ETSI TS 129 563 V19.2.0 (2026-01)

TECHNICAL SPECIFICATION

5G;
5G System;
Home Subscriber Server (HSS)
services for interworking with
Unified Data Management (UDM);
Stage 3
(3GPP TS 29.563 version 19.2.0 Release 19)

Reference
RTS/TSGC-0429563vj20

Keywords
5G

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from the
ETSI Search & Browse Standards application.

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format on ETSI deliver repository.

Users should be aware that the present document may be revised or have its status changed, this information is available in the Milestones listing.

If you find errors in the present document, please send your comments to the relevant service listed under Committee Support Staff.

If you find a security vulnerability in the present document, please report it through our Coordinated Vulnerability Disclosure (CVD) program.

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.
No recommendation as to products and services or vendors is made or should be implied.
No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.
In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.
The content of the PDF version shall not be modified without the written authorization of ETSI.
The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2026.
All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI IPR online database.

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM**® and the GSM logo are trademarks registered and owned by the GSM Association.

Legal Notice

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

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found at 3GPP to ETSI numbering cross-referencing.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights 2
Legal Notice 2
Modal verbs terminology 2
Foreword 9
1 Scope 11
2 References 11
3 Definitions of terms, symbols and abbreviations 12
3.1 Terms 12
3.2 Symbols 12
3.3 Abbreviations 12
4 Overview 12
4.1 Introduction 12
5 Services offered by the HSS 13
5.1 Introduction 13
5.2 Nhss_UEAuthentication Service 13
5.2.1 Service Description 13
5.2.2 Service Operations 13
5.2.2.1 Introduction 13
5.2.2.2 Get 14
5.2.2.2.1 General 14
5.2.2.2.2 Authentication Vector Retrieval 14
5.3 Nhss_SubscriberDataManagement Service 14
5.3.1 Service Description 14
5.3.2 Service Operations 14
5.3.2.1 Introduction 14
5.3.2.2 Get 15
5.3.2.2.1 General 15
5.3.2.2.2 UE Context In PGW Data Retrieval 15
5.3.2.3 Subscribe 16
5.3.2.3.1 General 16
5.3.2.3.2 Subscription to notifications of data change 16
5.3.2.4 Unsubscribe 16
5.3.2.4.1 General 16
5.3.2.4.2 Unsubscribe to notifications of data change 16
5.3.2.5 Notification 17
5.3.2.5.1 General 17
5.3.2.5.2 Data Change Notification To NF 17
5.3.2.6 ModifySubscription 18
5.3.2.6.1 General 18
5.3.2.6.2 Modification of a subscription to notifications of data change 18
5.4 Nhss_UEContextManagement Service 18
5.4.1 Service Description 18
5.4.2 Service Operations 19
5.4.2.1 Introduction 19
5.4.2.2 SnDeregistration 19
5.4.2.2.1 General 19
5.4.2.2.2 SN Deregistration 19
5.4.2.3 IMEI Update 20
5.4.2.4 Roaming Status Update 21
5.5 Nhss_EventExposure Service 21
5.5.1 Service Description 21
5.5.2 Service Operations 21
5.5.2.1 Introduction 21

5.5.2.2 Subscribe 22
5.5.2.2.1 General 22
5.5.2.2.2 Subscription to Notification of event occurrence 22
5.5.2.3 Unsubscribe 23
5.5.2.3.1 General 23
5.5.2.3.2 Unsubscribe to notifications of event occurrence 23
5.5.2.4 Notify 24
5.5.2.4.1 General 24
5.5.2.4.2 Event Occurrence Notification 24
5.5.2.5 ModifySubscription 24
5.5.2.5.1 General 24
5.5.2.5.2 Modification of a subscription 24
5.6 Nhss_ParameterProvision Service 25
5.6.1 Service Description 25
5.6.2 Service Operations 25
5.6.2.1 Introduction 25
5.6.2.2 Create 25
5.6.2.2.1 General 25
5.6.2.3 Update 26
5.6.2.3.1 General 26
5.6.2.3.2 Parameter Provisioning Data Entry per AF update 26
5.6.2.4 Delete 27
5.6.2.4.1 General 27
5.6.2.4.2 Parameter Provisioning Data Entry per AF deletion 27
5.6.2.5 Get 28
5.6.2.5.1 General 28
5.6.2.5.2 Parameter Provisioning Data Entry per AF get 28

6 API Definitions 29
6.1 Nhss_UEAuthentication Service API 29
6.1.1 Introduction 29
6.1.2 Usage of HTTP 29
6.1.2.1 General 29
6.1.2.2 HTTP standard headers 29
6.1.2.2.1 General 29
6.1.2.2.2 Content type 29
6.1.2.3 HTTP custom headers 30
6.1.2.3.1 General 30
6.1.3 Resources 30
6.1.3.1 Overview 30
6.1.4 Custom Operations without associated resources 30
6.1.4.1 Overview 30
6.1.4.2 Operation: Generate AV 30
6.1.4.2.1 Description 30
6.1.4.2.2 Operation Definition 31
6.1.5 Notifications 31
6.1.6 Data Model 31
6.1.6.1 General 31
6.1.6.2 Structured data types 32
6.1.6.2.1 Introduction 32
6.1.6.2.2 Type: AvGenerationRequest 32
6.1.6.2.3 Type: AvGenerationResponse 32
6.1.6.3 Simple data types and enumerations 33
6.1.6.3.1 Introduction 33
6.1.6.3.2 Simple data types 33
6.1.7 Error Handling 33
6.1.7.1 General 33
6.1.7.2 Protocol Errors 33
6.1.7.3 Application Errors 33
6.1.8 Feature negotiation 33
6.1.9 Security 33
6.1.10 HTTP redirection 34

6.2 Nhss_SubscriberDataManagement Service API 34
6.2.1 API URI 34
6.2.2 Usage of HTTP 34
6.2.2.1 General 34
6.2.2.2 HTTP standard headers 34
6.2.2.2.1 General 34
6.2.2.2.2 Content type 34
6.2.2.3 HTTP custom headers 35
6.2.2.3.1 General 35
6.2.3 Resources 35
6.2.3.1 Overview 35
6.2.3.2 Resource: UeContextInPgwData 35
6.2.3.2.1 Description 35
6.2.3.2.2 Resource Definition 36
6.2.3.2.3 Resource Standard Methods 36
6.2.3.3 Resource: Subscriptions 37
6.2.3.3.1 Description 37
6.2.3.3.2 Resource Definition 37
6.2.3.3.3 Resource Standard Methods 37
6.2.3.4 Resource: Individual subscription 38
6.2.3.4.1 Description 38
6.2.3.4.2 Resource Definition 39
6.2.3.4.3 Resource Standard Methods 39
6.2.4 Custom Operations without associated resources 41
6.2.5 Notifications 41
6.2.5.1 General 41
6.2.5.2 Data Change Notification 42
6.2.6 Data Model 43
6.2.6.1 General 43
6.2.6.2 Structured data types 43
6.2.6.2.1 Introduction 43
6.2.6.2.2 Type: UeContextInPgwData 44
6.2.6.2.3 Type: SubscriptionData 44
6.2.6.2.4 Type: SubscriptionDataSets 44
6.2.6.3 Simple data types and enumerations 45
6.2.6.3.1 Introduction 45
6.2.6.3.2 Simple data types 45
6.2.7 Error Handling 45
6.2.7.1 General 45
6.2.7.2 Protocol Errors 45
6.2.7.3 Application Errors 45
6.2.8 Feature Negotiation 45
6.2.9 Security 45
6.2.10 HTTP redirection 46
6.3 Nhss_UEContextManagement Service API 46
6.3.1 Introduction 46
6.3.2 Usage of HTTP 46
6.3.2.1 General 46
6.3.2.2 HTTP standard headers 46
6.3.2.2.1 General 46
6.3.2.2.2 Content type 47
6.3.2.3 HTTP custom headers 47
6.3.2.3.1 General 47
6.3.3 Resources 47
6.3.3.1 Overview 47
6.3.4 Custom Operations without associated resources 48
6.3.4.1 Overview 48
6.3.4.2 Operation: deregister-sn 48
6.3.4.2.1 Description 48
6.3.4.2.2 Operation Definition 48
6.3.4.3 Operation: imei-update 49
6.3.4.3.1 Description 49

6.3.4.3.2 Operation Definition 49
6.3.4.4 Operation: roaming-status-update 50
6.3.4.4.1 Description 50
6.3.4.4.2 Operation Definition 50
6.3.5 Notifications 51
6.3.6 Data Model 51
6.3.6.1 General 51
6.3.6.2 Structured data types 51
6.3.6.2.1 Introduction 51
6.3.6.2.2 Type: DeregistrationRequest 52
6.3.6.2.3 Type: ImeiUpdateInfo 52
6.3.6.2.4 Type: ImeiUpdateResponse 52
6.3.6.2.5 Type: RoamingStatusUpdateInfo 53
6.3.6.3 Simple data types and enumerations 53
6.3.6.3.1 Introduction 53
6.3.6.3.2 Simple data types 53
6.3.6.3.3 Enumeration: DeregistrationReason 53
6.3.7 Error Handling 53
6.3.7.1 General 53
6.3.7.2 Protocol Errors 54
6.3.7.3 Application Errors 54
6.3.8 Feature Negotiation 54
6.3.9 Security 54
6.3.10 HTTP redirection 54
6.4 Nhss_EventExposure Service API 55
6.4.1 API URI 55
6.4.2 Usage of HTTP 55
6.4.2.1 General 55
6.4.2.2 HTTP standard headers 55
6.4.2.2.1 General 55
6.4.2.2.2 Content type 55
6.4.2.3 HTTP custom headers 55
6.4.2.3.1 General 55
6.4.3 Resources 56
6.4.3.1 Overview 56
6.4.3.2 Resource: EeSubscriptions (Collection) 56
6.4.3.2.1 Description 56
6.4.3.2.2 Resource Definition 56
6.4.3.2.3 Resource Standard Methods 57
6.4.3.3 Resource: Individual subscription (Document) 58
6.4.3.3.1 Resource Definition 58
6.4.3.3.2 Resource Standard Methods 59
6.4.4 Custom Operations without associated resources 61
6.4.5 Notifications 61
6.4.5.1 General 61
6.4.5.2 Event Occurrence Notification 62
6.4.6 Data Model 63
6.4.6.1 General 63
6.4.6.2 Structured data types 63
6.4.6.2.1 Introduction 63
6.4.6.2.2 Type: EeSubscription 64
6.4.6.2.3 Type: CreatedEeSubscription 65
6.4.6.2.4 Type: MonitoringConfiguration 66
6.4.6.2.5 Type: MonitoringReport 66
6.4.6.2.6 Type: Report 67
6.4.6.2.7 Type: ReportingOptions 67
6.4.6.2.8 Type: LocationReportingConfiguration 67
6.4.6.2.9 Type: ReachabilityForSmsReport 68
6.4.6.2.10 Type: LossConnectivityConfiguration 68
6.4.6.2.11 Type: ReachabilityForDataConfiguration 68
6.4.6.2.12 Type: PduSessionStatusCfg 68
6.4.6.2.13 Type: ReachabilityForDataReport 69

6.4.6.2.14 Type: FailedMonitoringConfiguration 69
6.4.6.2.15 Type: EeSubscriptionErrorAddInfo 69
6.4.6.2.16 Type: EeSubscriptionError 69
6.4.6.3 Simple data types and enumerations 69
6.4.6.3.1 Introduction 69
6.4.6.3.2 Simple data types 69
6.4.6.3.3 Enumeration: EventType 70
6.4.6.3.4 Enumeration: LocationAccuracy 70
6.4.6.3.5 Enumeration: FailedCause 71
6.4.7 Error Handling 71
6.4.7.1 General 71
6.4.7.2 Protocol Errors 71
6.4.7.3 Application Errors 71
6.4.8 Feature Negotiation 71
6.4.9 Security 72
6.4.10 HTTP redirection 72
6.5 Nhss_ParameterProvision Service API 72
6.5.1 API URI 72
6.5.2 Usage of HTTP 73
6.5.2.1 General 73
6.5.2.2 HTTP standard headers 73
6.5.2.2.1 General 73
6.5.2.2.2 Content type 73
6.5.2.3 HTTP custom headers 73
6.5.2.3.1 General 73
6.5.3 Resources 73
6.5.3.1 Overview 73
6.5.3.2 Resource: ParameterProvisioningDataEntry 74
6.5.3.2.1 Description 74
6.5.3.2.2 Resource Definition 74
6.5.3.2.3 Resource Standard Methods 75
6.5.4 Custom Operations without associated resources 77
6.5.5 Notifications 77
6.5.6 Data Model 77
6.5.6.1 General 77
6.5.6.2 Structured data types 77
6.5.6.2.1 Introduction 77
6.5.6.2.2 Type: PpDataEntry 78
6.5.6.2.3 Type: CommunicationCharacteristicsAF 78
6.5.6.3 Simple data types and enumerations 78
6.5.6.3.1 Introduction 78
6.5.6.3.2 Simple data types 78
6.5.7 Error Handling 79
6.5.7.1 General 79
6.5.7.2 Protocol Errors 79
6.5.7.3 Application Errors 79
6.5.8 Feature Negotiation 79
6.5.9 Security 79
6.5.10 HTTP redirection 80

Annex A (normative): OpenAPI specification 81

A.1 General 81

A.2 Nhss_UEAuthentication API 81

A.3 Nhss_SubscriberDataManagement API 83

A.4 Nhss_UEContextManagement API 87

A.5 Nhss_EE API 91

A.6 Nhss_PP API 98

Annex B (informative): Withdrawn API versions 102
B.1 General 102
Annex C (informative): Change history 103
History 106

Foreword

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

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

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

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

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

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

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

can indicates that something is possible

cannot indicates that something is impossible

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

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

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

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

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

In addition:

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

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

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

1 Scope

The present document specifies the stage 3 protocol, including message flows and API specification details, for the Nhss services, as part of the 5G Service-Based Architecture, offered by the HSS for interworking with the 5G UDM Network Function.

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

The User Data Interworking, Coexistence and Migration stage 2 architecture and procedures are specified in 3GPP TS 23.632 [8].

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

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

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

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

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

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

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

[6] 3GPP TS 23.335: "User Data Convergence (UDC); Technical realization and information flows".

[7] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[8] 3GPP TS 23.632: "User Data Interworking, Coexistence and Migration".

[9] IETF RFC 9113: "HTTP/2".

[10] OpenAPI Initiative, "OpenAPI Specification Version 3.0.0", https://spec.openapis.org/oas/v3.0.0.

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

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

[13] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[14] 3GPP TR 21.900: "Technical Specification Group working methods".

[15] 3GPP TS 23.003: "Numbering, addressing and identification".

[16] 3GPP TS 29.303: "Domain Name System Procedures; Stage 3".

[17] 3GPP TS 29.272: "Evolved Packet System; MME and SGSN Related Interfaces Based on Diameter Protocol".

[18] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[19] 3GPP TS 29.335: "User Data Convergence (UDC); User Data Repository Access Protocol over the Ud interface".

[20] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[21] 3GPP TS 29.336: "Home Subscriber Server (HSS) diameter interfaces for interworking with packet data networks and applications".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

Void.

3.2 Symbols

Void.

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].

5GC	5G Core Network
HSS	Home Subscriber Server
JSON	Javascript Object Notation
SBI	Service Based Interface
UDM	Unified Data Management
UDR	Unified Data Repository

4 Overview

4.1 Introduction

Within the 5GC, the HSS offers services to the UDM via the Nhss service-based interface (see 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.632 [8]).

Figure 4.1-1 provides the reference model in service-based interface representation with focus on the HSS.

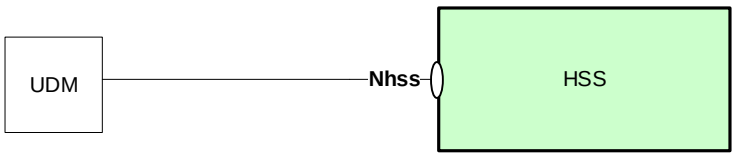

Figure 4.1-1: Reference model – HSS

5 Services offered by the HSS

5.1 Introduction

The HSS offers the following services via the Nhss interface:

- Nhss_UEAuthentication Service
- Nhss_SubscriberDataManagement Service
- Nhss_UEContextManagement service
- Nhss_EventExposure service
- Nhss_ParameterProvision service

All scenarios shown in the following clauses assume that the HSS is stateful and stores information in local memory. However, the HSS may be stateless and stores information externally in the EPS-UDR. If so, the stateless HSS makes use of Ud interface as specified in 3GPP TS 23.335 [6] and 3GPP TS 29.335 [19] to retrieve required data from the EPS-UDR and store them locally before processing an incoming request. Processing the incoming request may then include updating data in the EPS-UDR or subscribing to data change notifications at the EPS-UDR by using the Ud interface. After processing the incoming request, the HSS may delete the locally stored data.

Table 5.1-1 summarizes the corresponding APIs defined for this specification.

Table 5.1-1: API Descriptions

Service Name	Clause	Description	OpenAPI Specification File	apiName	Annex
Nhss_UEAuthentication Service	6.1	HSS UE Authentication Service	TS29563_Nhss_UEAU.yaml	nhss-ueau	A.2
Nhss_SubscriberDataManagement Service	6.2	HSS Subscriber Data Management	TS29563_Nhss_SDM.yaml	nhss-sdm	A.3
Nhss_UEContextManagement Service	6.3	HSS UE Context Management	TS29563_Nhss_UECM.yaml	nhss-uecm	A.4
Nhss_EventExposure	6.4	HSS Event Exposure	TS29563_Nhss_EE.yaml	nhss-ee	A.5
Nhss_ParameterProvision	6.5	HSS Parameter Provisioning	TS29563_Nhss_PP.yaml	nhss-pp	A.6

5.2 Nhss_UEAuthentication Service

5.2.1 Service Description

The Nhss_UEAuthentication service allows a NF consumer (UDM) to request calculation of a fresh Authentication Vector (AV) for 5G_AKA or EAP_AKA_PRIME and provide the calculated AV to the requesting NF.

5.2.2 Service Operations

5.2.2.1 Introduction

For the Nhss_UEAuthentication service the following service operation is defined:

- Get

The Nhss_UEAuthentication service is used by the UDM to request the HSS to, calculate a fresh authentication vector (AV) for authentication the method 5G_AKA or EAP_AKA_PRIME, and provide it to the UDM by means of the Get service operation. See 3GPP TS 23.632 [8] clause 4.2.2.

5.2.2.2 Get

5.2.2.2.1 General

The following procedure using the Get service operation is supported:

- Authentication Vector Retrieval

5.2.2.2.2 Authentication Vector Retrieval

Figure 5.2.2.2.2-1 shows a scenario where the NF service consumer (UDM) retrieves an Authentication Vector for the UE from the HSS (see also 3GPP TS 23.632 [8] clause 4.2.2). The request contains the UE's identity (imsi), the serving network name, the authentication method (5G_AKA or EAP_AKA_PRIME) and may contain resynchronization info.

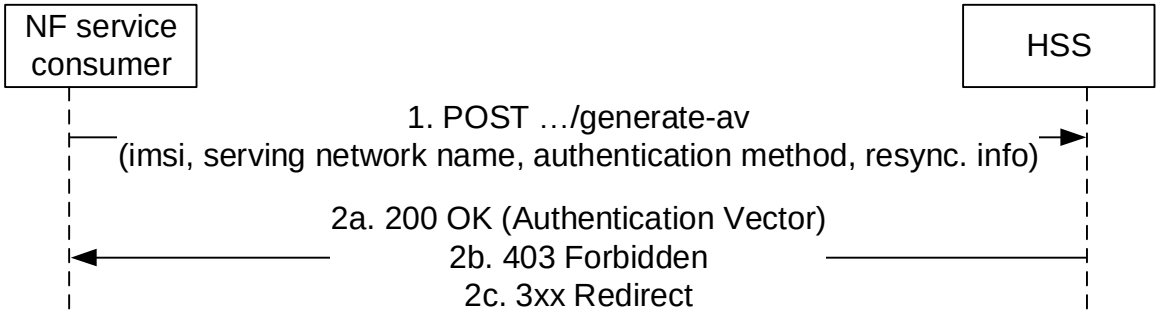

Figure 5.2.2.2.2-1: NF service consumer requesting an Authentication Vector

1. The NF service consumer sends a POST request (custom method: generate-av) to the HSS.

2a. The HSS responds with "200 OK" with the message body containing the authentication vector.

2b. If the operation cannot be authorized due to e.g. UE does not have required subscription data, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.3 Nhss_SubscriberDataManagement Service

5.3.1 Service Description

This service is used to retrieve the subscriber data indicated by the requested data type from HSS. In this release, only the PGW-C+SMF FQDN for S5/S8 interface information is supported as requested data type. See 3GPP TS 23.632 [8], clause 6.1.4.

5.3.2 Service Operations

5.3.2.1 Introduction

For the Nhss_SubscriberDataManagement service the following service operations are defined:

- Get
- Subscribe
- ModifySubscription

- Unsubscribe
- Notification

The Nhss_SubscriberDataManagement service is used by Consumer NF (UDM) to retrieve the UE data from the HSS due to IRAT mobility by means of the Get service operation.

It is also used by consumer NFs to subscribe to notifications of data change by means of the Subscribe service operation.

It is also used by consumer NFs to modify an existing subscription by means of the ModifySubscription service operation.

It is also used by consumer NFs that have previously subscribed, to unsubscribe from notifications of data changes by means of the Unsubscribe service operation.

It is also used by Consumer NFs that have previously subscribed, to get notified by means of the Notification service operation.

5.3.2.2 Get

5.3.2.2.1 General

The following procedure using the Get service operation is supported:

- UE Context In PGW Data Retrieval

5.3.2.2.2 UE Context In PGW Data Retrieval

Figure 5.3.2.2.2-1 shows a scenario where the NF service consumer (UDM) sends a request to the HSS to retrieve the UE's Context In PGW data. The request contains the UE's identity (which shall be an IMSI) and the requested information.

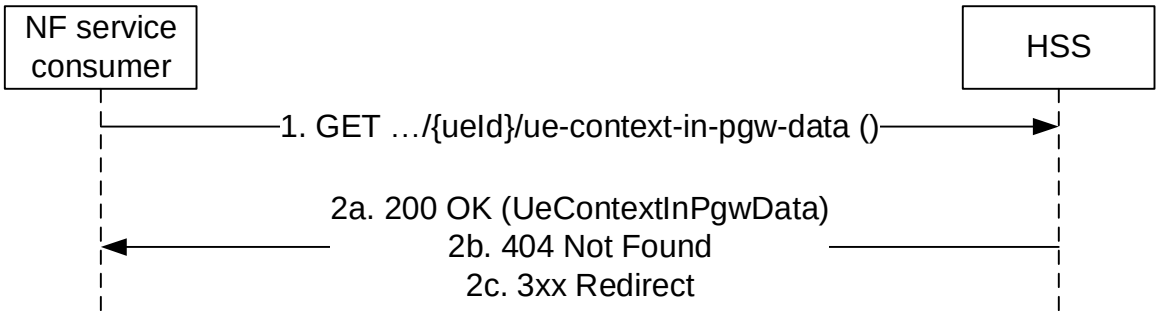

Figure 5.3.2.2.2-1: Requesting a UE's Context in PGW Data

1. The NF service consumer (e.g. UDM) shall send a GET request to the resource representing the UE's Context In PGW Data.

2a. On Success, the HSS shall respond with "200 OK" with the message body containing the UE's Context In PGW Data as relevant for the requesting NF service consumer.

2b. If there is no valid data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.3.2.3 Subscribe

5.3.2.3.1 General

The following procedures using the Subscribe service operation are supported:

- Subscription to notification of data change

5.3.2.3.2 Subscription to notifications of data change

Figure 5.3.2.3.2-1 shows a scenario where the NF service consumer (e.g. UDM) sends a request to the HSS to subscribe to notifications of data change. The request contains a callback URI and the URI of the monitored resource.

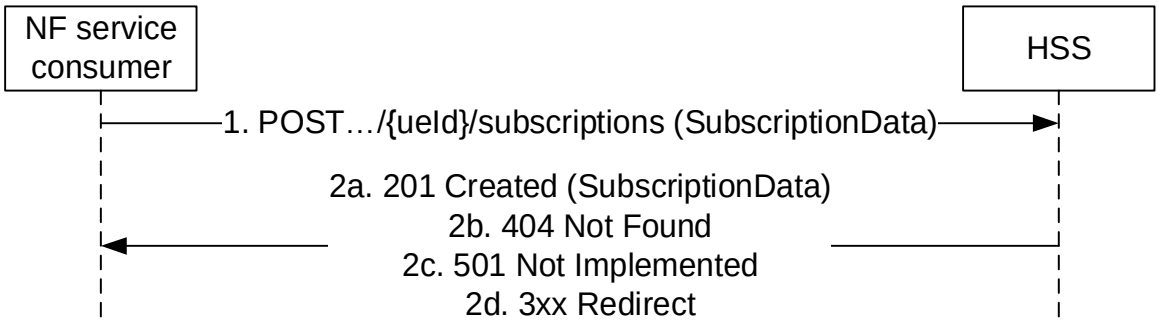

Figure 5.3.2.3.2-1: NF service consumer subscribes to notifications

1. The NF service consumer sends a POST request to the parent resource (collection of subscriptions) (.../{ueId}/subscriptions), to create a subscription as present in message body.

2a. On success, the HSS responds with "201 Created" with the message body containing a representation of the created subscription. The Location HTTP header shall contain the URI of the created subscription.

2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

2c. If the UE subscription data exist, but the requested subscription to data change notification cannot be created (e.g. due to an invalid/unsupported data reference to be monitored, contained in the SubscriptionData parameter), HTTP status code "501 Not Implemented" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.3.2.4 Unsubscribe

5.3.2.4.1 General

The following procedures using the Unsubscribe service operation are supported:

- Unsubscribe to notification of data change

5.3.2.4.2 Unsubscribe to notifications of data change

Figure 5.3.2.4.2-1 shows a scenario where the NF service consumer sends a request to the HSS to unsubscribe from notifications of data changes. The request contains the URI previously received in the Location HTTP header of the response to the subscription.

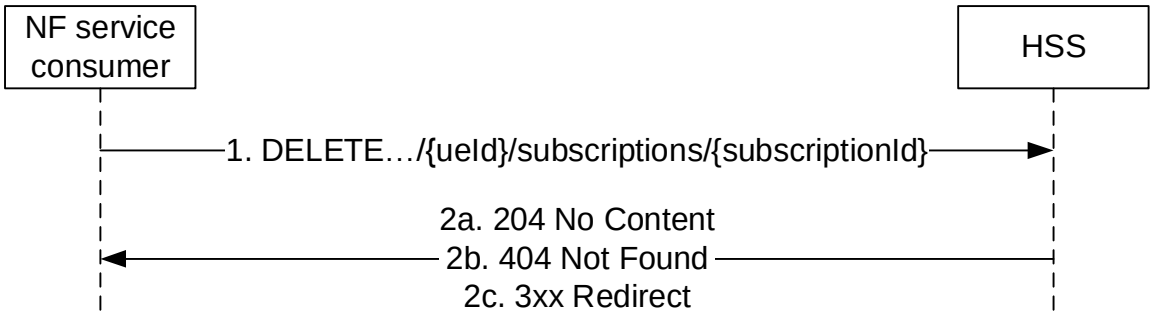

Figure 5.3.2.4.2-1: NF service consumer unsubscribes to notifications

1. The NF service consumer sends a DELETE request to the resource identified by the URI previously received during subscription creation.

2a. On success, the HSS responds with "204 No Content".

2b. If there is no valid subscription available (e.g. due to an unknown subscriptionId value), HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.3.2.5 Notification

5.3.2.5.1 General

The following procedures using the Notification service operation are supported:

- Data change notification to NF.

5.3.2.5.2 Data Change Notification To NF

Figure 5.3.2.5.2-1 shows a scenario where the HSS notifies the NF service consumer (that has subscribed to receive such notification) about subscription data change. The request contains the callbackReference URI as previously received in the SubscriptionData.

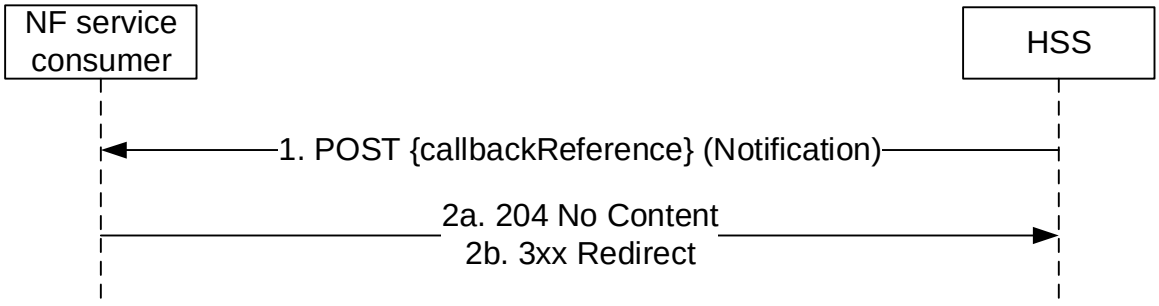

Figure 5.3.2.5.2-1: Subscription Data Change Notification

1. The HSS sends a POST request to the callbackReference as provided by the NF service consumer during the subscription.

2a. The NF service consumer responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

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 an alternative notification endpoint.

5.3.2.6 ModifySubscription

5.3.2.6.1 General

The following procedures using the ModifySubscription service operation are supported:

- Modification of a Subscription to notification of data change

5.3.2.6.2 Modification of a subscription to notifications of data change

Figure 5.3.2.6.2-1 shows a scenario where the NF service consumer sends a request to the HSS to modify a subscription to notifications of data changes. The request contains the URI previously received in the Location HTTP header of the response to the subscription.

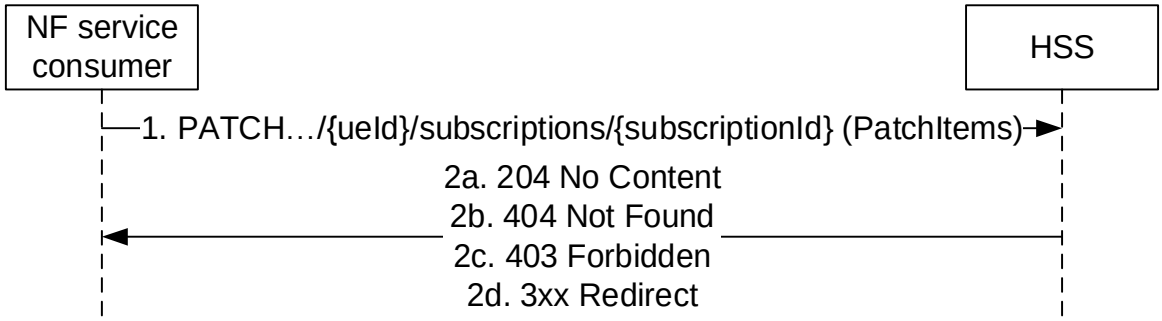

Figure 5.3.2.6.2-1: NF service consumer modifies a subscription to notifications

1. The NF service consumer sends a PATCH request to the resource identified by the URI previously received during subscription creation.

2a. On success, the UDM responds with "204 No Content".

2b. If there is no valid subscription available (e.g. due to an unknown subscriptionId value), HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

2c. If the operation cannot be authorized, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in "ProblemDetails" element)

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.4 Nhss_UEContextManagement Service

5.4.1 Service Description

The service allows an NF consumer (UDM) to trigger the cancellation of any previous registered serving node due to IRAT mobility. See 3GPP TS 23.632 [8], clause 6.1.3.

5.4.2 Service Operations

5.4.2.1 Introduction

For the Nhss_UEContextManagement service the following service operations are defined:

- SnDeregistration
- ImeiUpdate
- RoamingStatusUpdate

The Nhss_UEContextManagement service is used by Consumer NF (UDM) to request HSS to deregister the MME/SGSN via cancel location procedure and to update the IMEI and roaming status of the UE in the HSS.

5.4.2.2 SnDeregistration

5.4.2.2.1 General

The following procedure using the SnDeregistration service operation is supported:

- SN Deregistration

5.4.2.2.2 SN Deregistration

Figure 5.4.2.2.2-1 shows a scenario where the NF service consumer (UDM) requests HSS to initiate Cancel Location procedure towards the MME/SGSN due to IRAT mobility. The request contains the UE's identity which shall be an IMSI.

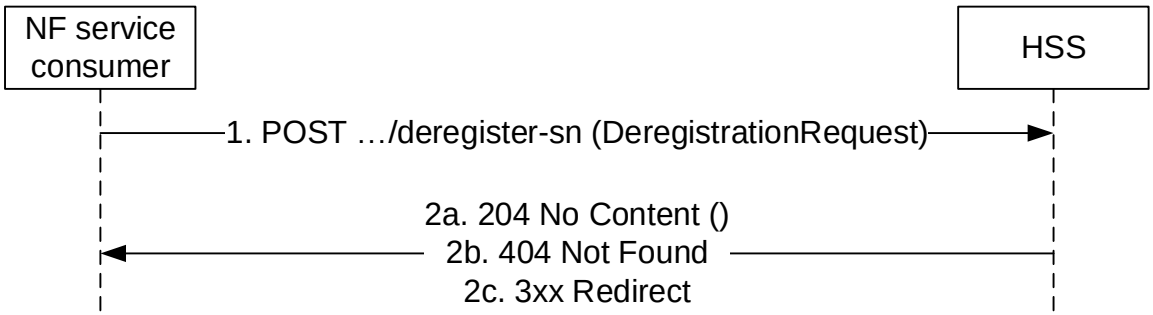

Figure 5.4.2.2.2-1: SN Deregistration

1. The NF service consumer sends a POST request (custom method: deregister-sn) to the HSS; the request body contains the UE identity (IMSI) and the deregistration reason.

   The HSS, based on the value indicated in the deregistration reason, initiates a Cancel Location towards the serving node, including a Cancellation Type value (see 3GPP TS 29.272 [17] and 3GPP TS 29.002 [20]) as follows:

   - "UE_INITIAL_AND_SINGLE_REGISTRATION": S6a/S6d/Gr(S4/Gn/Gp) Cancel Location sent towards MME/SGSN, with a Cancellation-Type set to MME_UPDATE_PROCEDURE/SGSN_UPDATE_PROCEDURE; the HSS shall delete the stored MME/SGSN address and MME/SGSN number.

     Additionally, a MAP D Cancel Location (IMSI) shall be sent towards MSC/VLR if a VLR number was found in the HSS/HLR for the user; the HSS/HLR shall delete the stored MSC/VLR number.

   - "UE_INITIAL_AND_DUAL_REGISTRATION": S6d/Gr(S4) Cancel Location sent towards SGSN, with a Cancellation-Type set to SGSN_UPDATE_PROCEDURE; the HSS shall delete the stored SGSN address and SGSN number.

NOTE 1: As described in 3GPP TS 23.502 [3], a UE operating in dual-registration mode indicates that it is moving from EPS, which implies that there is an MME registered in HSS.

- "EPS_TO_5GS_MOBILITY": S6a Cancel Location sent towards MME, with a Cancellation-Type set to MME_UPDATE_PROCEDURE; the HSS shall delete the stored MME address and MME number.

  Additionally, a MAP D Cancel Location (IMSI) shall be sent towards MSC/VLR if a VLR number was found in the HSS/HLR for the user; the HSS/HLR shall delete the stored MSC/VLR number.

- "EPS_TO_5GS_MOBILITY": S6d/Gr(S4) Cancel Location sent towards SGSN, with a Cancellation-Type set to SGSN_UPDATE_PROCEDURE; the HSS shall delete the stored SGSN address and SGSN number.

- "EPS_TO_5GS_MOBILITY_WITHOUT_N26_IWK": S6d/Gr(S4) Cancel Location sent towards SGSN, with a Cancellation-Type set to SGSN_UPDATE_PROCEDURE; the HSS shall delete the stored SGSN address and SGSN number. The HSS shall not send S6a Cancel Location towards MME (Clause 4.11.2.3 of 3GPP TS 23.502 [3]).

NOTE 2: Based on operator policy, and the presence of GUAMI in the DeregistrationRequest, the HSS can decide whether a registered VLR in the VPLMN needs to be cancelled. It should be noted that keeping the VLR registration can impact terminating services (e.g. T-ADS, MT-SMS…) causing failed paging attempts.

2a. On success, the HSS responds with "204 No Content". If the HSS has a valid subscription for the UE, but the UE is not registered in EPS network, the HSS shall respond with "204 No Content".

2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.4.2.3 IMEI Update

Figure 5.4.2.3-1 shows a scenario where the NF service consumer (UDM) requests HSS to update the IMEI of the UE stored in the HSS. The request contains the UE's identity which shall be an IMSI, and the new IMEI of the UE.

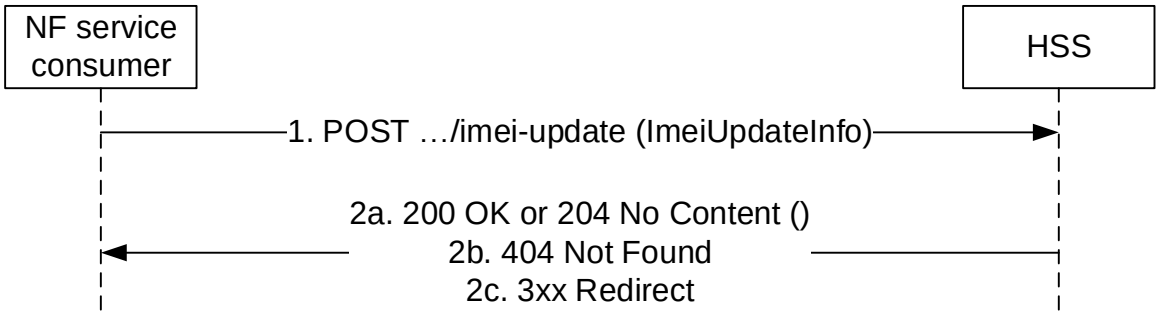

Figure 5.4.2.3-1: IMEI Update

1. The NF service consumer sends a POST request (custom method: imei-update) to the HSS; the request body contains the UE identity (IMSI) and the new IMEI of the UE.

2a. On success, the HSS responds either with "204 No Content", which indicates that the HSS does not have any stored IMEI(SV) value for the UE, or with a "200 OK", which indicates that the HSS had an IMEI value stored for the UE. In the latter case, the HSS shall update the locally stored IMEI value for the UE, and return in the response body the previous IMEI, so the NF Service Consumer (UDM) can determine whether the HSS contained a different IMEI value than the current one sent to the HSS in this IMEI Update notification.

2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.4.2.4 Roaming Status Update

Figure 5.4.2.4-1 shows a scenario where the NF service consumer (UDM) requests HSS to update the Roaming Status of the UE stored in the HSS. The request contains the UE's identity which shall be an IMSI, and the new PLMN-ID where the UE is located.

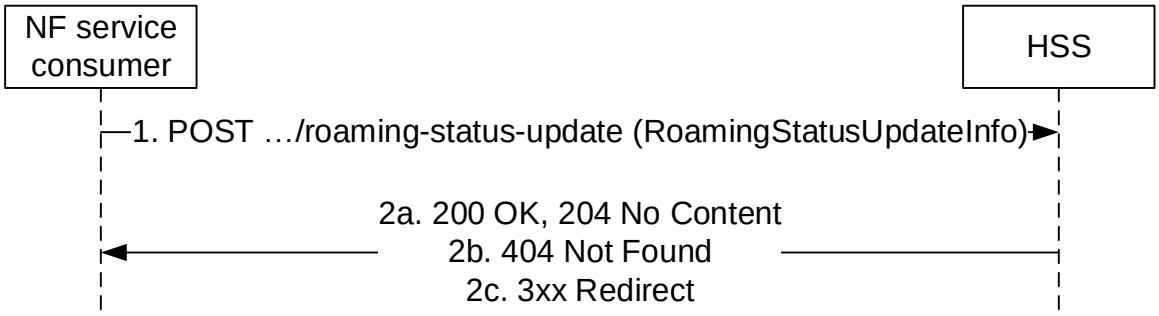

Figure 5.4.2.4-1: Roaming Status Update

1. The NF service consumer sends a POST request (custom method: roaming-status-update) to the HSS; the request body contains the UE identity (IMSI) and the new PLMN-ID of the UE.

2a. On success, the HSS responds with "204 No Content".

2b. If there is no valid subscription data for the UE, HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.5 Nhss_EventExposure Service

5.5.1 Service Description

See 3GPP TS 23.632 [8].

5.5.2 Service Operations

5.5.2.1 Introduction

For the Nhss_EventExposure service the following service operations are defined:

- Subscribe
- Unsubscribe
- Notify
- ModifySubscription

The Nhss_EventExposure service is used by consumer NFs (e.g. UDM) to subscribe to notifications of event occurrence by means of the Subscribe service operation.

The Nhss_EventExposure service is also used by the consumer NFs (e.g. UDM) that have previously subscribed to notifications, to unsubscribe by means of the Unsubscribe service operation.

The Nhss_EventExposure service is also used by the subscribed consumer NFs (e.g. UDM) to modify an existing subscription by means of the ModifySubscription service operation.

5.5.2.2 Subscribe

5.5.2.2.1 General

The following procedures using the Subscribe service operation are supported:

- Subscribe to Notification of event occurrence

5.5.2.2.2 Subscription to Notification of event occurrence

Figure 5.5.2.2.2-1 shows a scenario where the NF service consumer sends a request to the HSS to subscribe to notifications of event occurrence. The request contains a callback URI, the type of event that is monitored and additional information e.g. SCEF Id, event filters and reporting options.

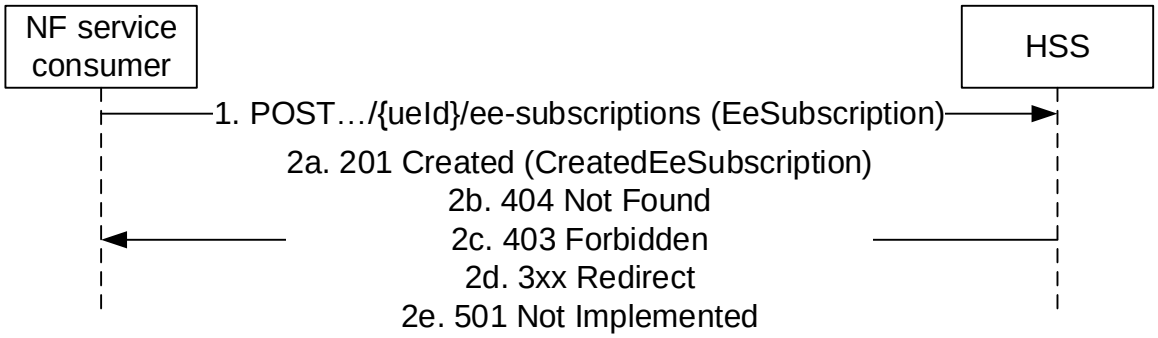

Figure 5.5.2.2.2-1: NF service consumer subscribes to notifications

1. The NF service consumer sends a POST request to the parent resource (collection of subscriptions) (.../{ueId}/ee-subscriptions), to create a subscription as present in message body. The request may contain an expiry time, suggested by the NF Service Consumer, representing the time upto which the subscription is desired to be kept active and the time after which the subscribed event(s) shall stop generating notifications. Additionally, the request may include an SCEF Id if Common Network Exposure is used (i.e. if combined SCEF+NEF requested the event(s) to be subscribed/monitored in EPC)

   If MTC Provider information is received in the request, the HSS shall check whether the MTC Provider is allowed to perform this operation for the UE; otherwise, the HSS shall skip the MTC provider authorization check.

2a. On success, the HSS responds with "201 Created" with the message body containing a representation of the created subscription. The Location HTTP header shall contain the URI of the created subscription.

   If immediate reporting is requested and if both HSS and NF consumer has indicated supporting of ERIR feature (see clause 6.4.8), the HSS shall include available immediate event reports, i.e. reports already received from MME, in the response body; otherwise if the HSS and/or the NF consumer cannot support the ERIR feature, the HSS shall send a notification (see clause 5.5.2.4.2) towards the NF consumer including the current status of the events requested for immediate reporting. If immediate reporting is requested but the current status of the event(s) is not available at the time of subscription, the HSS should include the current status not available indication in the response.

   If some of the requested monitoring configurations fails, the response may include the failedMonitoringConfigs to indicate the failed cause of the failed monitoring configurations.

2b. If the user does not exist, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

2c. If there is no valid subscription data for the UE, i.e. based on the UE's subscription information monitoring of the requested EventType is not allowed, or the requested EventType is not supported, or the MTC Provider is not allowed to perform this operation for the UE, HTTP status code "403 Forbidden" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

2d. In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

2e. If the requested monitoring event types or reporting options are not supported, HTTP status code "501 Not Implemented" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

5.5.2.3 Unsubscribe

5.5.2.3.1 General

The following procedures using the Unsubscribe service operation are supported:

- Unsubscribe to Notifications of event occurrence

5.5.2.3.2 Unsubscribe to notifications of event occurrence

Figure 5.5.2.3.2-1 shows a scenario where the NF service consumer sends a request to the HSS to unsubscribe from notifications of event occurrence. The request contains the URI previously received in the Location HTTP header of the response to the subscription.

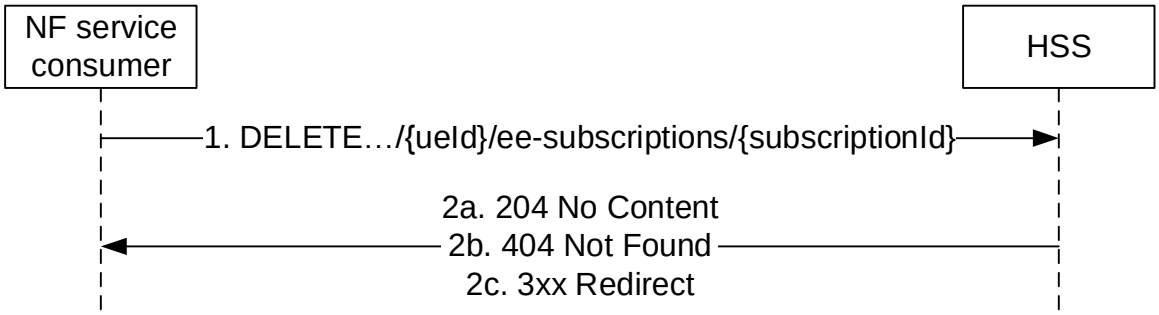

Figure 5.5.2.3.2-1: NF service consumer unsubscribes to notifications

1. The NF service consumer sends a DELETE request to the resource identified by the URI previously received during subscription creation.

2a. On success, the HSS responds with "204 No Content".

2b. If there is no valid subscription available (e.g. due to an unknown SubscriptionId value), HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.5.2.4 Notify

5.5.2.4.1 General

The following procedures using the Notify service operation are supported:

- Event Occurrence Notification

5.5.2.4.2 Event Occurrence Notification

Figure 5.5.2.4.2-1 shows a scenario where the HSS notifies the NF service consumer (that has subscribed to receive such notification) about occurrence of an event or the current status of the events requested for immediate reporting if ERIR feature (see clause 6.4.8) is not supported by the HSS and/or the NF consumer. The request contains the Reference IDs as previously received in the EeSubscription.

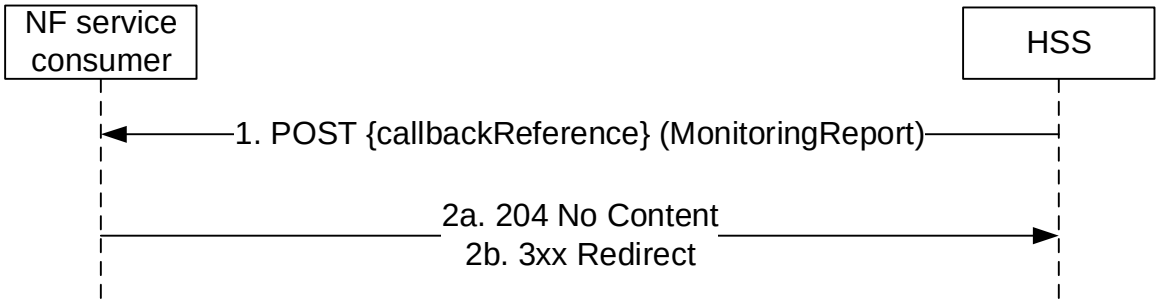

Figure 5.5.2.4.2-1: Event Occurrence Notification

1. The HSS sends a POST request to the callbackReference URI as provided by the NF service consumer during the subscription.

2a. The NF Service Consumer responds with "204 No Content".

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

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 an alternative notification endpoint.

5.5.2.5 ModifySubscription

5.5.2.5.1 General

The following procedures using the ModifySubscription service operation are supported:

- Modification of an EE-Subscription to notification of events

5.5.2.5.2 Modification of a subscription

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

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

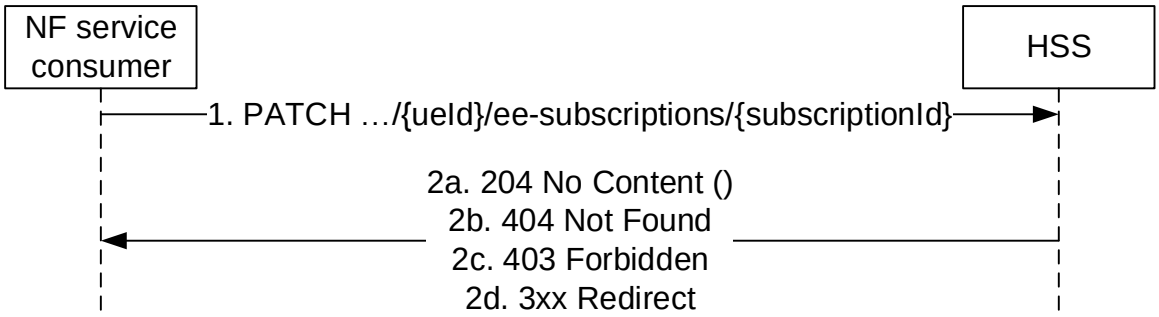

Figure 5.5.2.5.2-1: NF service consumer updates subscription

1. The NF service consumer (e.g. NEF) 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.

2a. On success, the request is accepted, the HSS shall respond with "204 No Content".

2b. If the resource does not exist e.g. the subscriptionId cannot be found, HTTP status code "404 Not Found" should be returned including additional error information in the response body (in the "ProblemDetails" element).

2c. If the modification can't be accepted, HTTP status code "403 Forbidden" should be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PATCH response body.

In the case of redirection, the HSS shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another HSS (service) instance.

5.6 Nhss_ParameterProvision Service

5.6.1 Service Description

This service allows service consumers (e.g. UDM) to externally provision UE subscription parameters for use in the EPS.

5.6.2 Service Operations

5.6.2.1 Introduction

For the Nhss_ParameterProvision service the following service operations are defined:

- Create
- Update
- Delete
- Get

The Nhss_ParameterProvision service is used by consumer NFs (e.g. UDM) to create, update, delete, or retrieve a UE's or a group of UEs' subscription data by means of the Create/Update/Delete/Get service operations.

5.6.2.2 Create

5.6.2.2.1 General

The following procedures using the Create service operation are supported:

- Parameter Provisioning Data Entry per AF creation

5.6.2.2.1.1 Parameter Provisioning Data Entry per AF creation

Figure 5.6.2.2.1.1-1 shows a scenario where the NF service consumer (e.g. UDM) sends a request to the HSS to create the Parameter Provisioning Data entry for a certain AF, which will influence the UE's subscription data. The NF consumer shall send a PUT request towards the resource URI of new Parameter Provisioning Data entry for the AF (.../{ueId}/pp-data-store/{afInstanceId}) with the new value in the request body.

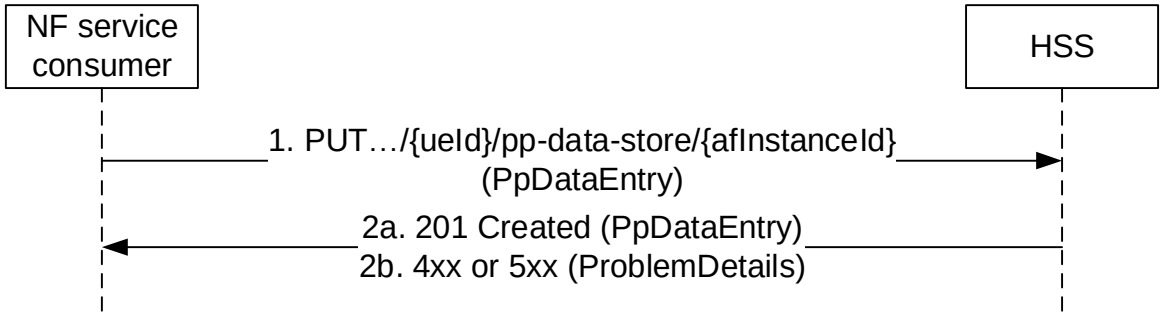

Figure 5.6.2.2.1.1-1: NF service consumer creates a Parameter Provisioning Data Entry per AF

1. The NF service consumer (e.g. UDM) sends a PUT request to the resource that represents the new Parameter Provisioning Data entry for the AF identified by the afInstnaceId. The request body shall contain a PpDataEntry object representing the value of the new resource.

The HSS shall check whether the AF is allowed to perform this operation:

- if MTC Provider information is received in the request, the HSS shall check whether the MTC Provider is allowed to perform this operation for the UE; otherwise, the HSS shall skip authorization check.

2a. The HSS responds with "201 Created" and the response body shall contain a PpDataEntry object representing the new created resource.

2b. If MTC Provider or AF are not allowed to perform this operation for the UE, HTTP status code "403 Forbidden" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

NOTE: Upon reception of creation of maximum latency, maximum response time or DL Buffering Suggested Packet Count, HSS may need to adjust the value of active time and/or periodic registration timer and/or DL Buffering Suggested Packet Count and the HSS shall notify MME if the values are updated.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

5.6.2.3 Update

5.6.2.3.1 General

The following procedures using the Update service operation are supported:

- Parameter Provisioning Data Entry per AF update

5.6.2.3.2 Parameter Provisioning Data Entry per AF update

Figure 5.6.2.3.2-1 shows a scenario where the NF service consumer (e.g. UDM) sends a request to the HSS to update the Parameter Provisioning Data entry for a certain AF, which will influence the UE's subscription. The NF consumer shall send a PUT request towards the resource URI of an existing Parameter Provisioning Data entry for the AF (.../{ueId}/pp-data-store/{afInstanceId}) with the new value in the request body.

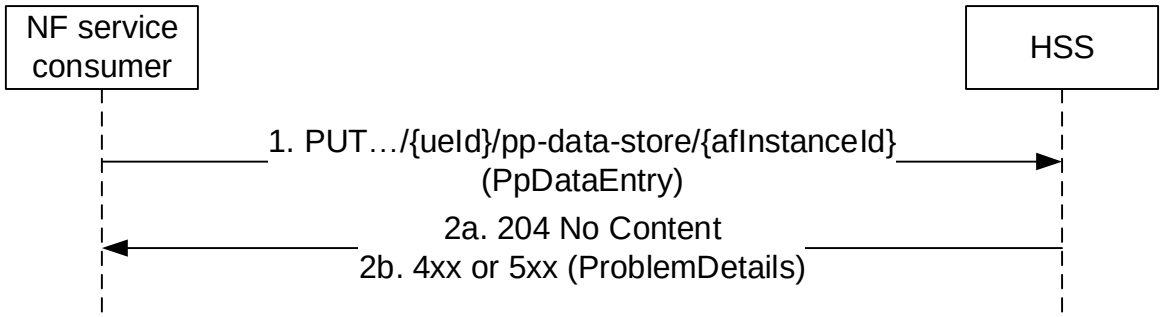

Figure 5.6.2.3.2-1: NF service consumer updates a Parameter Provisioning Data Entry per AF

1. The NF service consumer (e.g. UDM) sends a PUT request to the resource that represents an existing Parameter Provisioning Data entry for the AF identified by the afInstnaceId. The request body shall contain a PpDataEntry object representing the new value of the resource.

   The HSS shall check whether the AF is allowed to perform this operation:

   - if MTC Provider information is received in the request, the HSS shall check whether the MTC Provider is allowed to perform this operation for the UE; otherwise, the HSS shall skip the authorization check.

2a. The HSS responds with "204 No Content".

2b. If MTC Provider or AF are not allowed to perform this operation for the UE, HTTP status code "403 Forbidden" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

NOTE: Upon reception of an update or removal of maximum latency, maximum response time or DL Buffering Suggested Packet Count, HSS may need to adjust the value of active time and/or periodic registration timer and/or DL Buffering Suggested Packet Count and the HSS shall notify MME if the values are updated.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the PUT response body.

5.6.2.4 Delete

5.6.2.4.1 General

The following procedures using the Delete service operation are supported:

- Parameter Provisioning Data Entry per AF deletion

5.6.2.4.2 Parameter Provisioning Data Entry per AF deletion

Figure 5.6.2.4.2-1 shows a scenario where the NF service consumer (e.g. UDM) sends a request to the HSS to delete a Parameter Provisioning Data Entry for a certain AF. The NF consumer shall send a DELETE request towards the resource URI of an existing Parameter Provisioning Data entry for the AF (.../{ueId}/pp-data-store/{afInstanceId}).

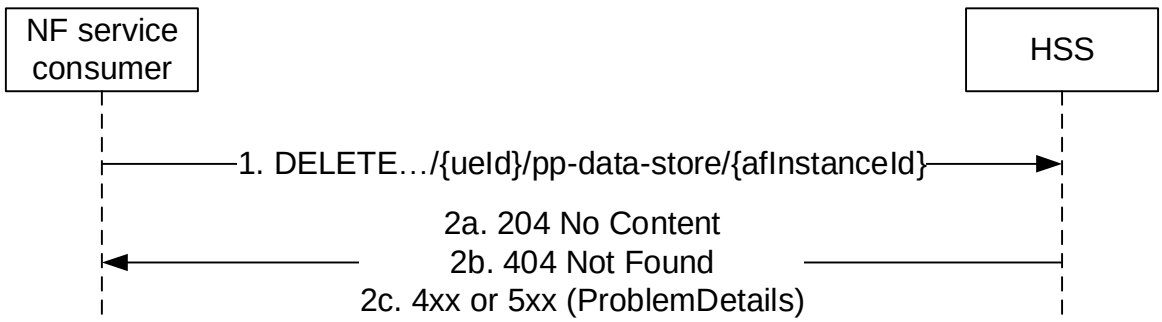

Figure 5.6.2.4.2-1: NF service consumer deletes a Parameter Provisioning Data Entry per AF

1. The NF service consumer sends a DELETE request to the resource ... /{ueId}/pp-data-store/{afInstanceId}, to delete the Parameter Provisioning Data Entry for the AF identified by afInstanceId.

   The HSS shall check whether the AF is allowed to perform this operation:

   - if MTC Provider information is received in the request, the HSS shall check whether the MTC Provider is allowed to perform this operation for the UE; otherwise, the HSS shall skip the authorization check.

2a. On success, the HSS responds with "204 No Content".

2b. If the Parameter Provisioning Data Entry for the AF does not exist in the HSS, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

2c. If MTC Provider or AF are not allowed to perform this operation for the UE, HTTP status code "403 Forbidden" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the DELETE response body.

5.6.2.5 Get

5.6.2.5.1 General

The following procedures using the Get service operation are supported:

- Parameter Provisioning Data Entry per AF get

5.6.2.5.2 Parameter Provisioning Data Entry per AF get

Figure 5.6.2.5.2-1 shows a scenario where the NF service consumer (e.g. UDM) sends a request to the HSS to get a Parameter Provisioning Data Entry for a certain AF. The NF consumer shall send a GET request towards the resource URI of an existing Parameter Provisioning Data entry for the AF (.../{ueId}/pp-data-store/{afInstanceId}).

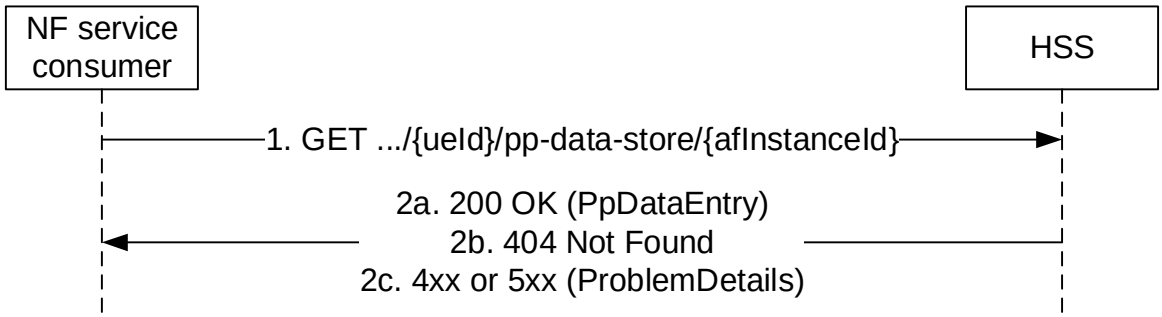

Figure 5.6.2.5.2-1: NF service consumer gets a Parameter Provisioning Data Entry per AF

1. The NF service consumer sends a GET request to the resource .../{ueId}/pp-data-store/{afInstanceId}, to get the Parameter Provisioning Data Entry for the AF identified by afInstanceId.

   The HSS shall check whether the AF is allowed to perform this operation:

   - If MTC Provider information is stored in the PP data, the HSS shall check whether the MTC Provider is allowed to perform this operation for the UE; otherwise, the HSS shall skip the authorization check.

2a. On success, the HSS responds with "200 OK" with the Parameter Provisioning Data Entry for the AF.

2b. If the Parameter Provisioning Data Entry for the AF does not exist in the HSS, HTTP status code "404 Not Found" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

2c. If MTC Provider or AF are not allowed to perform this operation for the UE, HTTP status code "403 Forbidden" shall be returned including additional error information in the response body (in the "ProblemDetails" element).

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the GET response body.

6 API Definitions

6.1 Nhss_UEAuthentication Service API

6.1.1 Introduction

The Nhss_UEAuthentication service shall use the Nhss_UEAuthentication API.

The request URI used in HTTP request from the NF service consumer towards the NF service producer shall have the 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 "nhss-ueau".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.

6.1.2 Usage of HTTP

6.1.2.1 General

HTTP/2, as defined in IETF RFC 9113 [9], 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].

HTTP messages and bodies for the Nhss_UEAuthentication service shall comply with the OpenAPI [10] specification contained in Annex A.

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.1.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [11], signalled by the content type "application/json".
- The Problem Details JSON Object (IETF RFC 9457 [12] signalled by the content type "application/problem+json".

6.1.2.3 HTTP custom headers

6.1.2.3.1 General

In this release of the specification, no specific custom headers are defined for the Nhss_UEAuthentication service.

For 3GPP specific HTTP custom headers used across all service based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.1.3 Resources

6.1.3.1 Overview

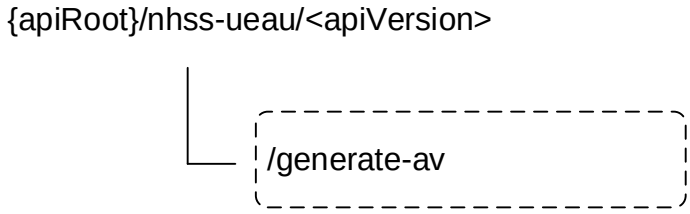

Figure 6.1.3.1-1: Resource URI structure of the nhss-ueau API

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
n/a	generate-av	generate-av (POST)	Generate Authentication Vector

6.1.4 Custom Operations without associated resources

6.1.4.1 Overview

Table 6.1.4.1-1: Custom operations without associated resources

Custom operation URI	Mapped HTTP method	Description
{apiRoot}/nhss-ueau/<apiVersion>/generate-av	POST	The HSS calculates a fresh Authentication Vector taking into account the received information (imsi, serving network name, authentication method)

6.1.4.2 Operation: Generate AV

6.1.4.2.1 Description

This custom operation is used by the NF service consumer (UDM) to request calculation of an authentication vector for the provided imsi.

6.1.4.2.2 Operation Definition

This operation shall support the response data structures and response codes specified in tables 6.1.4.2.2-1 and 6.1.4.2.2-2.

Table 6.1.4.2.2-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
AvGenerationRequest	M	1	Contains input parameters for Authentication Vector calculation

Table 6.1.4.2.2-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
AvGenerationResponse	M	1	200 OK	Upon success, a response body containing the generated authentication vector shall be returned
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - AUTHENTICATION_REJECTED
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND

Table 6.1.4.2.2-3: Headers supported by the 307 Response Code on this resource

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

Table 6.1.4.2.2-4: Headers supported by the 308 Response Code on this resource

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

6.1.5 Notifications

In this release of this specification, no notifications are defined for the Nhss_UEAuthentication Service.

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 Nhss service based interface protocol.

Table 6.1.6.1-1: Nhss specific Data Types

Data type	Clause defined	Description	Applicability
AvGenerationRequest	6.1.6.2.2	Contains imsi, authentication method, serving network name, resynchronization info	
AvGenerationResponse	6.1.6.2.3	Contains the calculated Authentication Vector	

Table 6.1.6.1-2 specifies data types re-used by the Nhss 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 Nhss service based interface.

Table 6.1.6.1-2: Nhss re-used Data Types

Data type	Reference	Comments	Applicability
AuthType	3GPP TS 29.503 [13]		
ServingNetworkName	3GPP TS 29.503 [13]		
ResynchronizationInfo	3GPP TS 29.503 [13]		
AvEapAkaPrime	3GPP TS 29.503 [13]		
Av5GHeAka	3GPP TS 29.503 [13]		
ProblemDetails	3GPP TS 29.571 [7]	Response body of error response messages.	
RedirectResponse	3GPP TS 29.571 [7]	Response body of redirect response messages.	

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: AvGenerationRequest

Table 6.1.6.2.2-1: Definition of type AvGenerationRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
imsi	string	M	1	pattern: "[0-9]{5,15}"	
authType	AuthType	M	1	Indicates the authentication method; "EAP_AKA_PRIME" or "5G_AKA"	
servingNetworkName	ServingNetwork Name	M	1		
resynchronizationInfo	ResynchronizationInfo	O	0..1		

6.1.6.2.3 Type: AvGenerationResponse

Table 6.1.6.2.3-1: Definition of type AvGenerationResponse

Attribute name	Data type	P	Cardinality	Description	Applicability
avEapAkaPrime	AvEapAkaPrime	C	0..1	shall be present if av5GHeAka is absent, otherwise shall be absent.	
av5GHeAka	Av5GHeAka	C	0..1	shall be present if avEapAkaPrime is absent, otherwise shall be absent.	

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

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

6.1.7 Error Handling

6.1.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.1.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.1.7.3 Application Errors

The application errors defined for the Nhss_UEAuthentication service are listed in table 6.1.7.3-1.

Table 6.1.7.3-1: Application errors

Application Error	HTTP status code	Description
AUTHENTICATION_REJECTED	403 Forbidden	The user cannot be authenticated
USER_NOT_FOUND	404 Not Found	The user does not exist in the HPLMN

6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Nhss_UEAuthentication 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	Description

6.1.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nhss_UEAU API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nhss_UEAU API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nhss_UEAU service.

The Nhss_UEAU API defines a single scope "nhss-ueau" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, 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 HSS service instance when using direct or indirect communications (see 3GPP TS 29.500 [4]).

An SCP that reselects a different HSS producer instance will return the NF Instance ID of the new HSS 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 HSS redirects a service request to a different HSS using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new HSS 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 Nhss_SubscriberDataManagement Service API

6.2.1 API URI

The Nhss_SubscriberDataManagement service shall use the Nhss_SubscriberDataManagement API.

The request URI used in HTTP request from the NF service consumer towards the NF service producer shall have the 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 "nhss-sdm".
- 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, as defined in IETF RFC 9113 [9], 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].

HTTP messages and bodies for the Nhss_SubscriberDataManagement service shall comply with the OpenAPI [10] specification contained in Annex A.

6.2.2.2 HTTP standard headers

6.2.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.2.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [11], signalled by the content type "application/json".
- The Problem Details JSON Object (IETF RFC 9457 [12] signalled by the content type "application/problem+json".

6.2.2.3 HTTP custom headers

6.2.2.3.1 General

In this release of the specification, no specific custom headers are defined for the Nhss_SubscriberDataManagement service.

For 3GPP specific HTTP custom headers used across all service-based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.2.3 Resources

6.2.3.1 Overview

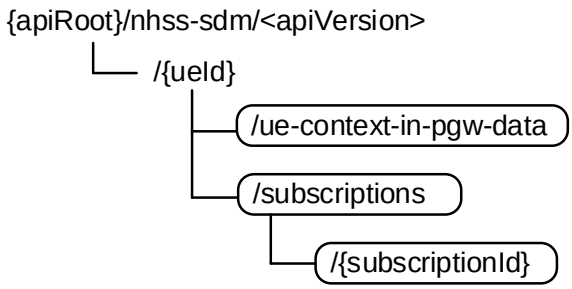

Figure 6.2.3.1-1: Resource URI structure of the nhss-sdm API

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 (Archetype)	Resource URI	HTTP method or custom operation	Description
UeContextInPgwData (Document)	/{ueId}/ue-context-in-pgw-data	GET	Retrieve the UE's Context in PGW Data
Subscriptions (Collection)	/{ueId}/subscriptions	POST	Create a subscription
Individual Subscription (Document)	/{ueId}/subscriptions/{subscriptionId}	DELETE	Delete the subscription identified by {subscriptionId}, i.e. unsubscribe
		PATCH	Modify the subscription identified by {subscriptionId}

6.2.3.2 Resource: UeContextInPgwData

6.2.3.2.1 Description

This resource represents the allocated PGWs for the UE.

6.2.3.2.2 Resource Definition

Resource URI: {apiRoot}/nhss-sdm/<apiVersion>/{ueId}/ue-context-in-pgw-data

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
ueId	Represents the UE identifier with type IMSI. pattern: "^(imsi-[0-9]{5,15}|.+)$"

6.2.3.2.3 Resource Standard Methods

6.2.3.2.3.1 GET

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

Table 6.2.3.2.3.3-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
n/a				

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

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

Data type	P	Cardinality	Description
n/a			

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

Data type	P	Cardinality	Response codes	Description
UeContextInPgwData	M	1	200 OK	A response body containing the UeContextInPgwData shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND - DATA_NOT_FOUND
NOTE: In addition, common data structures as listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

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

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

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

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

6.2.3.3 Resource: Subscriptions

6.2.3.3.1 Description

This resource is used to represent subscriptions to notifications.

6.2.3.3.2 Resource Definition

Resource URI: {apiRoot}/nhss-sdm/<apiVersion>/{ueId}/subscriptions

This resource shall support the resource URI variables defined in table 6.2.3.3.2-1.

Table 6.2.3.3.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See clause 6.1.1
apiVersion	See clause 6.1.1
ueId	Represents the IMSI of the subscriber. pattern: "^(imsi-[0-9]{5,15})$"

6.2.3.3.3 Resource Standard Methods

6.2.3.3.3.1 POST

This method shall support the URI query parameters specified in table 6.2.3.3.3.1-1.

Table 6.2.3.3.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.2.3.3.3.1-2 and the response data structures and response codes specified in table 6.2.3.3.3.1-3.

Table 6.2.3.3.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SubscriptionData	M	1	The subscription that is to be created.

Table 6.2.3.3.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SubscriptionData	M	1	201 Created	Upon success, a response body containing a representation of the created Individual subscription resource shall be returned. The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND
ProblemDetails	O	0..1	501 Not Implemented	The "cause" attribute may be used to indicate one of the following application errors: - UNSUPPORTED_RESOURCE_URI This response shall not be cached.
NOTE: In addition, common data structures as listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

Table 6.2.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.2.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.2.3.4 Resource: Individual subscription

6.2.3.4.1 Description

This resource is used to represent an individual subscription to notifications.

6.2.3.4.2 Resource Definition

Resource URI: {apiRoot}/nhss-sdm/<apiVersion>/{ueId}/subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 6.2.3.4.2-1.

Table 6.2.3.4.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See clause 6.1.1
apiVersion	See clause 6.1.1
ueId	Represents the IMSI of the subscriber pattern: "^(imsi-[0-9]{5,15})$"
subscriptionId	The subscriptionId identifies an individual subscription to notifications.

6.2.3.4.3 Resource Standard Methods

6.2.3.4.3.1 DELETE

This method shall support the URI query parameters specified in table 6.2.3.4.3.1-1.

Table 6.2.3.4.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.2.3.4.3.1-2 and the response data structures and response codes specified in table 6.2.3.4.3.1-3.

Table 6.2.3.4.3.1-2: Data structures supported by the Delete Request Body on this resource

Data type	P	Cardinality	Description
n/a			The request body shall be empty.

Table 6.2.3.4.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND - SUBSCRIPTION_NOT_FOUND (see 3GPP TS 29.500 [4] table 5.2.7.2-1)
NOTE: In addition, common data structures as listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

Table 6.2.3.4.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.2.3.4.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.2.3.4.3.2 PATCH

This method shall support the URI query parameters specified in table 6.2.3.4.3.2-1.

Table 6.2.3.4.3.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.2.3.4.3.2-2 and the response data structures and response codes specified in table 6.2.3.4.3.2-3.

Table 6.2.3.4.3.2-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
array(PatchItem)	M	1	It contains the list of changes to be made to the resource representing the individual subscription, according to the JSON PATCH format specified in IETF RFC 6902 [13].

Table 6.2.3.4.3.2-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, a response with no content is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND - SUBSCRIPTION_NOT_FOUND (see 3GPP TS 29.500 [4] table 5.2.7.2-1)
ProblemDetails	O	0..1	403 Forbidden	One or more attributes are not allowed to be modified. The "cause" attribute may be used to indicate one of the following application errors: - MODIFICATION_NOT_ALLOWED (see 3GPP TS 29.500 [4] table 5.2.7.2-1)
NOTE: In addition, common data structures as listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

Table 6.2.3.4.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.2.3.4.3.2-5: Headers supported by the 308 Response Code on this resource

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

6.2.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nhss_SubscriberDataManagement Service.

6.2.5 Notifications

6.2.5.1 General

This clause specifies the use of notifications and corresponding protocol details.

6.2.5.2 Data Change Notification

The POST method shall be used for Data Change Notifications and the URI shall be as provided during the subscription procedure.

Resource URI: {callbackReference}

Support of URI query parameters is specified in table 6.2.5.2-1.

Table 6.2.5.2-1: URI query parameters supported by the POST method

Name	Data type	P	Cardinality	Description
n/a				

Support of request data structures is specified in table 6.2.5.2-2 and of response data structures and response codes is specified in table 6.2.5.2-3.

Table 6.2.5.2-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
ModificationNotification	M	1	When a modification of any attributes in UeContextInPgwData is notified to the UDM, the notification should include all the attributes including the ones that are not modified as well. For the unchanged attributes, "REPLACE" operation shall be used in changeItem with absent origValue.

Table 6.2.5.2-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - CONTEXT_NOT_FOUND See table 6.2.7.3-1 for the description of this error.
NOTE: In addition, common data structures as listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

Table 6.2.5.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.2.5.2-5: Headers supported by the 308 Response Code on this resource

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

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 Nhss_SubscriberDataManagement service API.

Table 6.2.6.1-1: Nhss_SubscriberDataManagement specific Data Types

Data type	Clause defined	Description
UeContextInPgwData	6.2.6.2.2	
SubscriptionData	6.2.6.2.3	Subscription Data
SubscriptionDataSets	6.2.6.2.4	UE Subscription Data Sets

Table 6.2.6.1-2 specifies data types re-used by the Nhss_SubscriberDataManagement service API from other APIs, including a reference and when needed, a short description of their use within the Nhss_SubscriberDataManagement service API.

Table 6.2.6.1-2: Nhss_SubscriberDataManagement re-used Data Types

Data type	Reference	Comments
PgwInfo	3GPP TS 29.503 [13]	
ModificationNotification	3GPP TS 29.503 [13]	
NfInstanceId	3GPP TS 29.571 [7]	Network Function Instance Identifier
Uri	3GPP TS 29.571 [7]	Uniform Resource Identifier
DateTime	3GPP TS 29.571 [7]	
ProblemDetails	3GPP TS 29.571 [7]	Response body of error response messages.
RedirectResponse	3GPP TS 29.571 [7]	Response body of redirect response messages.
Fqdn	3GPP TS 29.571 [7]	Fully Qualified Domain Name

6.2.6.2 Structured data types

6.2.6.2.1 Introduction

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

6.2.6.2.2 Type: UeContextInPgwData

Table 6.2.6.2.2-1: Definition of type UeContextInPgwData

Attribute name	Data type	P	Cardinality	Description
pgwInfo	array(PgwInfo)	O	1..N	Information about the APNs and PGW-C+SMF FQDNs used in interworking with UDM
emergencyFqdn	Fqdn	O	0..1	PGW-C+SMF FQDN for emergency session
emergencyPlmnId	PlmnId	O	0..1	PLMN where the PGW-C+SMF for emergency session is located
emergencyIpAddr	IpAddress	O	0..1	IP address of the PGW-C+SMF for emergency session
emergencyRegistrationTime	DateTime	O	0..1	Time of PGW-C+SMF for emergency session Registration.
Note: At least one of pgwInfo and emergencyFqdn/emergencyIPAddr shall be present. The format of PGW-C+SMF FQDN is specified in clause 5.12.3.2, 3GPP TS 29.303 [16].				

6.2.6.2.3 Type: SubscriptionData

Table 6.2.6.2.3-1: Definition of type SubscriptionData

Attribute name	Data type	P	Cardinality	Description
nfInstanceId	NfInstanceId	M	1	Identity of the NF Instance creating the subscription.
callbackReference	Uri	M	1	URI provided by the NF service consumer to receive notifications
monitoredResourceUris	array(Uri)	M	1..N	A set of URIs that identify the resources for which a change triggers a notification. The URI shall take the form of either an absolute URI or an absolute-path reference as defined in IETF RFC 3986 [31]. See NOTE 1.
expires	DateTime	O	0..1	If present in a POST request, it indicates the point in time at which the subscription expires. Within a POST request the proposed expiry time is conveyed whereas in a POST response or PATCH response the confirmed expiry time is returned.
immediateReport	boolean	O	0..1	This IE indicates whether immediate report is needed or not. When present, this IE shall be set as following: - true: immediate report is required - false (default) immediate report is not required
report	SubscriptionDataSets	C	0..1	This IE shall be present in Subscribe response, if the immediateReport attribute is set to "true" in Subscribe request. When present, this IE shall contain the representation of subscription data sets that to be monitored, i.e. listed in monitoredResourceUris attribute.
NOTE 1: The HSS should handle only the relative-path part (apiSpecificResourceUriPart, see 3GPP TS 29.501 [5] clause 4.4.1) and ignore possible inconsistencies (caused by e.g. an SCP) in the base URI part.				

6.2.6.2.4 Type: SubscriptionDataSets

Table 6.2.6.2.4-1: Definition of type SusbcriptionDataSets

Attribute name	Data type	P	Cardinality	Description
ueContextInPgwData	UeContextInPgwData	O	0..1	UE Context in PGW Data

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.

6.2.6.3.2 Simple data types

The simple data types defined in table 6.2.6.3.2-1 shall be supported.

Table 6.2.6.3.2-1: Simple data types

Type Name	Type Definition	Description

6.2.7 Error Handling

6.2.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.2.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.2.7.3 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 Nhss_SubscriberDataManagement service. The following application errors listed in Table 6.2.7.3-1 are specific for the Nhss_SubscriberDataManagement service.

Table 6.2.7.3-1: Application errors

Application Error	HTTP status code	Description
USER_NOT_FOUND	404 Not Found	The user does not exist.
DATA_NOT_FOUND	404 Not Found	The requested data is not found/does not exist.
CONTEXT_NOT_FOUND	404 Not Found	It is used during the modification of an existing subscription when no corresponding context exists.

6.2.8 Feature Negotiation

The optional features in table 6.2.8-1 are defined for the Nhss_SubscriberDataManagement 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 [6] and 3GPP TS 29.500 [4], the access to the Nhss_SDM API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nhss_SDM API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nhss_SDM service.

The Nhss_SDM API defines a single scope "nhss-sdm" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, 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 HSS service instance when using direct or indirect communications (see 3GPP TS 29.500 [4]).

An SCP that reselects a different HSS producer instance will return the NF Instance ID of the new HSS 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 HSS redirects a service request to a different HSS using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new HSS 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].

6.3 Nhss_UEContextManagement Service API

6.3.1 Introduction

The Nhss_UEContextManagement service shall use the Nhss_UEContextManagement API.

The request URI used in HTTP request from the NF service consumer towards the NF service producer shall have the 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 "nhss-uecm".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.

6.3.2 Usage of HTTP

6.3.2.1 General

HTTP/2, as defined in IETF RFC 9113 [9], 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].

HTTP messages and bodies for the Nhss_UEContextManagement service shall comply with the OpenAPI [10] specification contained in Annex A.

6.3.2.2 HTTP standard headers

6.3.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.3.2.2.2 Content type

The following content types shall be supported:

- JSON, as defined in IETF RFC 8259 [11], signalled by the content type "application/json".
- The Problem Details JSON Object (IETF RFC 9457 [12] signalled by the content type "application/problem+json".

6.3.2.3 HTTP custom headers

6.3.2.3.1 General

In this release of the specification, no specific custom headers are defined for the Nhss_UEContextManagement service.

For 3GPP specific HTTP custom headers used across all service-based interfaces, see clause 5.2.3 of 3GPP TS 29.500 [4].

6.3.3 Resources

6.3.3.1 Overview

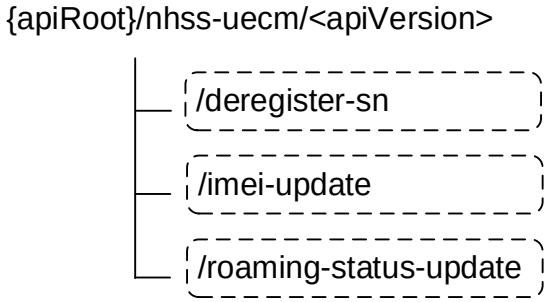

Figure 6.3.3.1-1: Resource URI structure of the nhss-uecm API

Table 6.3.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.3.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
n/a	deregister-sn	deregister-sn (POST)	Requesting MME/SGSN deregistration
n/a	imei-update	imei-update (POST)	Requests the update of the IMEI of the UE stored in HSS
n/a	roaming-status-update	roaming-status-update (POST)	Requests the update of the roaming status of the UE stored in HSS

6.3.4 Custom Operations without associated resources

6.3.4.1 Overview

Table 6.3.4.1-1: Custom operations without associated resources

Custom operation URI	Mapped HTTP method	Description
{apiRoot}/nhss-uecm/<apiVersion>/deregister-sn	POST	Requesting MME/SGSN deregistration.

6.3.4.2 Operation: deregister-sn

6.3.4.2.1 Description

This custom operation is used by the NF service consumer (UDM) to request MME/SGSN deregistration.

6.3.4.2.2 Operation Definition

This operation shall support the data structures and response codes specified in tables 6.3.4.2.2-1 and 6.3.4.2.2-2.

Table 6.3.4.2.2-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
DeregistrationRequest	M	1	

Table 6.3.4.2.2-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND

Table 6.3.4.2.2-3: Headers supported by the 307 Response Code on this resource

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

Table 6.3.4.2.2-4: Headers supported by the 308 Response Code on this resource

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

6.3.4.3 Operation: imei-update

6.3.4.3.1 Description

This custom operation is used by the NF service consumer (UDM) to request the update of the IMEI of the UE.

6.3.4.3.2 Operation Definition

This operation shall support the data structures and response codes specified in tables 6.3.4.3.2-1 and 6.3.4.3.2-2.

Table 6.3.4.3.2-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
ImeiUpdateInfo	M	1	

Table 6.3.4.3.2-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
ImeiUpdateResponse	M	1	200 OK	Upon success, a response body containing the IMEI(SV) stored previously in HSS shall be returned.
n/a			204 No Content	Upon success, if the HSS does not have any IMEI(SV) values stored for the UE, an empty response body shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND - CONTEXT_NOT_FOUND

Table 6.3.4.3.2-3: Headers supported by the 307 Response Code on this resource

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

Table 6.3.4.3.2-4: Headers supported by the 308 Response Code on this resource

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

6.3.4.4 Operation: roaming-status-update

6.3.4.4.1 Description

This custom operation is used by the NF service consumer (UDM) to request the update of the roaming status of the UE.

6.3.4.4.2 Operation Definition

This operation shall support the data structures and response codes specified in tables 6.3.4.4.2-1 and 6.3.4.4.2-2.

Table 6.3.4.4.2-1: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
RoamingStatusUpdateInfo	M	1	

Table 6.3.4.4.2-2: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND - CONTEXT_NOT_FOUND

Table 6.3.4.4.2-3: Headers supported by the 307 Response Code on this resource

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

Table 6.3.4.4.2-4: Headers supported by the 308 Response Code on this resource

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

6.3.5 Notifications

In this release of this specification, no notifications are defined for the Nhss_UEContextManagement Service.

6.3.6 Data Model

6.3.6.1 General

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

Table 6.3.6.1-1 specifies the structured data types defined for the Nhss_UECM service API.

Table 6.3.6.1-1: Nhss_UECM specific Data Types

Data type	Clause defined	Description	Applicability
DeregistrationRequest	6.3.6.2.2	Contains IMSI, deregistration reason	
ImeiUpdateInfo	6.3.6.2.3	Contains IMSI, new IMEI(SV)	
ImeiUpdateResponse	6.3.6.2.4	Contains the previous IMEI(SV) stored in HSS	
RoamingStatusUpdateInfo	6.3.6.2.5	Contains PLMN-ID where the UE is located	

Table 6.3.6.1-2 specifies data types re-used by the Nhss_UECM service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nhss_UECM service API.

Table 6.3.6.1-2: Nhss_UECM re-used Data Types

Data type	Reference	Comments	Applicability
Guami	3GPP TS 29.571 [7]		
ProblemDetails	3GPP TS 29.571 [7]	Response body of error response messages.	
RedirectResponse	3GPP TS 29.571 [7]	Response body of redirect response messages.	
PlmnId	3GPP TS 29.571 [7]		

6.3.6.2 Structured data types

6.3.6.2.1 Introduction

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

6.3.6.2.2 Type: DeregistrationRequest

Table 6.3.6.2.2-1: Definition of type DeregistrationRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
imsi	string	M	1	pattern: "^[0-9]{5,15}$"	
deregReason	DeregistrationReason	M	1	String, see clause 6.3.6.3.3	
guami	Guami	O	0..1	The GUAMI identifying the AMF where the UE is registered. May be used by the HSS based on operator policy to decide whether a registered VLR shall be cancelled.	

6.3.6.2.3 Type: ImeiUpdateInfo

Table 6.3.6.2.3-1: Definition of type ImeiUpdateInfo

Attribute name	Data type	P	Cardinality	Description
imsi	string	M	1	IMSI of the subscriber. pattern: "^[0-9]{5,15}$"
imei	string	C	0..1	IMEI of the UE as described in 3GPP TS 23.003 [15], clause 6.2.1; the check digit should not be included and shall be discarded when received. pattern: "^[0-9]{14,15}$"
imeisv	string	C	0..1	IMEISV of the UE as described in 3GPP TS 23.003 [15], clause 6.2.2. pattern: "^[0-9]{16}$"
NOTE: Exactly one of attributes "imei" or "imeisv" shall be present.				

6.3.6.2.4 Type: ImeiUpdateResponse

Table 6.3.6.2.4-1: Definition of type ImeiUpdateResponse

Attribute name	Data type	P	Cardinality	Description
previousImei	string	C	0..1	Previous IMEI of the UE as described in 3GPP TS 23.003 [15], clause 6.2.1; the check digit should not be included and shall be discarded when received. It shall be included if the HSS has an IMEI value stored for the UE. pattern: "^[0-9]{14,15}$"
previousImeisv	string	C	0..1	IMEISV of the UE as described in 3GPP TS 23.003 [15], clause 6.2.2. It shall be included if the HSS has an IMEISV value stored for the UE. pattern: "^[0-9]{16}$"
NOTE: At least one of attributes "previousImei" or "previousImeisv" shall be present.				

6.3.6.2.5 Type: RoamingStatusUpdateInfo

Table 6.3.6.2.5-1: Definition of type RoamingStatusUpdateInfo

Attribute name	Data type	P	Cardinality	Description
imsi	string	M	1	IMSI of the subscriber. pattern: "^[0-9]{5,15}$"
plmnId	PlmnId	M	1	PLMN-ID where the UE is located.

6.3.6.3 Simple data types and enumerations

6.3.6.3.1 Introduction

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

6.3.6.3.2 Simple data types

The simple data types defined in table 6.3.6.3.2-1 shall be supported.

Table 6.3.6.3.2-1: Simple data types

Type Name	Type Definition	Description

6.3.6.3.3 Enumeration: DeregistrationReason

Table 6.3.6.3.3-1: Enumeration DeregistrationReason

Enumeration value	Description
"UE_INITIAL_AND_SINGLE_REGISTRATION"	This value is used when the UDM needs to indicate to HSS that the MME/SGSN, if any, shall be cancelled due to an initial registration for single registration.
"UE_INITIAL_AND_DUAL_REGISTRATION"	This value is used when the UDM needs to indicate to HSS that an SGSN shall be cancelled (due to initial registration), but the MME shall not be cancelled (due to dual registration).
"EPS_TO_5GS_MOBILITY"	This value is used when the UDM needs to indicate to HSS that the MME/SGSN, if any, shall be cancelled due to a mobility event (i.e. for single registration which is not an initial registration).
"EPS_TO_5GS_MOBILITY_WITHOUT_N26_IWK"	This value is used when the UDM needs to indicate to HSS that an SGSN shall be cancelled (due to mobility event), but the MME shall not be cancelled (due to mobility registration for single registration).

6.3.7 Error Handling

6.3.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.3.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.3.7.3 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 Nudm_UEContextManagement service. The application errors defined for the Nhss_UEContextManagement service are listed in Table 6.3.7.3-1.

Table 6.3.7.3-1: Application errors

Application Error	HTTP status code	Description
USER_NOT_FOUND	404 Not Found	The user does not exist.
CONTEXT_NOT_FOUND	404 Not Found	It is used when no corresponding UE context exists.

6.3.8 Feature Negotiation

The optional features in table 6.3.8-1 are defined for the Nhss_UEContextManagement API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.3.8-1: Supported Features

Feature number	Feature Name	Description

6.3.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nhss_UECM API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nhss_UECM API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nhss_UECM service.

The Nhss_UECM API defines a single scope "nhss-uecm" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, and it does not define any additional scopes at resource or operation level.

6.3.10 HTTP redirection

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

An SCP that reselects a different HSS producer instance will return the NF Instance ID of the new HSS 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 HSS redirects a service request to a different HSS using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new HSS 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].

6.4 Nhss_EventExposure Service API

6.4.1 API URI

URIs of this API shall have the following root:

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

where "apiRoot" is defined in clause 4.4.1 of 3GPP TS 29.501 [5], the "apiName" shall be set to "nhss-ee" and the "apiVersion" shall be set to "v1" for the current version of this specification.

6.4.2 Usage of HTTP

6.4.2.1 General

HTTP/2, as defined in IETF RFC 9113 [13], 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].

HTTP messages and bodies for the Nhss_EE service shall comply with the OpenAPI [14] specification contained in Annex A5.

6.4.2.2 HTTP standard headers

6.4.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.4.2.2.2 Content type

The following content types shall be supported:

JSON, as defined in IETF RFC 8259 [15], signalled by the content type "application/json".

The Problem Details JSON Object (IETF RFC 9457 [16] signalled by the content type "application/problem+json"

JSON Patch (IETF RFC 6902 [41]). The use of the JSON Patch format in a HTTP request body shall be signalled by the content type "application/json-patch+json".

6.4.2.3 HTTP custom headers

6.4.2.3.1 General

The usage of HTTP custom headers shall be supported as specified in clause 5.2.3 of 3GPP TS 29.500 [4].

6.4.3 Resources

6.4.3.1 Overview

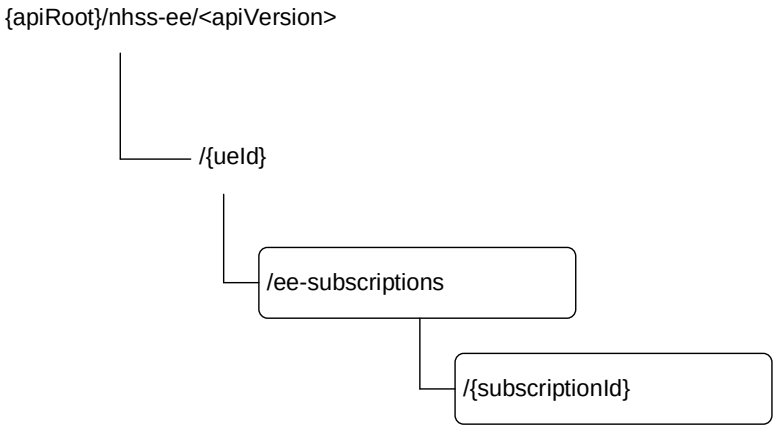

Figure 6.4.3.1-1: Resource URI structure of the Nhss_EE API

Table 6.4.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.4.3.1-1: Resources and methods overview

Resource name (Archetype)	Resource URI	HTTP method or custom operation	Description
EeSubscriptions (Collection)	/{ueId}/ee-subscriptions	POST	Create a subscription
Individual subscription (Document)	/{ueId}/ee-subscriptions/{subscriptionId}	PATCH	Update the subscription identified by {subscriptionId}
		DELETE	Delete the subscription identified by {subscriptionId}, i.e. unsubscribe

6.4.3.2 Resource: EeSubscriptions (Collection)

6.4.3.2.1 Description

This resource is used to represent subscriptions to notifications.

6.4.3.2.2 Resource Definition

Resource URI: {apiRoot}/nhss-ee/<apiVersion>/{ueId}/ee-subscriptions

This resource shall support the resource URI variables defined in table 6.4.3.2.2-1.

Table 6.4.3.2.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See clause 6.4.1
ueId	Represents the identity of the UE in the HSS (IMSI) or the identity of a group of UEs. - If representing a single UE, this parameter shall contain the IMSI of the UE. pattern: See type Imsi in clause 6.4.6.3.2 of this document. - If representing a group of UEs, this parameter shall contain the External Group Id. pattern: "^extgroupid-[^@]+@[^@]+$" (NOTE)
NOTE: If the HSS supports GBEE feature, the ueId can contain the External Group Id, or ueId can only contain IMSI of the UE.	

6.4.3.2.3 Resource Standard Methods

6.4.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.4.3.2.3.1-1.

Table 6.4.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.4.3.2.3.1-2 and the response data structures and response codes specified in table 6.4.3.2.3.1-3.

Table 6.4.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EeSubscription	M	1	The subscription that is to be created

Table 6.4.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
CreatedEeSubscription	M	1	201 Created	Upon success, a response body containing a representation of the created Individual subscription resource shall be returned, along with event reports that might be immediately available at the HSS. The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
EeSubscriptionError	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - MONITORING_NOT_ALLOWED - MAXIMUM_RESOURCES_EXCEEDED - MTC_PROVIDER_NOT_ALLOWED
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND
EeSubscriptionError	O	0..1	501 Not Implemented	The "cause" attribute may be used to indicate one of the following application errors: - UNSUPPORTED_MONITORING_EVENT_TYPE - UNSUPPORTED_MONITORING_REPORT_OPTIONS This response shall not be cached.

Table 6.4.3.2.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.4.3.2.3.1-5: Headers supported by the 308 Response Code on this resource

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

6.4.3.3 Resource: Individual subscription (Document)

6.4.3.3.1 Resource Definition

Resource URI: {apiRoot}/nhss-ee/<apiVersion>/{ueId}/ee-subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 6.4.3.3.1-1.

Table 6.4.3.3.1-1: Resource URI variables for this resource

Name	Definition
apiRoot	See clause 6.4.1
ueId	Represents the identity of the UE in the HSS (IMSI) or the identity of a group of UEs. - If representing a single UE, this parameter shall contain the IMSI of the UE. pattern: See type Imsi in clause 6.4.6.3.2 of this document. - If representing a group of UEs, this parameter shall contain the External Group Id. pattern: "^extgroupid-[^@]+@[^@]+$" (NOTE)
subscriptionId	The subscriptionId identifies an individual subscription to notifications The type is string.
NOTE: If the HSS supports GBEE feature, the ueId can contain the External Group Id, or ueId can only contain IMSI of the UE.	

6.4.3.3.2 Resource Standard Methods

6.4.3.3.2.1 DELETE

This method shall support the URI query parameters specified in table 6.4.3.3.2.1-1.

Table 6.4.3.3.1.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.4.3.3.2.1-2 and the response data structures and response codes specified in table 6.4.3.3.2.1-3.

Table 6.4.3.3.2.1-2: Data structures supported by the Delete Request Body on this resource

Data type	P	Cardinality	Description
n/a			The request body shall be empty.

Table 6.4.3.3.2.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND - SUBSCRIPTION_NOT_FOUND, see 3GPP TS 29.500 [4] table 5.2.7.2-1.

Table 6.4.3.3.2.1-4: Headers supported by the 307 Response Code on this resource

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

Table 6.4.3.3.2.1-5: Headers supported by the 308 Response Code on this resource

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

6.4.3.3.2.2 PATCH

This method shall support the URI query parameters specified in table 6.4.3.3.2.2-1.

Table 6.4.3.3.2.2-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
supported-features	SupportedFeatures	O	0..1	see 3GPP TS 29.500 [4] clause 6.6

This method shall support the request data structures specified in table 6.4.3.3.2.2-2 and the response data structures and response codes specified in table 6.4.3.3.2.2-3.

Table 6.4.3.3.2.2-2: Data structures supported by the PATCH Request Body on this resource

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

Table 6.4.3.3.2.2-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned.
PatchResult	M	1	200 OK	Upon success, the execution report is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND - SUBSCRIPTION_NOT_FOUND, see 3GPP TS 29.500 [4] table 5.2.7.2-1.
ProblemDetails	O	0..1	403 Forbidden	One or more attributes are not allowed to be modified. The "cause" attribute may be used to indicate one of the following application errors: - MODIFICATION_NOT_ALLOWED, see 3GPP TS 29.500 [4] table 5.2.7.2-1.

Table 6.4.3.3.2.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.4.3.3.2.2-5: Headers supported by the 308 Response Code on this resource

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

6.4.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nhss_EventExposure Service.

6.4.5 Notifications

6.4.5.1 General

This clause will specify the use of notifications and corresponding protocol details if required for the specific service. When notifications are supported by the API, it will include a reference to the general description of notifications support over the 5G SBIs specified in TS 29.500 / TS 29.501.

6.4.5.2 Event Occurrence Notification

The POST method shall be used for Event Occurrence Notifications and the URI shall be as provided during the subscription procedure.

Resource URI: {callbackReference}

Support of URI query parameters is specified in table 6.4.5.2-1.

Table 6.4.5.2-1: URI query parameters supported by the POST method

Name	Data type	P	Cardinality	Description
n/a				

Support of request data structures is specified in table 6.4.5.2-2 and of response data structures and response codes is specified in table 6.4.5.2-3.

Table 6.4.5.2-2: Data structures supported by the POST Request Body

Data type	P	Cardinality	Description
array(MonitoringReport)	M	1..N	A list of MonitoringReports each of which contains information regarding the occurred event

Table 6.4.5.2-3: Data structures supported by the POST Response Body

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection.
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection.
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - CONTEXT_NOT_FOUND
NOTE: In addition, common data structures as listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

Table 6.4.5.2-4: Headers supported by the 307 Response Code on this resource

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

Table 6.4.5.2-5: Headers supported by the 308 Response Code on this resource

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

6.4.6 Data Model

6.4.6.1 General

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

Table 6.4.6.1-1 specifies the data types defined for the Nhss_EE service API.

Table 6.4.6.1-1: Nhss_EE specific Data Types

Data type	Clause defined	Description
EeSubscription	6.4.6.2.2	A subscription to Notifications
CreatedEeSubscription	6.4.6.2.3	
MonitoringConfiguration	6.4.6.2.4	Monitoring Configuration
MonitoringReport	6.4.6.2.5	Monitoring Report
Report	6.4.6.2.6	
ReportingOptions	6.4.6.2.7	
LocationReportingConfiguration	6.4.6.2.8	
ReachabilityForSmsReport	6.4.6.2.9	
LossConnectivityConfiguration	6.4.6.2.10	
ReachabilityForDataConfiguration	6.4.6.2.11	
PduSessionStatusCfg	6.4.6.2.12	Reporting configuration for events related to PDN connectivity Status
ReachabilityForDataReport	6.4.6.2.13	Report of "UE_REACHABILITY_FOR_DATA" event
FailedMonitoringConfiguration	6.4.6.2.14	Failed Monitoring Configuration in the EE subscription
EeSubscriptionErrorAddInfo	6.4.6.2.15	Event Exposure Subscription Error Additional Information
EeSubscriptionError	6.4.6.2.16	Event Exposure Subscription Error
EventType	6.4.6.3.3	
LocationAccuracy	6.4.6.3.4	
FailedCause	6.4.6.3.5	Failed cause of the failed Monitoring Configuration in the EE subscription

Table 6.4.6.1-2 specifies data types re-used by the Nhss_EE service API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nhss_EE service API.

Table 6.4.6.1-2: Nhss_EE re-used Data Types

Data type	Reference	Comments
Uri	3GPP TS 29.571 [7]	Uniform Resource Identifier
SupportedFeatures	3GPP TS 29.571 [7]	See 3GPP TS 29.500 [4] clause 6.6
DateTime	3GPP TS 29.571 [7]	
PatchResult	3GPP TS 29.571 [7]	
DurationSec	3GPP TS 29.571 [7]	
DiameterIdentity	3GPP TS 29.571 [7]	
Dnn	3GPP TS 29.571 [7]	Data Network Name with Network Identifier only.
ProblemDetails	3GPP TS 29.571 [7]	Response body of error response messages.
RedirectResponse	3GPP TS 29.571 [7]	Response body of redirect response messages.
MtcProviderInformation	3GPP TS 29.571 [7]	MTC Provider Information
DiameterIdentity	3GPP TS 29.571 [7]	Diameter Identify (FQDN)
LossConnectivityReport	3GPP TS 29.503 [13]	Report of "LOSS_OF_CONNECTIVITY" event
LocationReport	3GPP TS 29.503 [13]	Report of "LOCATION_REPORTING" event
PdnConnectivityStatReport	3GPP TS 29.503 [13]	Report of "PDN_CONNECTIVITY_STATUS" event
ReferenceId	3GPP TS 29.503 [13]	Reference ID defined in Nudm_EE API. It shall contain a 64-bit long integer.

6.4.6.2 Structured data types

6.4.6.2.1 Introduction

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

6.4.6.2.2 Type: EeSubscription

Table 6.4.6.2.2-1: Definition of type EeSubscription

Attribute name	Data type	P	Cardinality	Description
callbackReference	Uri	M	1	URI provided by the NF service consumer to receive notifications
monitoringConfigurations	map(MonitoringConfiguration)	O	1..N	A map (list of key-value pairs where referenceId converted from integer to string serves as key) of MonitoringConfigurations
scefId	DiameterIdentity	O	0..1	Diameter Identify (FQDN) of the SCEF
scefDiamRealm	DiameterIdentity	O	0..1	When present, It contains the Diameter realm of the SCEF to which the monitered reports may be sent in EPC.
supportedFeatures	SupportedFeatures	O	0..1	See clause 6.4.8
reportingOptions	ReportingOptions	O	0..1	This IE may be included if the NF service consumer wants to describe how the reports of the event are to be generated. If this attribute is not present in the request, it means that the NF service consumer does not specify any maximum number of reports or any expiry time for the subscription; still, the NF service producer (HSS) may set an expiry time in the response to the subscription creation (see clause 6.4.6.2.7).
mtcProviderInformation	MtcProviderInformation	O	0..1	Indicates MTC provider information for Monitoring Configuration authorization.
externalIdentifier	string	O	0..1	Represents a single external Identifier or a group of external Identifiers: - If representing a single external identifier: pattern: "^extid-[^@]+@[^@]+$" - If representing a group of external identifiers: pattern: "^extgroupid-[^@]+@[^@]+$"

6.4.6.2.3 Type: CreatedEeSubscription

Table 6.4.6.2.3-1: Definition of type CreatedEeSubscription

Attribute name	Data type	P	Cardinality	Description	Applicability
eeSubscription	EeSubscription	M	1	This IE shall contain the representation of the created event subscription.	
eventReports	array(MonitoringReport)	O	1..N	This IE may be included when the NF consumer has indicated supporting of ERIR feature in the subscription creation request (see clause 6.4.8). This IE when present, shall contain the status of events that are requested for immediate reporting as well, if those events are available at the time of subscription.	ERIR
failedMonitoringConfigs	map(FailedMonitoringConfiguration)	O	1..N	A map (list of key-value pairs where ReferenceId converted from integer to string serves as key; see clause 6.4.6.3.2) of FailedMonitoringConfiguration; see clause 6.4.6.2.14. This IE is used to indicate the failed subscriptions of event monitoring configuration and the failed cause for them.	
currentStatusNotAvailableList	array(EventType)	O	1..N	This IE should be present if immediate reporting was requested by the NF consumer, but the current status of at least one of the subscribed events is not available at the time of subscription. When present, this IE shall list the events for which the current status is not available for immediate reporting.	
supportedFeatures	SupportedFeatures	O	0..1	See clause 6.4.8	

6.4.6.2.4 Type: MonitoringConfiguration

Table 6.4.6.2.4-1: Definition of type MonitoringConfiguration

Attribute name	Data type	P	Cardinality	Description
eventType	EventType	M	1	Event type
immediateFlag	boolean	O	0..1	Indicates if an immediate event report in the subscription response indicating current value / status of the event is required, if available. If the flag is not present, then immediate reporting may be skipped.
locationReportingConfiguration	LocationReportingConfiguration	C	0..1	Shall be present if eventType is "LOCATION_REPORTING"
lossConnectivityConfiguration	LossConnectivityConfiguration	O	0..1	May be present if eventType is "LOSS_OF_CONNECTIVITY".
reachabilityForDataConfiguration	ReachabilityForDataConfiguration	O	0..1	May be present if eventType is "UE_REACHABILITY_FOR_DATA"
pduSessionStatusCfg	PduSessionStatusCfg	O	0..1	may be present if eventType is "PDN_CONNECTIVITY_STATUS"
idleStatusInd	boolean	O	0..1	Idle Status Indication request. May be present if eventType is "UE_REACHABILITY_FOR_DATA" or "AVAILABILITY_AFTER_DDN_FAILURE" When present, this IE shall be set as following: - true: Idle status indication is requested - false (default): Idle status indication is not requested

6.4.6.2.5 Type: MonitoringReport

Table 6.4.6.2.5-1: Definition of type MonitoringReport

Attribute name	Data type	P	Cardinality	Description
referenceId	ReferenceId	M	1	Shall contain the Reference ID which was provided as the key of the associated monitoring configuration in subscription request. The consumer can use this IE to uniquely associate the report with the corresponding event that was requested to be monitored.
eventType	EventType	M	1	String; see clause 6.4.6.3.3 only the following values are allowed: "UE_REACHABILITY_FOR_SMS" "UE_REACHABILITY_FOR_DATA" "LOSS_OF_CONNECTIVITY" "LOCATION_REPORTING" "PDN_CONNECTIVITY_STATUS"
timeStamp	DateTime	M	1	Point in time at which the event occured
report	Report	O	0..1	Shall be present if eventType is "UE_REACHABILITY_FOR_SMS" "UE_REACHABILITY_FOR_DATA" "LOSS_OF_CONNECTIVITY" "LOCATION_REPORTING" "PDN_CONNECTIVITY_STATUS"

6.4.6.2.6 Type: Report

Table 6.4.6.2.6-1: Definition of type Report

Attribute name	Data type	P	Cardinality	Description
reachabilityForSmsReport	ReachabilityForSms Report	O	0..1	Reports the UE reachacbility for SMS
reachabilityForDataReport	ReachabilityForData Report	O	0..1	Reports the UE reachacbility for Data
lossConnectivityReport	LossConnectivityRe port	O	0..1	Reports the Loss of Connectivity
locationReport	LocationReport	O	0..1	Reports the UE Location
pdnConnectivityStatReport	PdnConnectivityStat Report	O	0..1	Reports the PDN Connectivity Status. Absence of pdnConnectivityStatReport in MonitoringReports with EventType "PDN_CONNECTIVITY_STATUS" indicates that the requested APN is not active.

6.4.6.2.7 Type: ReportingOptions

Table 6.4.6.2.7-1: Definition of type ReportingOptions

Attribute name	Data type	P	Cardinality	Description
maxNumOfReports	MaxNumOfReports	O	0..1	Maximum number of reports. If not present, the NF service consumer does not specify any maximum number of reports to be received. (NOTE)
expiry	DateTime	C	0..1	This IE shall be included in an event subscription response, if, based on operator policy, the HSS needs to include an expiry time, and may be included in an event subscription request. When present, this IE shall represent the time at which monitoring shall cease and the subscription becomes invalid. If the maxNumOfReports included in an event subscription response is 1 and if an event report is included in the subscription response then the value of the expiry included in the response shall be an immediate timestamp. (NOTE)
reportPeriod	DurationSec	C	0..1	Indicates the interval time between which the event notification is reported, may be present if event type is "LOCATION_REPORTING"
NOTE: If parameter "maxNumOfReports" and "expiry" are included at the same time, the subscription will expire as soon as one of the conditions is met.				

6.4.6.2.8 Type: LocationReportingConfiguration

Table 6.4.6.2.8-1: Definition of type LocationReportingConfiguration

Attribute name	Data type	P	Cardinality	Description
currentLocation	boolean	M	1	true: Indicates that current location is requested. false: Indicates that last known location is requested.
accuracy	LocationAccuracy	C	0..1	Indicates whether Cell-level or TA-level accuracy is requested. Shall be present when current location is requested.

6.4.6.2.9 Type: ReachabilityForSmsReport

Table 6.4.6.2.9-1: Definition of type ReachabilityForSmsReport

Attribute name	Data type	P	Cardinality	Description
reachabilitySmsStatus	boolean	M	1	true: UE is reachable for SMS false: UE is not reachable for SMS
maxAvailabilityTime	DateTime	O	0..1	Indicates the time (in UTC) until which the UE is expected to be reachable. This information may be used by the SMS Service Center to prioritize the retransmission of pending Mobile Terminated Short Message to UEs using a power saving mechanism (eDRX, PSM etc.).

6.4.6.2.10 Type: LossConnectivityConfiguration

Table 6.4.6.2.10-1: Definition of type LossConnectivityConfiguration

Attribute name	Data type	P	Cardinality	Description
maxDetectionTime	DurationSec	O	0..1	When present, it indicates the configured Maximum Detection Time

6.4.6.2.11 Type: ReachabilityForDataConfiguration

Table 6.4.6.2.11-1: Definition of type ReachabilityForDataConfiguration

Attribute name	Data type	P	Cardinality	Description
maximumLatency	DurationSec	O	0..1	When present, it indicates the configured Maximum Latency. (NOTE)
maximumResponseTime	DurationSec	O	0..1	When present, it indicates the configured Maximum Response Time. (NOTE)
suggestedPacketNumDl	integer	O	0..1	When present, it indicates the configured Suggested number of downlink packets. (NOTE)
NOTE: At least one of maximumLatency, maximumResponseTime or suggestedPacketNumDl shall be present				

6.4.6.2.12 Type: PduSessionStatusCfg

Table 6.4.6.2.12-1: Definition of type PduSessionStatusCfg

Attribute name	Data type	P	Cardinality	Description
apn	Dnn	O	0..1	When present, it indicates the APN for which the event is monitored. Absence indicates that monitoring of the event applies to all APNs.

6.4.6.2.13 Type: ReachabilityForDataReport

Table 6.4.6.2.13-1: Definition of type ReachabilityForDataReport

Attribute name	Data type	P	Cardinality	Description
reachabilityDataStatus	boolean	M	1	true: UE is reachable for Data false: UE is not reachable for Data
maxAvailabilityTime	DateTime	O	0..1	Indicates the time (in UTC) until which the UE is expected to be reachable. This information may be used by the SMS Service Center to prioritize the retransmission of pending Mobile Terminated Short Message to UEs using a power saving mechanism (eDRX, PSM etc.).

6.4.6.2.14 Type: FailedMonitoringConfiguration

Table 6.4.6.2.14-1: Definition of type FailedMonitoringConfiguration

Attribute name	Data type	P	Cardinality	Description
eventType	EventType	M	1	Contains the Event type, see clause 6.4.6.3.3
failedCause	FailedCause	M	1	Contains the failed cause of the subscription of the event monitoring.

6.4.6.2.15 Type: EeSubscriptionErrorAddInfo

Table 6.4.6.2.15-1: Definition of type EeSubscriptionErrorAddInfo

Attribute name	Data type	P	Cardinality	Description
failedMonitoringConfigs	map(FailedMonitoringConfiguration)	O	1..N	A map (list of key-value pairs where ReferenceId converted from integer to string serves as key; see clause 6.4.6.3.2) of FailedMonitoringConfiguration; see clause 6.4.6.2.14. This IE is used to indicate the failed subscriptions of event monitoring configuration and the failed cause for them.

6.4.6.2.16 Type: EeSubscriptionError

Table 6.4.6.2.16-1: Definition of type EeSubscriptionError as a list of to be combined data types

Data type	Cardinality	Description	Applicability
ProblemDetails	1	Detail information of the problem	
EeSubscriptionErrorAddInfo	1	Additional information to be returned in error response.	

6.4.6.3 Simple data types and enumerations

6.4.6.3.1 Introduction

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

6.4.6.3.2 Simple data types

The simple data types defined in table 6.4.6.3.2-1 shall be supported.

Table 6.4.6.3.2-1: Simple data types

Type Name	Type Definition	Description
Imsi	string	IMSI pattern: '^(imsi-[0-9]{5,15})$'
UeIdOrGroupId	string	Contains the UE identifier or the Group Identifier of the UE. pattern: '^(imsi-[0-9]{5,15}|extgroupid-[^@]+@[^@]+|.+$)'
MaxNumOfReports	integer	Maximum number of reports. Minimum: 1

6.4.6.3.3 Enumeration: EventType

Table 6.4.6.3.3-1: Enumeration EventType

Enumeration value	Description
"LOSS_OF_CONNECTIVITY"	Loss of connectivity event
"UE_REACHABILITY_FOR_DATA"	UE reachability for Data, implements the "UE Reachability for Data" event as specified in 3GPP TS 23.682 [18]. When this event is subscribed by an NF service consumer, the HSS shall send an Insert Subscriber Data Request message to the MME/SGSN for the UE with the Monitoring-Type AVP set to the value UE_REACHABILITY and the Reachability-Information AVP set to the value REACHABLE_FOR_DATA, see clause 5.2.2.1.3 of 3GPP TS 29.272 [17].
"UE_REACHABILITY_FOR_SMS"	UE reachability for SMS, implements the "UE Reachability for SMS Delivery" event as specified in 3GPP TS 23.682 [18]. This event only supports One-Time reporting.
"LOCATION_REPORTING"	Location Reporting event
"COMMUNICATION_FAILURE"	Communication Failure event
"AVAILABILITY_AFTER_DDN_FAILURE"	Availability after DDN failure event
"PDN_CONNECTIVITY_STATUS"	PDN Connectivity Status event

6.4.6.3.4 Enumeration: LocationAccuracy

Table 6.4.6.3.4-1: Enumeration LocationAccuracy

Enumeration value	Description
"CELL_LEVEL"	Change of cell shall be reported, equivalent to the value "CGI-ECGI (0)" of Accuracy IE of HSS Diameter interface as specified in clause 8.4.17 of 3GPP TS 29.336 [21].
"RAN_NODE_LEVEL"	change of serving RAN node shall be reported, equivalent to the value "eNB (1)" of Accuracy IE of HSS Diameter interface as specified in clause 8.4.17 of 3GPP TS 29.336 [21].
"TA_LEVEL"	Change of TA shall be reported, equivalent to the value " LA-TA-RA (2)" of Accuracy IE of HSS Diameter interface as specified in clause 8.4.17 of 3GPP TS 29.336 [21].

6.4.6.3.5 Enumeration: FailedCause

Table 6.4.6.3.5-1: Enumeration FailedCause

Enumeration value	Description
"MTC_PROVIDER_NOT_ALLOWED"	MTC Provider is now allowed to perform monitoring for the requested event type.
"MONITORING_NOT_ALLOWED"	The subscriber does not have the necessary subscription for monitoring with the requested Event Type.
"UNSUPPORTED_MONITORING_EVENT_TYPE"	The required event type is unsupported.
"UNSUPPORTED_MONITORING_REPORT_OPTIONS"	The monitoring configuration for the required event type contains unsupported report options.
"UNSPECIFIED"	The failed cause is unspecified.

6.4.7 Error Handling

6.4.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.4.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.4.7.3 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 Nhss_EventExposure service. The following application errors listed in Table 6.4.7.3-1 are specific for the Nhss_EventExposure service.

Table 6.4.7.3-1: Application errors

Application Error	HTTP status code	Description
MONITORING_NOT_ALLOWED	403 Forbidden	The subscriber does not have the necessary subscription for monitoring with the requested Event Type.
MTC_PROVIDER_NOT_ALLOWED	403 Forbidden	MTC Provider not authorized to perform monitoring configuration.
USER_NOT_FOUND	404 Not Found	The user does not exist
CONTEXT_NOT_FOUND	404 Not Found	It is used when no corresponding context exists.
UNSUPPORTED_MONITORING_EVENT_TYPE	501 Not Implemented	The monitoring configuration contains unsupported event type.
UNSUPPORTED_MONITORING_REPORT_OPTIONS	501 Not Implemented	The monitoring configuration contains unsupported report options.

6.4.8 Feature Negotiation

The optional features in table 6.4.8-1 are defined for the Nhss_EE API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.4.8-1: Supported Features

Feature number	Feature Name	Description
1	ERIR	Event Reports in Response An NF consumer supporting this feature shall be able to handle the event reports within the Event Subscription Create Response, as specified in clause 5.5.2.2.2.
2	GBEE	Support of Group-based Event Exposure. This feature bit indicates whether the Nhss_EventExposure Service support Group-based Event Exposure or not.

6.4.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nhss_EE API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nhss_EE API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], 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 Nhss_EE service.

The Nhss_EE API defines a single scope "nhss-ee" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, and it does not define any additional scopes at resource or operation level.

6.4.10 HTTP redirection

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

An SCP that reselects a different HSS producer instance will return the NF Instance ID of the new HSS 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 HSS redirects a service request to a different HSS using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new HSS 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].

6.5 Nhss_ParameterProvision Service API

6.5.1 API URI

URIs of this API shall have the following root:

{apiRoot}/{apiName}/<apiVersion>

The request URI used in HTTP request from the NF service consumer towards the NF service producer shall have the 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 "nhss-pp".
- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 6.5.3.

6.5.2 Usage of HTTP

6.5.2.1 General

HTTP/2, as defined in IETF RFC 9113 [13], 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].

HTTP messages and bodies for the Nhss_PP service shall comply with the OpenAPI [14] specification contained in Annex A6.

6.5.2.2 HTTP standard headers

6.5.2.2.1 General

The usage of HTTP standard headers shall be supported as specified in clause 5.2.2 of 3GPP TS 29.500 [4].

6.5.2.2.2 Content type

The following content types shall be supported:

JSON, as defined in IETF RFC 8259 [15], signalled by the content type "application/json".

The Problem Details JSON Object (IETF RFC 9457 [16] signalled by the content type "application/problem+json"

6.5.2.3 HTTP custom headers

6.5.2.3.1 General

The usage of HTTP custom headers shall be supported as specified in clause 5.2.3 of 3GPP TS 29.500 [4].

6.5.3 Resources

6.5.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.5.3.1-1 depicts the resource URIs structure for the Nhss_PP API.

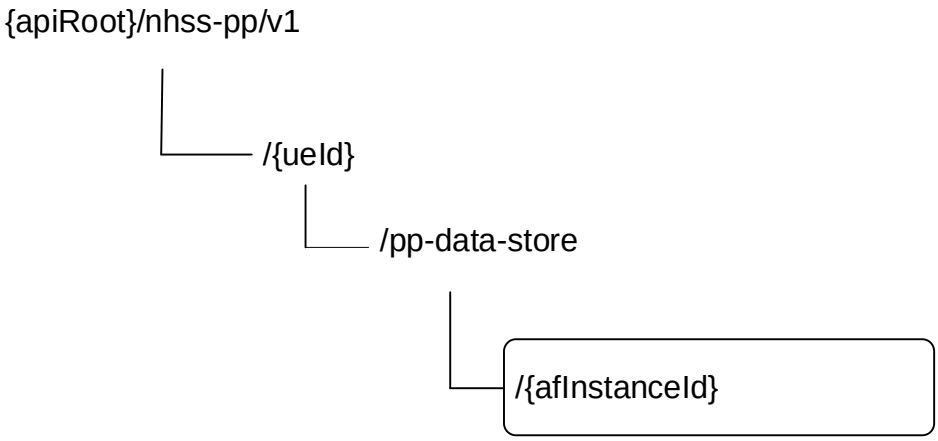

Figure 6.5.3.1-1: Resource URI structure of the Nhss_PP API

Table 6.5.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.5.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
ParameterProvisioningDataEntry	/{ueId}/pp-data-store/{afInstanceId}	PUT	Create or update a Parameter Provisioning Data entry per AF
		DELETE	Delete a Parameter Provisioning Data entry per AF
		GET	Retrieve a Parameter Provisioning Data entry per AF

6.5.3.2 Resource: ParameterProvisioningDataEntry

6.5.3.2.1 Description

This resource is used to allow the storage of different Parameter Provisioning entries for different Application Functions.

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

6.5.3.2.2 Resource Definition

Resource URI: {apiRoot}/nhss-pp/<apiVersion>/{ueId}/pp-data-store/{afInstanceId}

This resource shall support the resource URI variables defined in table 6.5.3.2.2-1.

Table 6.5.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 6.5.1
ueId	string	Represents the Subscription Identifier SUPI, GPSI, Group Id or anyUE (see 3GPP TS 23.501 [4] clause 5.9.2) - If representing a single UE, this parameter shall contain the GPSI or SUPI. pattern: See pattern of type VarUeId 3GPP TS 29.571 [7] - If representing a group of UEs, this parameter shall contain the External GroupId. pattern: "^extgroupid-[^@]+@[^@]+$" - If representing any UE, this parameter shall contain "anyUE". pattern: "^anyUE$"
afInstanceId	string	The string identifying the originating AF. (NOTE)
NOTE: When the service operation is originated by external AF via T8/N33 interface, information carried in {scsAsId} URI variable in resource URIs on T8/N33 interface (see clause 5 of 3GPP TS 29.122 [45]) or in {afId} URI variable in resource URIs on N33 interface (see clause 5 of 3GPP TS 29.522 [54]) can be used as the value for this IE.		

6.5.3.2.3 Resource Standard Methods

6.5.3.2.3.1 PUT

This method shall support the URI query parameters specified in table 6.5.3.2.3.1-1.

Table 6.5.3.2.3.1-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.5.3.2.3.1-2 and the response data structures and response codes specified in table 6.5.3.2.3.1-3.

Table 6.5.3.2.3.1-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
PpDataEntry	M	1	Contains a Parameter Provisioning Data entry

Table 6.5.3.2.3.1-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PpDataEntry	M	1	201 Created	Indicates a successful creation of the resource.
n/a			204 No Content	Indicates a successful update of the resource. An empty response shall be returned.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - CREATION_NOT_ALLOWED - AF_NOT_ALLOWED - MTC_PROVIDER_NOT_ALLOWED
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - USER_NOT_FOUND
NOTE: In addition, common data structures as listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

6.5.3.2.3.2 DELETE

This method shall support the URI query parameters specified in table 6.5.3.2.3.2-1.

Table 6.5.3.2.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.5.3.2.3.2-2 and the response data structures and response codes specified in table 6.5.3.2.3.2-3.

Table 6.5.3.2.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.5.3.2.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Upon success, an empty response body shall be returned
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - AF_NOT_ALLOWED - MTC_PROVIDER_NOT_ALLOWED
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - CONTEXT_NOT_FOUND
NOTE: In addition, common data structures as listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] are supported.				

6.5.3.2.3.3 GET

This method shall support the URI query parameters specified in table 6.5.3.2.3.3-1.

Table 6.5.3.2.3.3-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
supported-features	SupportedFeatures	O	0..1	see 3GPP TS 29.500 [4] clause 6.6

This method shall support the response data structures and response codes specified in table 6.5.3.2.3.3-3.

Table 6.5.3.2.3.3-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 6.5.3.2.3.3-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
PpDataEntry	M	1	200 OK	Upon success, the request body contain the target PPDataEntry.
ProblemDetails	O	0..1	403 Forbidden	The "cause" attribute may be used to indicate one of the following application errors: - AF_NOT_ALLOWED
ProblemDetails	O	0..1	404 Not Found	The "cause" attribute may be used to indicate one of the following application errors: - CONTEXT_NOT_FOUND

6.5.4 Custom Operations without associated resources

In this release of this specification, no custom operations without associated resources are defined for the Nhss_ParameterProvision Service.

6.5.5 Notifications

In this release of this specification, no notifications are defined for the Nhss_ParameterProvision Service.

6.5.6 Data Model

6.5.6.1 General

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

Table 6.5.6.1-1 specifies the data types defined for the Nhss_PP service API.

Table 6.5.6.1-1: Nhss_PP specific Data Types

Data type	Clause defined	Description
PpDataEntry	6.5.6.2.2	Provisioning Parameter Data Entry
CommunicationCharacteristicsAF	6.5.6.2.3	Communication Characteristics per AF
PpDlPacketCount	6.5.6.3.2	

Table 6.5.6.1-2 specifies data types re-used by the Nhss_PP service API from other APIs, including a reference and when needed, a short description of their use within the Nhss_PP service API.

Table 6.5.6.1-2: Nhss_PP re-used Data Types

Data type	Reference	Comments
DurationSec	3GPP TS 29.571 [7]	Time value in seconds
SupportedFeatures	3GPP TS 29.571 [7]	
ProblemDetails	3GPP TS 29.571 [7]	
DateTime	3GPP TS 29.571 [7]	
MtcProviderInformation	3GPP TS 29.571 [7]	MTC Provider Information
ReferenceId	3GPP TS 29.503 [13]	

6.5.6.2 Structured data types

6.5.6.2.1 Introduction

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

6.5.6.2.2 Type: PpDataEntry

Table 6.5.6.2.2-1: Definition of type PpDataEntry

Attribute name	Data type	P	Cardinality	Description
communicationCharacteristics	CommunicationCharacteristicsAF	O	0..1	Communication characteristics for the AF
referenceId	ReferenceId	M	1	Transaction Reference ID
validityTime	DateTime	O	0..1	When present, this IE shall identify the point of time up to which the provisioned parameters will be expire and shall be deleted. If absent, it indicates that there is no expiration time for the provisioned parameters. If this IE is in request body, it indicates the expected validity time by consumer. If this IE is in response body, it indicates the confirmed validity time by HSS.
mtcProviderInformation	MtcProviderInformation	O	0..1	When present, this IE shall indicate the MTC provider information for Parameter Provisioning authorization.
supportedFeatures	SupportedFeatures	O	0..1	Supported Features

6.5.6.2.3 Type: CommunicationCharacteristicsAF

Table 6.5.6.2.3-1: Definition of type CommunicationCharacteristicsAF

Attribute name	Data type	P	Cardinality	Description
ppDlPacketCount	PpDlPacketCount	O	0..1	AF provisioned DL Buffering Suggested Packet Count; nullable
maximumResponseTime	DurationSec	O	0..1	When present, this IE shall contain value of Maximum Response Time in seconds. Maximum Response Time identifies the time for which the UE stays reachable to allow the AF to reliably deliver the required downlink data, see clause 4.15.6.3a of 3GPP TS 23.502 [3].
maximumLatency	DurationSec	O	0..1	When present, this IE shall contain value of Maximum Latency in seconds. Maximum Latency identifies maximum delay acceptable for downlink data transfers, see clause 4.15.6.3a of 3GPP TS 23.502 [3].

6.5.6.3 Simple data types and enumerations

6.5.6.3.1 Introduction

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

6.5.6.3.2 Simple data types

The simple data types defined in table 6.5.6.3.2-1 shall be supported.

Table 6.5.6.3.2-1: Simple data types

Type Name	Type Definition	Description
PpDlPacketCount	integer	nullable

6.5.7 Error Handling

6.5.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

6.5.7.2 Protocol Errors

Protocol errors handling shall be supported as specified in clause 5.2.7 of 3GPP TS 29.500 [4].

6.5.7.3 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 Nhss_ParameterProvision service. The following application errors listed in Table 6.5.7.3-1 are specific for the Nhss_ParameterProvision service.

The application errors defined for the Nhss_PP service are listed in Table 6.5.7.3-1.

Table 6.5.7.3-1: Application errors

Application Error	HTTP status code	Description
CREATION_NOT_ALLOWED	403 Forbidden	Creation not allowed
USER_NOT_FOUND	404 Not Found	The User does not exist.
AF_NOT_ALLOWED	403 Forbidden	This AF is not allowed to perform external provisioning.
MTC_PROVIDER_NOT_ALLOWED	403 Forbidden	MTC Provider not authorized to perform external provisioning.

6.5.8 Feature Negotiation

The optional features in table 6.5.8-1 are defined for the Nhss_PP API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.5.8-1: Supported Features

Feature number	Feature Name	Description

6.5.9 Security

As indicated in 3GPP TS 33.501 [6] and 3GPP TS 29.500 [4], the access to the Nhss_PP API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [18]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [19]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Nhss_PP API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [19], clause 5.8.2.2.

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 Nhss_PP service.

The Nhss_PP API defines a single scope "nhss-pp" for OAuth2 authorization (as specified in 3GPP TS 33.501 [6]) for the entire API, and it does not define any additional scopes at resource or operation level.

6.5.10 HTTP redirection

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

An SCP that reselects a different HSS producer instance will return the NF Instance ID of the new HSS 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 HSS redirects a service request to a different HSS using an 307 Temporary Redirect or 308 Permanent Redirect status code, the identity of the new HSS 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 Nhss Service API(s). It consists of OpenAPI 3.0.0 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: 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 [14] clause 5B).

A.2 Nhss_UEAuthentication API

```
openapi: 3.0.0
info:
  version: '1.3.0-alpha.1'
  title: 'NhssUEAU'
  description: |
    HSS UE Authentication Service.
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.563 HSS Services for Interworking With UDM, version 19.2.0
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.563/'

servers:
  - url: '{apiRoot}/nhss-ueau/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
  - oAuth2ClientCredentials:
    - nhss-ueau
  - {}

paths:
  /generate-av:
    post:
      summary: Generate authentication vector for the UE
      operationId: GenerateAV
      tags:
        - Generate Auth Vector
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AvGenerationRequest'
        required: true
      responses:
        '200':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AvGenerationResponse'
        '307':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '501':
          $ref: 'TS29571_CommonData.yaml#/components/responses/501'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nhss-ueau: Access to the nhss-ueau API


  schemas:

# STRUCTURED TYPES:

    AvGenerationRequest:
      description: >
        It represents the request body in the Authentication Vector (AV) request sent by UDM to HSS,
        containing the IMSI of the UE, authentication type, serving network, etc.
      type: object
      required:
        - imsi
        - authType
        - servingNetworkName
      properties:
        imsi:
          type: string
          pattern: '^[0-9]{5,15}$'
        authType:
          $ref: 'TS29503_Nudm_UEAU.yaml#/components/schemas/AuthType'
        servingNetworkName:
          $ref: 'TS29503_Nudm_UEAU.yaml#/components/schemas/ServingNetworkName'
        resynchronizationInfo:
          $ref: 'TS29503_Nudm_UEAU.yaml#/components/schemas/ResynchronizationInfo'

    AvGenerationResponse:
      description: >
        It represents the response body in the AV response sent by HSS to UDM, containing the 5G-AKA
        or EAP-AKA-prime authentication vector
      type: object
      oneOf:
        - required:
          - avEapAkaPrime
        - required:
          - av5GHeAka
      properties:
        avEapAkaPrime:
```

```
          $ref: 'TS29503_Nudm_UEAU.yaml#/components/schemas/AvEapAkaPrime'
        av5GHeAka:
          $ref: 'TS29503_Nudm_UEAU.yaml#/components/schemas/Av5GHeAka'


# SIMPLE TYPES:


# ENUMS:
```

A.3 Nhss_SubscriberDataManagement API

```
openapi: 3.0.0

info:
  version: '1.3.0-alpha.1'
  title: 'Nhss_SDM'
  description: |
    HSS Subscriber Data Management.
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.563 HSS Services for Interworking With UDM, version 19.2.0
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.563/'

servers:
  - url: '{apiRoot}/nhss-sdm/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
  - oAuth2ClientCredentials:
    - nhss-sdm
  - {}

paths:
  /{ueId}/ue-context-in-pgw-data:
    get:
      summary: Retrieve the UE Context In PGW
      operationId: GetUeCtxInPgwData
      tags:
        - UE Context In PGW Data Retrieval
      parameters:
        - name: ueId
          in: path
          description: Identifier of the UE
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15})$'
      responses:
        '200':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeContextInPgwData'
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
```

```
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error

  /{ueId}/subscriptions:
    post:
      summary: subscribe to notifications
      operationId: Subscribe
      tags:
        - Subscription Creation
      parameters:
        - name: ueId
          in: path
          description: IMSI of the user
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15})$'
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SubscriptionData'
        required: true
      responses:
        '201':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/SubscriptionData'
          headers:
            Location:
              description: >
                Contains the URI of the newly created resource, according to the structure:
                {apiRoot}/nhss-sdm/<apiVersion>/{ueId}/subscriptions/{subscriptionId}
              required: true
              schema:
                type: string
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '501':
          $ref: 'TS29571_CommonData.yaml#/components/responses/501'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
      callbacks:
        datachangeNotification:
```

```
        '{$request.body#/callbackReference}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ModificationNotification'
            responses:
              '204':
                description: Successful Notification response
              '307':
                $ref: 'TS29571_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29571_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '502':
                $ref: 'TS29571_CommonData.yaml#/components/responses/502'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                description: Unexpected error

  /{ueId}/subscriptions/{subscriptionId}:
    delete:
      summary: unsubscribe from notifications
      operationId: Unsubscribe
      tags:
        - Subscription Deletion
      parameters:
        - name: ueId
          in: path
          description: IMSI of the user
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15})$'
        - name: subscriptionId
          in: path
          description: Id of the Subscription
          required: true
          schema:
            type: string
      responses:
        '204':
          description: Successful response
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
    patch:
      summary: modify the subscription
      operationId: Modify
      tags:
        - Subscription Modification
      parameters:
        - name: ueId
          in: path
          description: IMSI of the user
          required: true
          schema:
            type: string
            pattern: '^(imsi-[0-9]{5,15})$'
        - name: subscriptionId
          in: path
          description: Id of the Subscription
          required: true
          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:
        '204':
          description: Successful modification
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nhss-sdm: Access to the nhss-sdm API
```

```
  schemas:

# STRUCTURED TYPES:

    UeContextInPgwData:
      description: >
        Contains data about APNs and PGW-C+SMF FQDNs used in interworking with UDM, and the
        PGW-C+SMF FQDN to be used for emergency session
      type: object
      properties:
        pgwInfo:
          type: array
          items:
            $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/PgwInfo'
          minItems: 1
        emergencyFqdn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Fqdn'
        emergencyPlmnId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
        emergencyIpAddr:
          $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/IpAddress'
        emergencyRegistrationTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

    SubscriptionData:
      description: >
        Contains data about a subscription request, to be created by a consumer to an URI of the
        HSS_SDM API to be monitored; it also represents the response containing data about the
        created subscription
      type: object
      required:
        - nfInstanceId
        - callbackReference
        - monitoredResourceUris
      properties:
        nfInstanceId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/NfInstanceId'
        callbackReference:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        monitoredResourceUris:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
          minItems: 1
        expires:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        immediateReport:
          type: boolean
          default: false
        report:
          $ref: '#/components/schemas/SubscriptionDataSets'

    SubscriptionDataSets:
      description: >
        Contains data to be reported as an immediate report in the response to a subscription
        creation request
      type: object
      properties:
        ueContextInPgwData:
          $ref: '#/components/schemas/UeContextInPgwData'

# SIMPLE TYPES:


# ENUMS:
```

A.4 Nhss_UEContextManagement API

```
openapi: 3.0.0

info:
  version: '1.3.0-alpha.1'
  title: 'Nhss_UECM'
  description: |
    HSS UE Context Management.
```

© 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
All rights reserved.

```
externalDocs:
  description: 3GPP TS 29.563 HSS Services for Interworking With UDM, version 19.2.0
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.563/'

servers:
  - url: '{apiRoot}/nhss-uecm/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
  - oAuth2ClientCredentials:
    - nhss-uecm
  - {}

paths:
  /deregister-sn:
    post:
      summary: MME/SGSN Deregistration
      operationId: DeregisterSN
      tags:
        - MME/SGSN Deregistration
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/DeregistrationRequest'
        required: true
      responses:
        '204':
          description: No content
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '501':
          $ref: 'TS29571_CommonData.yaml#/components/responses/501'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error

  /imei-update:
    post:
      summary: IMEI Update
      operationId: IMEIUpdate
      tags:
        - IMEI Update
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ImeiUpdateInfo'
        required: true
```

```
    responses:
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ImeiUpdateResponse'
      '204':
        description: No content
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '501':
        $ref: 'TS29571_CommonData.yaml#/components/responses/501'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error

  /roaming-status-update:
    post:
      summary: Roaming Status Update
      operationId: RoamingStatusUpdate
      tags:
        - Roaming Status Update
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/RoamingStatusUpdateInfo'
        required: true
      responses:
        '204':
          description: No content
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '501':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/501'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nhss-uecm: Access to the nhss-uecm API

  schemas:

# STRUCTURED TYPES:

    DeregistrationRequest:
      description: >
        It represents the request body of the deregistration request sent by UDM to HSS and contains
        the IMSI of the UE, the deregistration reason, etc.
      type: object
      required:
        - imsi
        - deregReason
      properties:
        imsi:
          type: string
          pattern: '^[0-9]{5,15}$'
        deregReason:
          $ref: '#/components/schemas/DeregistrationReason'
        guami:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Guami'

    ImeiUpdateInfo:
      description: >
        It represents the request body of the IMEI update request sent by UDM to HSS,
        and contains the IMSI of the UE and the new IMEI(SV)
      type: object
      required:
        - imsi
      oneOf:
        - required: [ imei ]
        - required: [ imeisv ]
      properties:
        imsi:
          type: string
          pattern: '^[0-9]{5,15}$'
        imei:
          type: string
          pattern: '^[0-9]{14,15}$'
        imeisv:
          type: string
          pattern: '^[0-9]{16}$'

    ImeiUpdateResponse:
      description: >
        It represents the response body of the IMEI update request sent by UDM to HSS,
        and contains the previous IMEI(SV) stored by HSS
      type: object
      anyOf:
        - required: [ previousImei ]
        - required: [ previousImeisv ]
      properties:
        previousImei:
          type: string
          pattern: '^[0-9]{14,15}$'
        previousImeisv:
          type: string
          pattern: '^[0-9]{16}$'

    RoamingStatusUpdateInfo:
      description: >
```

```
        It represents the request body of the Roaming Status Update request sent by UDM to HSS,
        and contains the IMSI of the UE and the new PLMN-ID
      type: object
      required:
        - imsi
        - plmnId
      properties:
        imsi:
          type: string
          pattern: '^[0-9]{5,15}$'
        plmnId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'

# SIMPLE TYPES:


# ENUMS:

    DeregistrationReason:
      description: The reason that triggers that the serving node needs to be deregistered by HSS
      anyOf:
        - type: string
          enum:
            - UE_INITIAL_AND_SINGLE_REGISTRATION
            - UE_INITIAL_AND_DUAL_REGISTRATION
            - EPS_TO_5GS_MOBILITY
            - EPS_TO_5GS_MOBILITY_WITHOUT_N26_IWK
        - type: string
```

A.5 Nhss_EE API

```
openapi: 3.0.0

info:
  version: '1.3.0-alpha.1'
  title: 'Nhss_EE'
  description: |
    HSS Event Exposure.
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.563 HSS Services for Interworking With UDM, version 19.2.0
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.563/'

servers:
  - url: '{apiRoot}/nhss-ee/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
  - {}
  - oAuth2ClientCredentials:
    - nhss-ee

paths:
  /{ueId}/ee-subscriptions:
    post:
      summary: Subscribe
      operationId: CreateEeSubscription
      tags:
        - EE Subscription (Collection)
      parameters:
        - name: ueId
          in: path
          description: IMSI of the subscriber or the identity of a group of UEs
          required: true
          schema:
            $ref: '#/components/schemas/UeIdOrGroupId'
      requestBody:
        content:
          application/json:
            schema:
```

```
        $ref: '#/components/schemas/EeSubscription'
    required: true
  responses:
    '201':
      description: Expected response to a valid request
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/CreatedEeSubscription'
      headers:
        Location:
          description: >
            Contains the URI of the newly created resource, according to the structure:
            {apiRoot}/nhss-ee/v1/{ueId}/ee-subscriptions/{subscriptionId}
          required: true
          schema:
            type: string
    '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':
      description: Forbidden
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/EeSubscriptionError'
    '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'
    '501':
      description: Not Implemented
      content:
        application/problem+json:
          schema:
            $ref: '#/components/schemas/EeSubscriptionError'
    '502':
      $ref: 'TS29571_CommonData.yaml#/components/responses/502'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      description: Unexpected error
  callbacks:
    eventOccurrenceNotification:
      '{$request.body#/callbackReference}':
        post:
          requestBody:
            required: true
            content:
              application/json:
                schema:
                  type: array
                  items:
                    $ref: '#/components/schemas/MonitoringReport'
                  minItems: 1
          responses:
            '204':
              description: Successful Notification response
            '307':
              $ref: 'TS29571_CommonData.yaml#/components/responses/307'
            '308':
              $ref: 'TS29571_CommonData.yaml#/components/responses/308'
            '400':
              $ref: 'TS29571_CommonData.yaml#/components/responses/400'
            '401':
```

```
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '502':
                $ref: 'TS29571_CommonData.yaml#/components/responses/502'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                description: Unexpected error

/{ueId}/ee-subscriptions/{subscriptionId}:
  delete:
    summary: Unsubscribe
    operationId: DeleteEeSubscription
    tags:
      - Delete EE Subscription
    parameters:
      - name: ueId
        in: path
        description: IMSI of the subscriber or the identity of a group of UEs
        required: true
        schema:
          $ref: '#/components/schemas/UeIdOrGroupId'
      - name: subscriptionId
        in: path
        description: Id of the EE Subscription
        required: true
        schema:
          type: string
    responses:
      '204':
        description: Successful response
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error

  patch:
    summary: Patch
    operationId: UpdateEeSubscription
    tags:
      - Update EE Subscription
    parameters:
      - name: ueId
        in: path
        description: IMSI of the subscriber or the identity of a group of UEs
        required: true
        schema:
```

```
            $ref: '#/components/schemas/UeIdOrGroupId'
        - name: subscriptionId
          in: path
          description: Id of the EE Subscription
          required: true
          schema:
            type: string
      requestBody:
        content:
          application/json-patch+json:
            schema:
              type: array
              items:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchItem'
              minItems: 1
        required: true
      responses:
        '200':
          description: Expected response to a valid request
          content:
            application/json:
              schema:
                $ref: 'TS29571_CommonData.yaml#/components/schemas/PatchResult'
        '204':
          description: Successful response
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nhss-ee: Access to the nhss-ee API

  schemas:

# STRUCTURED TYPES:

    EeSubscription:
      description: >
        It represents the request body of the subscription request sent to HSS, containing data
        related to the subscription to be created, such as the SCEF, Monitoring Configurations and
        reporting options
      type: object
      required:
        - callbackReference
      properties:
        callbackReference:
```

```
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      scefId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'
      scefDiamRealm:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DiameterIdentity'
      monitoringConfigurations:
        description: >
          A map (list of key-value pairs where ReferenceId serves as key) of
          MonitoringConfigurations
        type: object
        additionalProperties:
          $ref: '#/components/schemas/MonitoringConfiguration'
        minProperties: 1
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      reportingOptions:
        $ref: '#/components/schemas/ReportingOptions'
      mtcProviderInformation:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/MtcProviderInformation'
      externalIdentifier:
        type: string

  CreatedEeSubscription:
    description: >
      It represents the response body of the subscription request, containing data of the created
      subscription in the HSS
    type: object
    required:
      - eeSubscription
    properties:
      eeSubscription:
          $ref: '#/components/schemas/EeSubscription'
      eventReports:
        type: array
        items:
          $ref: '#/components/schemas/MonitoringReport'
        minItems: 1
      failedMonitoringConfigs:
        description: >
          A map (list of key-value pairs where referenceId converted from integer to string serves
          as key; see clause 6.4.6.3.2) of FailedMonitoringConfiguration
        type: object
        additionalProperties:
          $ref: '#/components/schemas/FailedMonitoringConfiguration'
        minProperties: 1
      currentStatusNotAvailableList:
        type: array
        items:
          $ref: '#/components/schemas/EventType'
        minItems: 1
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

  FailedMonitoringConfiguration:
    description: >
      Contains the event type and failed cause of the failed Monitoring Configuration
      in the EE subscription
    type: object
    required:
      - eventType
      - failedCause
    properties:
      eventType:
        $ref: '#/components/schemas/EventType'
      failedCause:
        $ref: '#/components/schemas/FailedCause'

  MonitoringConfiguration:
    description: >
      Contains data for each Monitoring Configuration (such as event type, etc.) and
      the configuration data needed depending on each event type
    type: object
    required:
      - eventType
    properties:
      eventType:
        $ref: '#/components/schemas/EventType'
      immediateFlag:
```

```
        type: boolean
      locationReportingConfiguration:
        $ref: '#/components/schemas/LocationReportingConfiguration'
      lossConnectivityConfiguration:
        $ref: '#/components/schemas/LossConnectivityConfiguration'
      reachabilityForDataConfiguration:
        $ref: '#/components/schemas/ReachabilityForDataConfiguration'
      pduSessionStatusCfg:
        $ref: '#/components/schemas/PduSessionStatusCfg'
      idleStatusInd:
        type: boolean
        default: false

MonitoringReport:
  description: Contains data for each Monitoring Event Report sent by the HSS
  type: object
  required:
    - referenceId
    - eventType
    - timeStamp
  properties:
    referenceId:
      $ref: 'TS29503_Nudm_EE.yaml#/components/schemas/ReferenceId'
    eventType:
      $ref: '#/components/schemas/EventType'
    timeStamp:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    report:
      $ref: '#/components/schemas/Report'

ReportingOptions:
  description: >
    Contains the different reporting options associated to a given subscription created in HSS
  type: object
  properties:
    maxNumOfReports:
      $ref: '#/components/schemas/MaxNumOfReports'
    expiry:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    reportPeriod:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'

Report:
  description: Contains data for a given Monitoring Event Report
  type: object
  properties:
    reachabilityForSmsReport:
      $ref: '#/components/schemas/ReachabilityForSmsReport'
    reachabilityForDataReport:
      $ref: '#/components/schemas/ReachabilityForDataReport'
    lossConnectivityReport:
      $ref: 'TS29503_Nudm_EE.yaml#/components/schemas/LossConnectivityReport'
    locationReport:
      $ref: 'TS29503_Nudm_EE.yaml#/components/schemas/LocationReport'
    pdnConnectivityStatReport:
      $ref: 'TS29503_Nudm_EE.yaml#/components/schemas/PdnConnectivityStatReport'

ReachabilityForSmsReport:
  description: >
    Contains data for a Monitoring Event Report, specific to the 'Reachability For SMS'
    event type
  type: object
  required:
    - reachabilitySmsStatus
  properties:
    reachabilitySmsStatus:
      type: boolean
    maxAvailabilityTime:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

ReachabilityForDataReport:
  description: >
    Contains data for a Monitoring Event Report, specific to the 'Reachability For Data'
    event type
  type: object
  required:
    - reachabilityDataStatus
  properties:
```

```
        reachabilityDataStatus:
          type: boolean
        maxAvailabilityTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'

    LossConnectivityConfiguration:
      description: >
        Contains data needed for a Monitoring Configuration, specific to the 'Loss of Connectivity'
        event type
      type: object
      properties:
        maxDetectionTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'

    LocationReportingConfiguration:
      description: >
        Contains data needed for a Monitoring Configuration, specific to the 'Location Reporting'
        event type
      type: object
      required:
        - currentLocation
      properties:
        currentLocation:
          type: boolean
        accuracy:
          $ref: '#/components/schemas/LocationAccuracy'

    ReachabilityForDataConfiguration:
      description: >
        Contains data needed for a Monitoring Configuration, specific to the 'Reachability for Data'
        event type
      type: object
      anyOf:
        - required: [ maximumLatency ]
        - required: [ maximumResponseTime ]
        - required: [ suggestedPacketNumDl ]
      properties:
        maximumLatency:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        maximumResponseTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        suggestedPacketNumDl:
          type: integer
          minimum: 1

    PduSessionStatusCfg:
      description: >
        Contains data needed for a Monitoring Configuration, specific to the 'PDN Connectivity
        Status' event type
      type: object
      properties:
        apn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'

    EeSubscriptionErrorAddInfo:
      description: Additional Information for EE Subscription Error.
      type: object
      properties:
        failedMonitoringConfigs:
          description: >
            A map (list of key-value pairs where referenceId converted from integer to string serves
            as key; see clause 6.4.6.3.2) of FailedMonitoringConfiguration
          type: object
          additionalProperties:
            $ref: '#/components/schemas/FailedMonitoringConfiguration'
          minProperties: 1

    EeSubscriptionError:
      description: EE Subscription Error.
      allOf:
        - $ref: 'TS29571_CommonData.yaml#/components/schemas/ProblemDetails'
        - $ref: '#/components/schemas/EeSubscriptionErrorAddInfo'

# SIMPLE TYPES:

    Imsi:
      description: IMSI of the UE
      type: string
```

```
      pattern: '^(imsi-[0-9]{5,15})$'

    UeIdOrGroupId:
      description: Contains the UE identifier or the Group Identifier of the UE
      type: string
      pattern: '^(imsi-[0-9]{5,15}|extgroupid-[^@]+@[^@]+|.+$)'

    MaxNumOfReports:
      description: Maximum number of events to be reported for events in a given subscription
      type: integer
      minimum: 1

# ENUMS:

    EventType:
      description: Type of Monitoring Event
      anyOf:
        - type: string
          enum:
          - LOSS_OF_CONNECTIVITY
          - UE_REACHABILITY_FOR_DATA
          - UE_REACHABILITY_FOR_SMS
          - LOCATION_REPORTING
          - COMMUNICATION_FAILURE
          - AVAILABILITY_AFTER_DDN_FAILURE
          - PDN_CONNECTIVITY_STATUS
        - type: string

    LocationAccuracy:
      description: Location accuracy used in the 'Location Reporting' event type
      anyOf:
        - type: string
          enum:
          - CELL_LEVEL
          - RAN_NODE_LEVEL
          - TA_LEVEL
        - type: string

    FailedCause:
      description: >
        Indicates the Failed cause of the failed Monitoring Configuration in the EE subscription
      anyOf:
        - type: string
          enum:
          - MTC_PROVIDER_NOT_ALLOWED
          - MONITORING_NOT_ALLOWED
          - UNSUPPORTED_MONITORING_EVENT_TYPE
          - UNSUPPORTED_MONITORING_REPORT_OPTIONS
          - UNSPECIFIED
        - type: string
```

A.6 Nhss_PP API

```
openapi: 3.0.0

info:
  version: '1.0.0-alpha.2'
  title: 'Nhss_PP'
  description: |
    Nhss Parameter Provision Service.
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: 3GPP TS 29.563 Unified Data Management Services, version 19.2.0
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.563/'

servers:
  - url: '{apiRoot}/nhss-pp/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501.

security:
```

```
  - oAuth2ClientCredentials:
    - nhss-pp
  - {}

paths:
  /{ueId}/pp-data-store/{afInstanceId}:
    put:
      summary: Create a Provisioning Parameter Data Entry
      operationId: Create PP Data Entry
      tags:
        - ParameterProvisioningDataEntry (Document)
      parameters:
        - name: ueId
          in: path
          description: Identifier of the UE
          required: true
          schema:
            anyOf:
              - $ref: 'TS29571_CommonData.yaml#/components/schemas/VarUeId'
              - $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExtGroupId'
              - type: string
                pattern: '^anyUE$'
        - name: afInstanceId
          in: path
          description: Application Function Instance Identifier
          required: true
          schema:
            type: string
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PpDataEntry'
        required: true
      responses:
        '201':
          description: Indicating a successful creation of the resource
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/PpDataEntry'
        '204':
          description: Indicating a successful update of the resource
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          description: Unexpected error
    delete:
      summary: Delete a Provisioning Parameter Data Entry
      operationId: Delete PP Data Entry
      tags:
        - ParameterProvisioningDataEntry (Document)
      parameters:
        - name: ueId
          in: path
          description: Identifier of the UE
          required: true
          schema:
```

```
          anyOf:
            - $ref: 'TS29571_CommonData.yaml#/components/schemas/VarUeId'
            - $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExtGroupId'
            - type: string
              pattern: '^anyUE$'
      - name: afInstanceId
        in: path
        description: Application Function Instance Identifier
        required: true
        schema:
          type: string
    responses:
      '204':
        description: Expected response to a valid request
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        description: Unexpected error
  get:
    summary: get Parameter Provisioning Data Entry
    operationId: Get PP Data Entry
    tags:
      - ParameterProvisioningDataEntry (Document)
    parameters:
      - name: ueId
        in: path
        description: Identifier of the UE
        required: true
        schema:
          anyOf:
            - $ref: 'TS29571_CommonData.yaml#/components/schemas/VarUeId'
            - $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExtGroupId'
            - type: string
              pattern: '^anyUE$'
      - name: afInstanceId
        in: path
        description: Application Function Instance Identifier
        required: true
        schema:
          type: string
      - name: supported-features
        in: query
        description: Features required to be supported by the target NF
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    responses:
      '200':
        description: Expected response to a valid request
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/PpDataEntry'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
```

```
        '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:
          description: Unexpected error



components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nhss-pp: Access to the nhss-pp API


  schemas:

# STRUCTURED TYPES:


    PpDataEntry:
      type: object
      required:
        - referenceId
      properties:
        communicationCharacteristics:
          $ref: '#/components/schemas/CommunicationCharacteristicsAF'
        referenceId:
          $ref: 'TS29503_Nudm_EE.yaml#/components/schemas/ReferenceId'
        validityTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        mtcProviderInformation:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MtcProviderInformation'
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      nullable: true

    CommunicationCharacteristicsAF:
      type: object
      properties:
        ppDlPacketCount:
          $ref: '#/components/schemas/PpDlPacketCount'
        maximumResponseTime:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
        maximumLatency:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      nullable: true


# SIMPLE TYPES:


    PpDlPacketCount:
      type: integer
      nullable: true



# ENUMS:
```

Annex B (informative): Withdrawn API versions

B.1 General

This Annex lists withdrawn API versions of the APIs defined in the present specification. 3GPP TS 29.501 [5] clause 4.3.1.6 describes the withdrawal of API versions.

Annex C (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2019-05	CT4#91	C4-192407				Initial Draft.	0.1.0
2019-09	CT4#93	C4-193847				Incorporation of pCRs agreed at CT4#93 in C4-193553, C4-193624.	0.2.0
2019-10	CT4#94	C4-194521				Incorporation of pCRs agreed at CT4#94 in C4-194346.	0.3.0
2019-11	CT4#95	C4-195636				Incorporation of pCRs agreed at CT4#95 in C4-195579.	0.4.0
2019-12	CT#86	CP-193067				TS presented for information	1.0.0
2020-03	CT4#96	C4-201271				Incorporation of pCRs agreed at CT4#96 in C4-200880, C4-200917, C4-200964, C4-201100.	1.1.0
2020-03	CT#87	CP-200065				TS presented for approval	2.0.0
2020-03	CT#87					Approved at CT#87	16.0.0
2020-07	CT#88	CP-201033	0001	-	B	Storage of YAML files in ETSI Forge	16.1.0
2020-07	CT#88	CP-201033	0002	-	F	PGW-C+SMF FQDN for Emergency Session	16.1.0
2020-07	CT#88	CP-201033	0003	1	B	Initial Registration	16.1.0
2020-07	CT#88	CP-201033	0004	1	B	HSS Event Exposure	16.1.0
2020-07	CT#88	CP-201033	0005	1	F	Serving Node Deregistration	16.1.0
2020-07	CT#88	CP-201073	0006	-	F	29.563 Rel-16 API version and External doc update	16.1.0
2020-09	CT#89	CP-202111	0007	-	F	UE Id Correction for EE Subscription	16.2.0
2020-09	CT#89	CP-202111	0008	1	F	Correction of HSS Event Exposure data types	16.2.0
2020-09	CT#89	CP-202096	0009	-	F	29.563 Rel-16 API version and External doc update	16.2.0
2020-12	CT#90	CP-205049	0010	1	F	Config APN for PDN connectivity status	16.3.0
2020-12	CT#90	CP-205049	0011	1	F	Definition of SubscriptionData	16.3.0
2020-12	CT#90	CP-205049	0012	-	F	References and Cardinality errors clean up	16.3.0
2020-12	CT#90	CP-205048	0013	-	F	Storage of YAML files in GitLab	16.3.0
2020-12	CT#90	CP-205049	0014	-	F	Reference ID	16.3.0
2020-12	CT#90	CP-205036	0015	-	F	29.563 Rel-16 API version and External doc update	16.3.0
2021-03	CT#91	CP-210042	0018	-	F	GUAMI in Deregistration Request	16.4.0
2021-03	CT#91	CP-210054	0022	-	F	29.563 Rel-16 API version and External doc update	16.4.0
2021-03	CT#91	CP-210042	0023	-	F	Cancellation Type sent to MME/SGSN when UE registers in 5G	16.4.0
2021-03	CT#91	CP-210042	0017	-	F	Correction of reference	17.0.0
2021-06	CT#92	CP-211064	0025	-	A	Serving Node Deregistration	17.1.0
2021-06	CT#92	CP-211028	0026	-	F	OpenAPI Reference	17.1.0
2021-06	CT#92	CP-211028	0027	1	B	Data Type Descriptions	17.1.0
2021-06	CT#92	CP-211028	0028	-	F	Nhss Services	17.1.0
2021-06	CT#92	CP-211047	0029	4	F	RAN Node Level Location Accuracy	17.1.0
2021-06	CT#92	CP-211065	0031	1	A	Monitored Resource URI	17.1.0
2021-06	CT#92	CP-211059	0033	-	A	Redirect Responses	17.1.0
2021-06	CT#92	CP-211064	0035	1	A	VLR Cancellation	17.1.0
2021-06	CT#92	CP-211054	0036	1	B	MTC Provider in Nhss_EE	17.1.0
2021-06	CT#92	CP-211050	0037	-	F	29.563 Rel-17 API version and External doc update	17.1.0
2021-09	CT#93	CP-212060	0040	-	A	3xx description correction for SCP	17.2.0
2021-09	CT#93	CP-212069	0043	1	A	Immediate Report in Response	17.2.0
2021-09	CT#93	CP-212069	0045	-	A	Missing Event Reports	17.2.0
2021-09	CT#93	CP-212056	0048	1	F	Corrections on EventType	17.2.0
2021-09	CT#93	CP-212057	0049	1	B	Partial success on EE subscription	17.2.0
2021-09	CT#93	CP-212059	0050	-	F	29.563 Rel-17 API version and External doc update	17.2.0
2021-12	CT#94	CP-213085	0041	2	F	EE subscription for a group	17.3.0
2021-12	CT#94	CP-213121	0052	-	F	29.563 Rel-17 API version and External doc update	17.3.0
2022-03	CT#95	CP-220023	0053	-	F	501 Not Implemented	17.4.0
2022-03	CT#95	CP-220074	0055	-	A	Essential Correction on Monitoring Events	17.4.0
2022-03	CT#95	CP-220074	0057	-	A	Idle Status Indication	17.4.0
2022-03	CT#95	CP-220090	0058	-	F	Editorial corrections	17.4.0
2022-03	CT#95	CP-220066	0059	-	F	29.563 Rel-17 API version and External doc update	17.4.0
2022-06	CT#96	CP-221029	0061	1	F	Fqdn Data Type Definition	17.5.0
2022-06	CT#96	CP-221028	0062	1	F	UeContextInPgwData for emergency sessions	17.5.0
2022-06	CT#96	CP-221029	0063	1	F	Subscription modification	17.5.0
2022-06	CT#96	CP-221051	0064	-	F	29.563 Rel-17 API version and External doc update	17.5.0
2022-09	CT#97	CP-222057	0065	-	F	IMEI Update	17.6.0
2022-09	CT#97	CP-222057	0066	-	F	Roaming Status Update	17.6.0
2022-09	CT#97	CP-222058	0067	-	F	29.563 Rel-17 API version and External doc update	17.6.0
2022-12	CT#98	CP-223028	0068	1	F	Missing Mandatory Status Codes in OpenAPI	18.0.0
2022-12	CT#98	CP-223033	0069	-	F	29.563 Rel-18 API version and External doc update	18.0.0
2023-03	CT#99	CP-230029	0070	-	F	PDN connectivity status	18.1.0
2023-03	CT#99	CP-230029	0071	1	F	Missing OAuth Security Clauses	18.1.0
2023-06	CT#100	CP-231027	0072	4	F	Location header and missing Redirection clause	18.2.0
2023-06	CT#100	CP-231025	0074	-	F	Roaming Status Update	18.2.0
2023-06	CT#100	CP-231027	0075	1	D	Editorial corrections for Roaming Status Update	18.2.0
2023-09	CT#101	CP-232033	0076	1	F	NEF Reference ID	18.3.0
2023-09	CT#101	CP-232058	0077	1	F	Immediate Reporting Handling	18.3.0

2023-09	CT#101	CP-232060	0078	-	F	29.563 Rel-18 API version and External doc update	18.3.0
2023-12	CT#102	CP-233029	0079	1	B	HTTP RFCs obsoleted by IETF RFC 9110, 9111 and 9113	18.4.0
2023-12	CT#102	CP-233029	0080	1	B	ProblemDetails RFC 7807 obsoleted by 9457	18.4.0
2023-12	CT#102	CP-233027	0081	-	B	Per Monitoring Configuration Failure Cause in Error Response	18.4.0
2023-12	CT#102	CP-233030	0082	-	F	Editorial and Style Corrections	18.4.0
2023-12	CT#102	CP-233071	0084	-	A	Group ID on Nhss_EE API	18.4.0
2023-12	CT#102	CP-233060	0085	-	F	29.563 Rel-18 API version and External doc update	18.4.0
2024-06	CT#104	CP-241028	0087	1	F	Callbacks	18.5.0
2024-06	CT#104	CP-241028	0088	3	F	UeContextInPgw modification	18.5.0
2024-06	CT#104	CP-241052	0089	-	F	29.563 Rel-18 API version and External doc update	18.5.0
2024-09	CT#105	CP-242053	0093	1	F	Not Cancelling the MME registration upon EPS to 5GS mobility	18.6.0
2024-09	CT#105	CP-242054	0094	-	F	29.563 Rel-18 API version and External doc update	18.6.0
2024-09	CT#105	CP-242030	0090	1	F	IMEI pattern alignment	19.0.0
2024-09	CT#105	CP-242030	0092	1	B	Nhss_Parameter Provisioning	19.0.0
2024-12	CT#106	CP-243035	0096	-	F	Removal of Editor's Note	19.1.0
2025-09	CT#109	CP-252176	0101	-	F	API version and External doc update	19.2.0

History

Document history		
V19.2.0	January 2026	Publication