	Cardinality	Description
Location	string	M		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	0		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		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	0		Identifier of the target NF (service) instance ID towards which the request is redirected

6.1.3.2.4 Resource Custom Operations

clause 5.2.7 of 3GPP TS 29.500 [4]).

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	Р	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	Р	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	Р	Cardinality	Response	Description
			codes	
n/a			204 No	
			Content	
RedirectResponse	0	01	307	Temporary redirection.
			Temporary	(NOTE 2)
			Redirect	
RedirectResponse	0	01	308	Permanent redirection.
			Permanent	(NOTE 2)
			Redirect	
ProblemDetails	0	01	404 Not	Indicates the modification of subscription has failed due to
			Found	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 cod	e for the DEL	ETE method listed in Table 5.2.7.1-1 of
3GPP TS 29.50	0 [4] a	lso apply, with r	esponse body	containing an object of ProblemDetails data type (see
clause 5.2.7 of	3GPP	TS 29.500 [4]).	_	
NOTE 2: RedirectRespor	nse ma	y 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	Р	Cardinality	Description
Location	string	M		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	0		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	Р	Cardinality	Description
Location	string	M		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	0		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	Р	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	Р	Cardinality	Description
array(PatchItem)	M	1N	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	Р	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)
RedirectRespons e	0	01	307 Temporary Redirect	Temporary redirection. (NOTE 3)
RedirectRespons e	0	01	308 Permanent Redirect	Permanent redirection. (NOTE 3)
ProblemDetails	О	01	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				
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				

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	Р	Cardinality	Description
Location	string	M		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	0	01	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	Р	Cardinality	Description
Location	string	M		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	0		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	Р	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	Р	Cardinality	Description
NotificationData	М	1	Representation of the event notification.

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

Data type	Р	Cardinality	Response codes	Description
n/a			204 No Content	This case represents a successful notification of the event.
ProblemDetails	0	01	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	0	01	307 Temporary Redirect	Temporary redirection. (NOTE 2)
RedirectResponse	0	01	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: RedirectRe	espor	ise may be ins	serted 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	Р	Cardinality	Description
Location	string	М	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-	string	0	01	Identifier of the target NF instance ID towards which the
Nf-Id				notification is redirected

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

Name	Data type	Р	Cardinality	Description
Location	string	M		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	0		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	
lpv4Addr	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	Р	Cardinality	Description	Applicability
notificationItems	array(Notificatio	М	1N	List of NotificationItem,	
	nltem)			whereby each entry shall	
				correspond to a report for	
				one subscribed event per	
				PDU session.	
correlationId	string	С	01	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]) or	
				if the notifyCorrelationId IE	
				was received in the	
				Nupf_EventExposure	
				Subscribe request.	
				When present, it shall be set	
				to the notification correlation	
				ID received via the N4 or	
achievedCompDeti	ComplinaDatio	_	0.1	Nupf interface.	
achievedSampRati	SamplingRatio	0	01	This IE may be included for	
O				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	Р	Cardinality	Description	Applicability
eventType	EventType	М	1	The event type of the event	
				for which the notification is	
				generated.	
uelpv4Addr	lpv4Addr	С	01	IPv4 address of the UE	
				(NOTE 1, NOTE 3)	
uelpv6Prefix	Ipv6Prefix	С	01	IPv6 address prefix of the	
				UE (NOTE 1, NOTE 3)	
ueMacAddr	MacAddr48	0	01	MAC address of the UE.	
				(NOTE 2, NOTE 3)	
dnn	Dnn	0	01	When present, this attribute	
				indicates the DNN of the	
				PDU session for which the	
				notification is generated.	
snssai	Snssai	0	01	When present, this attribute	
				indicates the S-NSSAI of	
				the PDU session for which	
				the notification is generated.	
gpsi	Gpsi	0	01	When present, this attribute	
				indicates the GPSI of the	
				UE for which the notification	
				is generated.	
supi	Supi	0	01	Subscription Permanent	
				Identifier	
timeStamp	DateTime	М	1	The value represents the	
				UTC time when the	
				information in this report	
				was generated.	
startTime	DateTime	0	01	When present, this attribute	
				shall provide the timestamp	
				when the information	
				measured for generating	
				this report was started.	
qosMonitoringMea	QosMonitoring	С	01	This attribute shall be	
surement	Measurement			present if eventType is set	
				to "QOS_MONITORING".	
userDataUsageMe	array(UserData	С	1N	This IE shall be present if	
asurements	UsageMeasure			eventType is set to	
	ments)			"USER_DATA_USAGE_ME	
				ASURES" or	
				"USER_DATA_USAGE_TR	
				ENDS".	
tscMngtInfo	TscManagemen	С	01	This attribute shall be	
	tInfo			present if eventType is set	
NOTE 4				to "TSC_MNGT_INFO".	II. (ID DD)

NOTE 1: At least one of uelpv4Addr and uelpv6Prefix 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 uelpv4Addr nor uelpv6Prefix.

NOTE 3: At least one of uelpv4Addr, uelpv6Prefix and ueMacAddr shall be present.

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
dlPacketDelay	Uint32	0	01	When present, the value of	
				this attribute is set to the	
				measured downlink packet	
				delay in millisecond (ms).	
ulPacketDelay	Uint32	0	01	When present, the value of	
				this attribute is set to the	
				measured uplink packet	
				delay in millisecond (ms).	
rtrPacketDelay	Uint32	0	01	When present, the value of	
				this attribute is set to the	
				measured round trip packet	
				delay in millisecond (ms).	
measureFailure	boolean	С	01	This IE shall be present to	
				report packet delay	
				measurement failure.	
				Mhan macant it aball be act	
				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	
dlAveThroughput	BitRate	0	01	3GPP TS 29.244 [15]. When present, this IE shall	
diAve i filougriput	Dilkale	0	0 1	indicate the average data	
				throughput in downlink	
				direction as specified in	
				clause 5.39.3.4 of	
				3GPP TS 29.244 [15].	
ulAveThroughput	BitRate	0	01	When present, this IE shall	
an we i mougriput	Dilitato		01	indicate the average data	
				throughput in uplink	
				direction as specified in	
				clause 5.39.3.4 of	
				3GPP TS 29.244 [15].	
dlCongestion	integer	0	01	When present, this IE shall	
and an grant and				contain the Downlink	
				congestion information,	
				expressed as an integer	
				value in the range 0 to	
				10000, representing the	
				percentage of congestion	
				level in the downlink	
				direction, up to two decimal	
				points, for the QoS flow.	
				Minimum = 0. Maximum =	
				10000.	
				Example: the value 9574	
				corresponds to a	
				percentage of 95.74%.	

ulCongestion	integer	0	01	When present, this IE shall contain the Uplink congestion information,	
				expressed as an integer	
				value in the range 0 to	
				10000, representing the	
				percentage of congestion	
				level in the uplink direction,	
				up to two decimal points, for	
				the QoS flow.	
				Minimum = 0. Maximum =	
				10000.	
				Example: the value 9574	
				corresponds to a	
				percentage of 95.74%.	
defaultQosFlowInd	boolean	С	01	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].	
				0011 10 20.211 [10].	
				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	appl	ds IE should b	e present, not both.	

6.1.6.2.5 Type: UserDataUsageMeasurements

Table 6.1.6.2.5-1: Definition of type UserDataUsageMeasurements

Attribute name	Data type	Р	Cardinality	Description
appld	ApplicationId	С	01	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	С	01	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	С	01	This attribute shall be present if eventType is set to "USER_DATA_USAGE_MEASURES" and measurementType is set to "VOLUME_MEASUREMENT".
throughputMeasuremen t	ThroughputMeasure ment	С	01	This attribute shall be present if eventType is set to "USER_DATA_USAGE_MEASURES" and measurementType is set to "THROUGHPUT_MEASUREMENT".
applicationRelatedInfor mation	ApplicationRelatedInf ormation	С	01	This attribute shall be present if eventType is set to "USER_DATA_USAGE_MEASURES" and measurementType is set to "APPLICATION_RELATED_INFORMATION".
throughputStatisticMeas urements	ThroughputStatisticM easurement	С	01	This attribute shall be present if eventType is set to "USER_DATA_USAGE_TRENDS".

NOTE:

Either the appld or the flowInfo may be present, not both. When neither appld 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 appld is present, the measurements shall correspond to user plane measurements of the application identified by the appld. 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	Р	Cardinality	Description
totalVolume	TrafficVolume	0	01	When present, this IE shall indicate the total volume (bytes) of user plane traffic for both the uplink and downlink directions.
ulVolume	TrafficVolume	0	01	When present, this IE shall indicate the volume (bytes) of user plane traffic for the uplink direction.
dlVolume	TrafficVolume	0	01	When present, this IE shall indicate the volume (bytes) of user plane traffic for the downlink direction.
totalNbOfPackets	Uint64	0	01	When present, this IE shall indicate the total number of user plane packets for both uplink and downlink directions.
ulNbOfPackets	Uint64	0	01	When present, this IE shall indicate the number of user plane packets for the uplink direction.
dlNbOfPackets	Uint64	0	01	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	Р	Cardinality	Description
ulThroughput	BitRate	0	01	When present, this IE shall indicate the
				measurement of data throughput in uplink direction.
dlThroughput	BitRate	0		When present, this IE shall indicate the
				measurement of data throughput in downlink
				direction.
ulPacketThroughput	PacketRate	0	01	When present, this IE shall indicate the
				measurement of packet throughput in uplink
				direction.
dlPacketThroughput	PacketRate	0	01	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	Р	Cardinality	Description
urls	array(Uri)	0	1N	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(DomainInformat ion)	Ο	1N	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	Р	Cardinality	Description
ulAverageThroughput	BitRate	0	01	When present, this IE shall indicate the average throughput in uplink direction over the measurement period.
dlAverageThroughput	BitRate	0	01	When present, this IE shall indicate the average throughput in downlink direction over the measurement period.
ulPeakThroughput	BitRate	0	01	When present, this IE shall indicate the peak throughput in uplink direction over the measurement period.
dlPeakThroughput	BitRate	0	01	When present, this IE shall indicate the peak throughput in downlink direction over the measurement period.
ulAveragePacketThroug hput	PacketRate	0	01	When present, this IE shall indicate the average packet throughput in uplink direction.
dlAveragePacketThroug hput	PacketRate	0	01	When present, this IE shall indicate the average packet throughput in downlink direction.
ulPeakPacketThroughp ut	PacketRate	0	01	When present, this IE shall indicate the Peak packet throughput in uplink direction.
dlPeakPacketThroughp ut	PacketRate	0	01	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	Р	Cardinality	Description
domainName	Fqdn	М	1	This IE shall contain a domain name.
domainNameProtocol	DnProtocol	0	01	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	Р	Cardinality	Description	Applicability
eventList	array(UpfEvent)	М	1N	This IE shall describe the events requested to	
				be subscribed in a subscription request or the	
				events successfully subscribed for this	
				subscription in a subscription response.	
eventNotifyUri	Uri	M	1	This IE shall identify the recipient address of	
				the notifications sent by the UPF for this	
				subscription.	
notifyCorrelationId	string	M	1	This IE shall contain the notification	
				correlation ID. The UPF shall include this	
				notification correlation 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 describe how the reports of the	
	<u> </u>			event shall be generated.	
nfld	NfInstanceId	M	1	This IE shall indicate the instance identity of	
				the network function creating the	
				subscription.	
uelpAddress	lpAddr	С	01	The IE shall be present if the event	
				subscription targets one specific UE's PDU	
				session. When present, the IE shall indicate	
				the IP address of the UE's PDU Session. (NOTE)	
anyUe	boolean	С	01	This IE shall be present if the event	
				subscription targets 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	0	01	Data Network Name.	
snssai	Snssai	0	01	A single Network Slice Selection Assistance	
				Information.	
NOTE: Either inform	nation about a single	e UE ((i.e. uelpAddre	ss) or anyUe set to true shall be included.	

6.1.6.2.12 Type: UpfEventMode

Table 6.1.6.2.12-1: Definition of type UpfEventMode

Attribute name	Data type	Р	Cardinality	Description	Applicability
trigger	UpfEventTrig ger	М	1	Describes how the reports are triggered.	
maxReports	integer	С	01	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	
	D . T			individual event in the list.	
expiry	DateTime	С	01	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	
repPeriod	DurationSec	С	01	timestamp. This IE shall be present if the trigger is set to	
тері епоч	Durationided		01	"PERIODIC". When present, this IE shall indicate the time period 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.	
sampRatio	SamplingRati o	0	01	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 shall 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.	
partitioningCri teria	array(Partition ingCriteria)	0	1N	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	NotificationFl ag	Ο	01	Indicates the notification flag, which is used to mute/unmute notifications and to retrieve events stored during a period of muted notifications.	

mutingExcInst	MutingExcepti	0	01	This IE may be included by NWDAF or DCCF in	EEMM
ructions	onInstructions			the event subscription request, if the notifFlag	
T GOLIOTIO	ommon donomo			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	
mutingNotSet	MutingNotific	0	01	This IE may be included in the event	EEMM
tings	ationsSettings			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	
NOTE: In thi	is release of spe	cifica	tion, the partitioni	ngCriteria values defined in 3GPP TS 29.571 [16] t	hat 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	Р	Cardinality	Description	Applicability
type	EventType	M	1	Describes the UPF event type to be reported	
immediateFlag	boolean	О	01	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.	
measurementTyp es	array(Measur ementType)	С	1N	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.	
applds	array(Applicat ionId)	0	1N	Contains the application identifiers. (NOTE 1, NOTE 2)	
trafficFilters	array(FlowInf ormation)	0	1N	Identifies IP or Ethernet packet filters. (NOTE 1, NOTE 2)	
granularityOfMea surement	GranularityOf Measurement	0	01	Indicates the granularity of measurement. (NOTE 2)	
reportingSuggesti onInfo	ReportingSug gestionInform ation	С	01	The IE should be present if the event notification can be delayed, i.e. it is delay tolerant.	

NOTE 1: Either the applds IE or the trafficFilters IE may be present, not both.

NOTE 2: If the applds or trafficFilters is provided, the granularityOfMeasurement shall not be set to "PER_SESSION". If neither applds 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	Р	Cardinality	Description
subscription	UpfEventSubscription	M	1	Represents the UPF Event Subscription resource to
				be created.
supportedFeatures	SupportedFeatures	С	01	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)	0	1N	Represents the immediate event reports (i.e. the
				current value / status of the events subscribed), if
				available.
supportedFeatures	SupportedFeatures	С	01	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	Р	Cardinality	Description
reportingUrgency	ReportingUrgency	M	1	Indicates whether the event report is delay tolerant.
reportingTimeInfo	DurationSec	С		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	Р	Cardinality	Description	Applicability
pmics	array(PortMana	0	1N	When present, this IE shall	
	gementContain			contain a Port Management	
	er)			Information Container for	
				one or more NW-TT ports.	
umic	BridgeManage	0	01	When present, this IE shall	
	mentContainer			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		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.
REJECTION_DUE_TO_NO_DNN_SNSSAI	403 Forbidden	Indicates the creation of a subscription towards a PDU session has failed due to an application error when the UPF cannot find a <u>unique</u> PDU session due to no DNN and/or S-NSSAI received.
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.
UNSUPPORTED_EVENT_TYPE	501 Not Implemented	The request for creation of a subscription is rejected because none of the events is supported by 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	0	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_GetUEPrivateIPaddrAndIdentifiers Service API

6.2.1 Introduction

The Nupf_GetUEPrivateIPaddrAndIdentifiers service shall use the Nupf_GetUEPrivateIPaddrAndIdentifiers API.

The API URI of the Nupf_GetUEPrivateIPaddrAndIdentifiers 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 6.2.3.

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_GetUEPrivateIPaddrAndIdentifiers 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

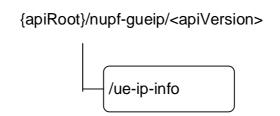


Figure 6.2.3.1-1: Resource URI structure of the Nupf_GetUEPrivatelPaddrAndIdentifiers API

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 (Document)	/ue-ip-info	GET	Nupf_GetUEPrivateIPaddrAndIdentifiers_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.1 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 and optionally UE identifiers (e.g. SUPI, GPSI), by querying the UPF with the NATed UE's public IP address and an optional Port number, and optionally the DNN and S-NSSAI.

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	Р	Cardinality	Description	Applicability
ue-ipv4-address	lpv4Addr	С	01	UE's IPv4 address (NOTE)	
ue-ipv6-prefix	Ipv6Prefix	С	01	UE's IPv6 Prefix (NOTE)	
port-number	integer	0	01	UDP or TCP Port	
dnn	Dnn	0	01	DNN of the PDU session	
snssai	Snssai	0	01	S-NSSAI of the PDU session	
NOTE: Either the ue-ipv4-address or the ue-ipv6-prefix shall be present.					

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	Р	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		
UelpInfo	М	1	200 OK	The response body contains a UelpInfo for a PDU session which contains attributes that are matching the queryparameter.		
RedirectRespons e	0	01	307 Temporary Redirect	Temporary redirection. (NOTE 2)		
RedirectRespons e	0	01	308 Permanent Redirect	Permanent redirection. (NOTE 2)		
ProblemDetails	0	01	404 Not Found	The "cause" attribute may be used to indicate the following application error: - NO_MATCHING UE_IP_ADDRESS		
	<u> </u>			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]).

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	Р	Cardinality	Description
Location	string	М		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	0		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	Р	Cardinality	Description
Location	string	М		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	0		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_GetUEPrivateIPaddrAndIdentifiers service based interface protocol.

Table 6.2.6.1-1: Nupf_GetUEPrivatelPaddrAndIdentifiers specific Data Types

Data type	Clause defined	Description	Applicability
UelpInfo	6.1.6.2.2	A UelpInfo for a PDU session	

Table 6.2.6.1-2 specifies data types re-used by the Nupf_GetUEPrivateIPaddrAndIdentifiers 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 Nupf_GetUEPrivateIPaddrAndIdentifiers service based interface.

Table 6.2.6.1-2: Nupf_GetUEPrivatelPaddrAndIdentifiers 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: UelpInfo

Table 6.2.6.2.2-1: Definition of type UelpInfo

Attribute name	Data type	Р	Cardinality	Description
privatelpv4Address	Ipv4Address	0	01	When present, this IE shall contain the Private IPv4 IP address.
ipDomain	string	0	01	When present, this IE contains the IP domain of the private IPv4 address.
privatelpv6Prefix	Ipv6Prefix	0	01	When present, this IE shall contain the Private IPv6 Prefix.
publiclpv4Address	Ipv4Address	0	01	When present, this IE shall contain the public (NATed) IPv4 IP address.
publiclpv6Prefix	lpv6Prefix	0	01	When present, this IE shall contain the public (NATed) IPv6 Prefix.
portNumber	Uint16	0	01	When present, this IE shall contain the port number for the source UDP or TCP port when Port Address Translation is used.
dnn	Dnn	0	01	When present, this IE shall contain the DNN of the PDU Session.
snssai	Snssai	0	01	When present, this IE shall contain the S-NSSAI of the PDU Session.
hplmnSnssai	Snssai	0	01	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	0	01	When present, this IE shall contain the SUPI of the UE.
gpsi	Gpsi	0	01	When present, this IE shall contain the GPSI of the UE.
hrsbolnd	boolean	С	01	This IE shall be included by a V-UPF and set to true if the PDU session is working in HR-SBO mode.
				The presence of this IE with the value false shall be prohibited.

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_GetUEPrivateIPaddrAndIdentifiers 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_GetUEPrivateIPaddrAndIdentifiers API.

6.2.7.2 Protocol Errors

No specific procedures for the Nupf_GetUEPrivateIPaddrAndIdentifiers service are specified.

6.2.7.3 Application Errors

The application errors defined for the Nupf GetUEPrivateIPaddrAndIdentifiers 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_GetUEPrivateIPaddrAndIdentifiers 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_GetUEPrivateIPaddrAndIdentifiers 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_GetUEPrivateIPaddrAndIdentifiers 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 GetUEPrivateIPaddrAndIdentifiers service.

The Nupf_GetUEPrivateIPaddrAndIdentifiers 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
  title: 'UPF Event Exposure Service'
  version: 1.1.0
  description:
   UPF Event Exposure Service.
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   All rights reserved.
externalDocs:
  description: 3GPP TS 29.564 V18.5.0; 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:
      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:
              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:
                $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'
          $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'
          $ref: 'TS29571 CommonData.vaml#/components/responses/415'
        14291:
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '501':
          $ref: 'TS29571_CommonData.yaml#/components/responses/501'
          $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 successfull
                '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'
               $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'
      12041:
       description: Successful response
       $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
       $ref: 'TS29571_CommonData.yaml#/components/responses/308'
       $ref: 'TS29571 CommonData.vaml#/components/responses/400'
      '401':
       $ref: 'TS29571_CommonData.yaml#/components/responses/401'
       $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'
      15021:
       $ref: 'TS29571_CommonData.yaml#/components/responses/502'
```

503:

```
$ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      summary: Nupf_EventExposure UnSubscribe service Operation
      operationId: DeleteSubscription
      parameters:
         - name: subscriptionId
         in: path
         required: true
          description: Unique ID of the subscription to be deleted
           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'
          $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'
          $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'
          $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
    # 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.vaml#/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'
    tscMnqtInfo:
     $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
    \verb|eventReportingMode|:
     $ref: '#/components/schemas/UpfEventMode'
     $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
    ueIpAddress:
     $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
    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
   {\tt 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:
       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:
     $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:
        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: integer
           minimum: 0
           maximum: 10000
        ulCongestion:
           type: integer
           minimum: 0
            maximum: 10000
        defaultQosFlowInd:
           type: boolean
            default: false
TscManagementInfo:
    description: TSC Management Information
    type: object
   properties:
        pmics:
           type: array
           items:
                $ref: 'TS29512_Npcf_SMPolicyControl.yaml#/components/schemas/PortManagementContainer'
           minItems: 1
            \verb| 'TS29512_Npcf_SMPolicyControl.yaml| #/components/schemas/BridgeManagementContainer'| | TS29512_Npcf_SMPolicyControl.yaml| #/components/schemas/BridgeManagementSMPolicyControl.yaml| #/components/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagements/schemas/BridgeManagem
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'
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'
    \verb"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
         - 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
         - PER_APPLICATION
         - PER_SESSION
         - PER_FLOW
        - type: string
    DnProtocol:
     description: Domain Name Protocol
     anyOf:
         type: string
         enum:
         - DNS ONAME
         - TLS_SNI
         - TLS_SAN
          - TLS_SCN
        - type: string
    ReportingUrgency:
      description: Reporting Urgency
      anyOf:
        - type: string
         enum:
         - DELAY_TOLERANT
          - NON_DELAY_TOLERANT
        - type: string
```

A.3 Nupf_GetUEPrivateIPaddrAndIdentifiers API

openapi: 3.0.0

SIMPLE TYPES

```
info:
  version: '1.0.0'
  title: 'UPF GET UE Private IP address and Identifiers Service'
  description:
   Nupf_GetUEPrivateIPaddrAndIdentifiers Service.
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
   All rights reserved.
externalDocs:
  description: 3GPP TS 29.564 V18.5.0; 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:
      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'
          description: Temporary Redirect
          content:
            application/json:
               $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'
         $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'
         $ref: 'TS29571 CommonData.vaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        500:
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          $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_GetUEPrivateIPaddrAndIdentifiers 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'
        hrsboInd:
          type: boolean
```

enum:
- true

Annex B (informative): Change history

Change history								
Date	Meeting	TDoc	CR	Re	Cat	Subject/Comment	New	
2021-09	CT4#105e	C4-214754		٧		Version after CT4#105-e including agreed pCRs:	version 0.1.0	
2021-03	014#1036	04-214/34				C4-214464	0.1.0	
						C4-214465		
						C4-214559		
2024 40	CT4#106e	C4 04 F F 4 0	1			Version offer CT4#106 a including agreed aCDa	0.2.0	
2021-10	C14#106e	C4-215518				Version after CT4#106-e including agreed pCRs: C4-215441	0.2.0	
						C4-215443		
						C4-215532		
						C4-215536		
2021-11	CT4#107e	C4-216471				Version after CT4#107-e including agreed pCRs:	0.3.0	
						C4-216524		
2024 42	CT#0.4 =	CD 040467				C4-216525	4.0.0	
2021-12	CT#94e CT4#107bi	CP-213167 C4-220453				V1.0.0 presented for information Version after CT4#107bis-e including agreed pCRs:	1.0.0	
2022-01	s-e	04-220433				C4-220146	1.1.0	
	3.0					C4-220147		
						C4-220148		
						C4-220149		
2022-02	CT4#108-e					Editorial corrections of the rapporteur	1.2.0	
2022-03	CT#95-e	CP-220106		<u> </u>	-	TS presented for approval	2.0.0	
2022-03	CT#95-e	OD 22/22	000:	<u> </u>		TS approved	17.0.0	
2022-06	CT#96-e	CP-221034		2		Resolving Editor's Note on Notification Information	17.1.0	
2022-06	CT#96-e	CP-221051			F	29.564 Rel-17 API version and External doc update	17.1.0	
2022-09 2022-09	CT#97-e CT#97-e	CP-222029 CP-222029	0005	1		Description fields Reporting Packet Delay Measurement Failure to AF/NEF when	17.2.0 17.2.0	
2022-09	C1#31-6	CF-222029	0004	'	'	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			F	29.564 Rel-17 API version and External doc update	17.2.0	
2023-03	CT#99	CP-230034	0010	1	В	Service operations of the UPF event exposure service	18.0.0	
2023-03	CT#99	CP-230034		1		Subscriptions to UPF events	18.0.0	
2023-03	CT#99	CP-230034		1		UPF events supported by the UPF event exposure service	18.0.0	
2023-03	CT#99	CP-230034		1		Unsubscribe service operation	18.0.0	
2023-03	CT#99	CP-230034		1		Resource URI structure of the UPF event exposure API	18.0.0	
2023-03	CT#99	CP-230034		1		Security of UPF Event Exposure service	18.0.0	
2023-03	CT#99	CP-230034		1		Service operations of Nupf_EventExposure service	18.0.0	
2023-03	CT#99 CT#99	CP-230034		1		Nupf_GetPrivateUEIPaddr service operation and API	18.0.0	
2023-03	CT#99	CP-230034 CP-230034		3		Resource and data type of Nupf_GetPrivateUEIPaddr service Updates to the Introduction of TS 29.564	18.0.0 18.0.0	
2023-03	CT#99	CP-230034		2		Subscribe service operation	18.0.0	
2023-03	CT#99	CP-230034		2		Resource for Nupf_EventExposure service	18.0.0	
2023-03	CT#99	CP-230071			F	29.564 Rel-18 API version and External doc update	18.0.0	
2023-06	CT#100	CP-231027	0027	4	F	Location header and missing Redirection clause	18.1.0	
2023-06	CT#100	CP-231035				Correction on DNN and S-NSSAI in Nupf_GetPrivateUEIPaddr_Get	18.1.0	
			0030		F	Operation		
2023-06	CT#100	CP-231035	0035		В	Support for Data rate monitoring	18.1.0	
2023-06	CT#100	CP-231035	0032	1	F	Creation of a Subscription for Nupf_eventexposure	18.1.0	
2023-06	CT#100	CP-231259				Data types for Nupf_eventexposure service notify operation and	18.1.0	
			0033	3	В	openAPI		
2023-06	CT#100	CP-231260	0004	,	Ь	Data types for Nupf_eventexposure service subscribe operation and	18.1.0	
2023-06	CT#100	CP-231035	0024	3		openAPI Including SUPI in the response	10 1 0	
2023-06	CT#100	CP-231035	0038	1		UPF exposure of TSC Management Information	18.1.0 18.1.0	
2023-06	CT#100	CP-231035	0030	- '		NF ID in Nupf_EventExposure_Subscribe Request and Fixing	18.1.0	
2020 00	01#100	01 231033	0039	1	В	Incorrect References	10.1.0	
2023-06	CT#100	CP-231035	0040	1		Modification of a subscription for UPF events	18.1.0	
2023-06	CT#100	CP-231035				Resource and data type of modification of a subscription for UPF	18.1.0	
			0041	1		events		
2023-06	CT#100	CP-231057	0037	1		UPF exposure of congestion information	18.1.0	
2023-06	CT#100	CP-231070		ļ	F	29.564 Rel-18 API version and External doc update	18.1.0	
2023-09	CT#101	CP-232038	0046	<u> </u>	F	Consumers of the UPF Event Exposure service	18.2.0	
2023-09	CT#101	CP-232038	0053		В	Applicability of the value "CONTINUOUS" for UpfEventTrigger	18.2.0	
2023-09	CT#101	CP-232038	0055		F	RedirectResponse Description	18.2.0	
2023-09	CT#101	CP-232038	0056		В	The Immediate Report Flag	18.2.0	
2023-09	CT#101	CP-232038	0047	1	F	Subscription type for User Data Usage Measures / Trends	18.2.0	
2023-09	CT#101	CP-232038		1		Domain Name Protocol	18.2.0	
2023-09	CT#101	CP-232038		2		The partitioning criteria for the UPF Event Exposure	18.2.0	
2023-09	CT#101	CP-232038		2		Multiple PDU Sessions in a NotificationItem	18.2.0	
2023-09	CT#101	CP-232054	0050	1	В	QoS flow description in QoS monitoring report	18.2.0	

		T ==				I=	
2023-09	CT#101	CP-232054	0048	2	<u>B</u>	Data rate monitoring	18.2.0
2023-09	CT#101	CP-232054		3	В	Exposure of congestion information	18.2.0
2023-09	CT#101	CP-232060			F	29.564 Rel-18 API version and External doc update	18.2.0
2023-09	CT#101	CP-232067	0052	1	Α	Support of an Ethernet PDU Session	18.2.0
2023-12	CT#102	CP-233028	0069	1	F	HTTP RFCs obsoleted by IETF RFC 9113	18.3.0
2023-12	CT#102	CP-233030	0075		F	ProblemDetails RFC 7807 obsoleted by 9457	18.3.0
2023-12	CT#102	CP-233032	0064		F	Miscellaneous corrections	18.3.0
2023-12	CT#102					List and description of events supported by the Nupf_EventExposure	18.3.0
		CP-233032	0066		F	service	
2023-12	CT#102	CP-233032			В	Reporting Suggestion Information	18.3.0
2023-12	CT#102	CP-233032		1	F	Correction on dnn and reportingUrgency attributes	18.3.0
2023-12	CT#102	CP-233032	0073		В	Achieved sampling ratio in Nupf_EventExposure_Notify	18.3.0
2023-12	CT#102	CP-233032	0074	1	В	Indication of QoS Flow associated with the default QoS Rule	18.3.0
2023-12	CT#102	CP-233032	0072	1	В	Nupf_GetPrivateUEIPaddr_Get response with GPSI	18.3.0
2023-12	CT#102					UPF GetPrivateUEIPaddr service extensions for HR-SBO PDU	18.3.0
		CP-233038			В	sessions	
2023-12	CT#102	CP-233045	0061	2	В	Muting enhancements	18.3.0
2023-12	CT#102	CP-233053	0071	1	F	Per QoS flow data rate monitoring	18.3.0
2023-12	CT#102	CP-233060	0077		F	29.564 Rel-18 API version and External doc update	18.3.0
2024-03	CT#103					Change the Nupf_GetPrivateUEIPaddr service as	18.4.0
		CP-240033	0800	1	В	Nupf_GetUEPrivatelPaddrAndIdentifiers service	
2024-03	CT#103	CP-240033	0082	1	В	DNN and S-NSSAI for UPF exposure service	18.4.0
2024-03	CT#103	CP-240033	0086	1	В	Editor Note cleanup for Nupf_EventExposure Service	18.4.0
2024-03	CT#103	CP-240034	0085	1	F	Update the description of QoS Monitoring event	18.4.0
2024-03	CT#103	CP-240034		1	В	Encoding of UL/DL Congestion Information	18.4.0
2024-03	CT#103	CP-240034	0081	1	F	Appld and flow information in the QoS Monitoring Measurement	18.4.0
2024-03	CT#103	CP-240056	0087		F	29.564 Rel-18 API version and External doc update	18.4.0
2024-06	CT#104	CP-241028	0091	2	В	Returning UNSUPPORTED_EVENT_TYPE	18.5.0
2024-06	CT#104					Correct the api name of Nupf_GetUEPrivatelPaddrAndIdentifiers	18.5.0
		CP-241028	0096	1	F	service	
2024-06	CT#104	CP-241031	0092	1	В	Application Function influence on traffic routing in HR-SBO	18.5.0
2024-06	CT#104	CP-241032	0089	1	F	Input parameters of Nupf_GetPrivateUEIPaddr_Get Request	18.5.0
2024-06	CT#104	CP-241032	0093	1	F	Correction of Nupf_GetUEPrivatelPaddrAndIdentifiers API	18.5.0
2024-06	CT#104	CP-241032	0095		F	UE ID corrections	18.5.0
2024-06	CT#104	CP-241032	0094	1	F	Corrections to the Nupf_EventExposure service	18.5.0
2024-06	CT#104	CP-241052	0097		F	29.564 Rel-18 API version and External doc update	18.5.0

History

Document history						
V18.4.0	May 2024	Publication				
V18.5.0	July 2024	Publication				