ETSI TS 123 632 V16.2.0 (2020-10)

LTE;
5G;
User data interworking, coexistence and migration;
Stage 2
(3GPP TS 23.632 version 16.2.0 Release 16)

Reference
DTS/TSGC-0423632vg20

Keywords
5G,LTE

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 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org/standards-search

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 at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx

If you find errors in the present document, please send your comment to one of the following services:
https://portal.etsi.org/People/CommiteeSupportStaff.aspx

Copyright Notification

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is 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 Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, 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.

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 under http://webapp.etsi.org/key/queryform.asp.

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

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 defines the Stage 2 architecture, procedures, flows and Network Function Services for User Data Interworking, Coexistence and Migration within the 5G System.

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 23.002: "Network Architecture".

[4] 3GPP TS 23.380: "IMS Restoration Procedures".

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

[6] 3GPP TS 33.501: "Security Architecture and Procedures for 5G System".

[7] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[8] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

[9] 3GPP TS 33.402: "3GPP System Architecture Evolution (SAE); Security aspects of non-3GPP accesses".

[10] 3GPP TS 33.203: "3G security; Access security for IP-based services".

[11] 3GPP TS 33.220: "3G security; Generic Authentication Architecture (GAA); Generic Bootstrapping Architecture (GBA)".

[12] 3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification - Formats and coding".

[13] 3GPP TS 23.237: "IP Multimedia Subsystem (IMS) Service Continuity".

[14] 3GPP TS 23.008: "Organization of subscriber data".

[15] 3GPP TS 29.328: "IP Multimedia (IM) Subsystem Sh interface; Signalling flows and message contents".

[16] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications; Stage 2".

[17] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[18] 3GPP TS 23.204: "Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

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

3.2 Symbols

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].

5GS UDR	5G Unified Data Repository
EPS UDR	EPS User Data Repository

4 System architecture

4.1 Architecture for direct UDM-HSS interworking

Figure 4.1-1 shows the reference architecture for direct UDM-HSS interworking.

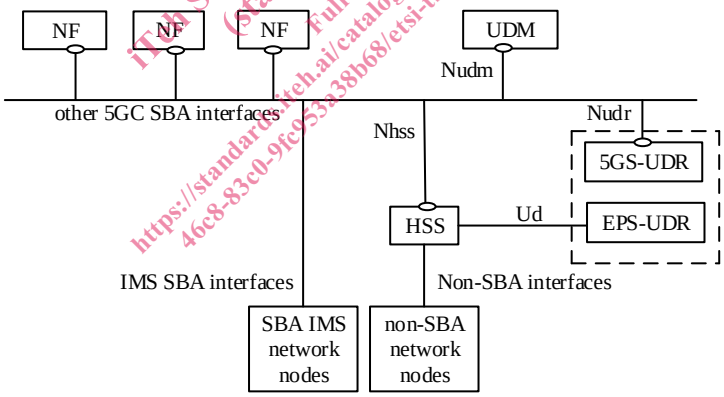

Figure 4.1-1: Architecture for Direct UDM-HSS interworking

Non-SBA interfaces between the HSS and non-SBA network nodes include interfaces to / from the SMS-GMSC/IWMSC and SMS Router. In the Architecture for direct UDM-HSS interworking , as a deployment option, these Non-SBA interfaces may either be supported by the HSS or by the UDM.

Figure 4.1-2 shows the reference architecture for direct UDM-HSS interworking using the reference point representation.

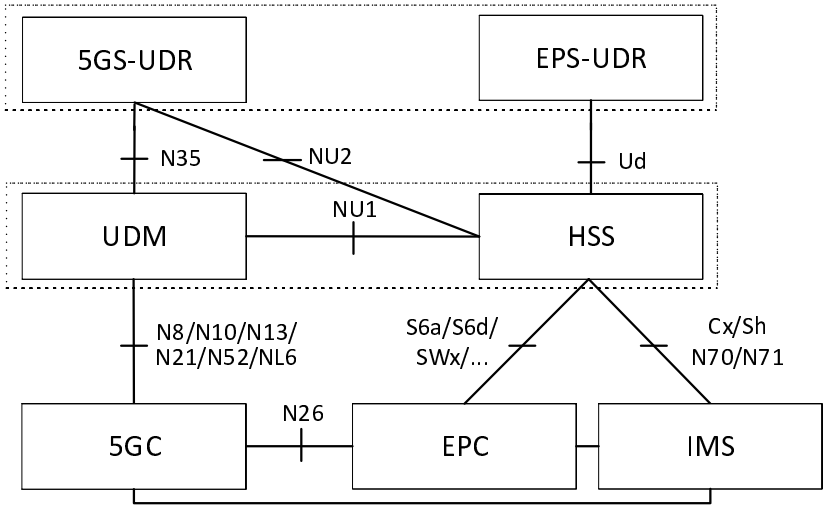

Figure 4.1-2: Architecture for Direct UDM-HSS interworking in reference point representation

The 5GS-UDR (Unified Data Repository) and EPS-UDR (User Data Repository) may be collocated, forming a common repository.

NOTE: The HSS is only using the NU2 reference point for the purpose of interworking with 5GS, i.e. NU2 is not a replacement of the Ud interface.

4.2 Reference points for direct UDM-HSS interworking

The following reference points are realized by service-based interfaces:

NU1: Reference point between the HSS and the UDM.

NU2: Reference point between the HSS and the 5GS-UDR.

For a list of other SBA reference points supported in 5GC see 3GPP TS 23.501 [2].

For a list of IMS reference points, including SBA IMS reference points, see 3GPP TS 23.228 [7].

For a list of Non-SBA reference points and Network Nodes interfacing the HSS see 3GPP TS 23.002 [3].

The HSS makes use of the Ud reference point to interact with the EPS-UDR. The UDM makes use of the N35 reference point to interact with the 5GS-UDR.

4.3 Service based interfaces for direct UDM-HSS interworking

Nudm: Service-based interface exhibited by UDM.

Nhss: Service-based interface exhibited by HSS.

The HSS shall make use of Nudm services as described in clause 6.2 and may make use of Nudr services as described in clause 6.3.

The UDM shall make use of Nhss services and Nudr services as described in clauses 6.1 and 6.3.

4.4 Subscription Identifiers

As defined in 3GPP TS 23.501 [2], for interworking with the EPC, the SUPI allocated to the 3GPP UE shall always be based on an IMSI to enable the UE to present an IMSI to the EPC.

The subscription identifier used over NU1 reference point in Nhss services shall be an IMSI. The UDM extracts the IMSI from the user's SUPI.

The subscription identifier used over NU1 reference point in Nudm services shall be a SUPI based on an IMSI. The HSS creates a SUPI from the user's IMSI or the IMSI associated to the user's public identifier in the EPS or IMS domain (e.g. user's MSISDN or IMPU).

4.5 HSS Discovery and Selection

This clause defines the procedures for HSS discovery and selection by the UDM. The procedures for HSS discovery and selection by SBI capable IMS entities is defined in 3GPP TS 23.228 [7].

The UDM performs HSS discovery to discover an HSS that manages the user subscriptions in EPC.

The UDM shall utilize the NRF to discover the HSS instance(s) unless the information about HSS instances is available by other means, e.g. locally configured on the UDM. The HSS selection function in UDM selects an HSS instance based on the available HSS instances (obtained from the NRF or locally configured).

When the NRF is used for HSS discovery, the HSS registers in the NRF using the Nnrf_NFManagement_NFRegister Request message as defined in 3GPP TS 23.502 [5].

Different HSS instances managing different sets of IMSI/MSISDN ranges may be deployed in a given PLMN. In this case, the HSS instances register in NRF using either different ranges of IMSI/MSISDN and/or HSS Group IDs.

NOTE 1: In deployments where simple IMSI/MSISDN ranges are not suitable to describe the IMSI/MSISDN sets served by HSS instances, it is expected the HSS instances only register HSS Group IDs.

When NRF is used for HSS discovery, the UDM sends a Nnrf_NFDiscovery_Request to NRF as defined in 3GPP TS 23.502 [5] to discover HSS instances within a given PLMN. The UDM may store all returned HSS instances and their NF profiles for subsequent use, including, if applicable, supported IMSI/MSISDN ranges, and/or HSS Group IDs.

The UDM may use Nnrf_NFStatusSubscribe/Unsubscribe service operations with NRF as defined in 3GPP TS 23.502 [5] to receive Nnrf_NFStatusNotify service operation for updates to the NF profiles of HSS instances registered in NRF.

The UDM always selects an HSS within its own PLMN. The HSS selection should consider one of the following factors when available to the UDM entity:

1. HSS Group ID of the UE's IMSI.
2. IMSI; the UDM selects an HSS instance based on the IMSI range the UE's IMSI belongs to or based on the results of a discovery procedure with NRF using the UE's IMSI as input for HSS discovery.

NOTE 2: In this release of the specification there is not identified need for the UDM to be able to select the HSS based on IMS identifiers (IMPI, IMPU) neither based on MSISDN or External Group ID.

4.6 UDM Discovery and Selection

The HSS performs UDM discovery and selection as described in 3GPP TS 23.501 [2].

4.7 Subscription Profiles

In the context of Mobility, IMS and SMS use cases, the HSS initiates interworking with the UDM only for UEs which have a 5G subscription that is known to be active in 5GC.

NOTE: The HSS may be aware that a 5G subscription for the UE exists based on the Core Network Type restrictions defined for the UE (i.e. If restriction for Core Network Type indicates that the UE can access to 5GC, it implies that the UE has 5G subscription data).
Additionally, the HSS may be aware that a UE for which 5G subscription data exist is not active in 5GC e.g. when the HSS has not yet received an Nhss_UECM_ SNDeregistration request from the UDM for that UE (see clause 5.3.3 step 3).

5 System procedures

5.1 General

Procedures involving communication between HSS and UDM comprise Authentication, Mobilty, IMS interworking, and SMS support.

5.2 Authentication

5.2.1 General

5.2.1 General

A subscriber's authentication subscription data, including the subscriber's long-term key(s) and sequence number, shall be stored in a single repository so that a single sequence number can be maintained for the subscriber.

The subscriber's long-term key(s) shall not be transferred over the NU1 reference point between HSS and UDM. Also it is not expected that the UDM has direct standardized access to the EPS-UDR. Therefore, the following options exist for subscribers with both 5G and EPS subscription:

1) Authentication subscription data are stored in the EPS-UDR and all authentication vectors are calculated in the HSS. Subscription data stored in the 5GS-UDR or locally configured in the UDM indicate that the UDM needs to consume the Nhss_UEAuthentication_Get service operation to retrieve a 5G vector from the HSS. See clause 5.2.2 for details.

2) Authentication subscription data are stored in the 5GS-UDR and all authentication vectors are calculated in the UDM. Subscription data stored in the EPS-UDR or locally configured in the HSS indicate that the HSS needs to consume the Nudm_UEAuthentication_GetHssAv service operation to retrieve an EPS vector from the UDM. See clause 5.2.3 for details.

3) Authentication subscription data are stored in the 5GS-UDR, 5G vectors are calculated in the UDM and EPS vectors are calculated in the HSS. Subscription data stored in the EPS-UDR or locally configured in the HSS indicate that the HSS needs to consume the Nudr_DM_Query service operation to retrieve authentication subscription data from the 5GS-UDR. See clause 5.2.4 for details.

The following clauses specify the system procedures for these different alternatives.

5.2.2 Vector Generation in HSS

This clause specifies the procedures for authentication vector request when the subscriber's authentication subscription data is stored at the EPS-UDR. In this case, the UDM requests the generation of the Authentication Vector for 5GS to the HSS.

NOTE: The HSS acts as ARPF rather than as AuC and it is required to generate authentication vectors as defined in 3GPP TS 33.501 [6].

Editor's Note: The possibility to collocate the ARPF in HSS (i.e. not within UDM as described in TS 33.501 [6]) needs to be confirmed by SA3.

When the UDM receives an authentication information Request from the AUSF it shall check (by means of an 5GS-UDR query or local configuration in the UDM) whether the subscribed authentication method is 5G_AKA or EAP_AKA_PRIME and if so whether 5G authentication vector generation for the identified subscriber shall be done in the HSS. If so, the UDM shall make use of the Nhss_UEAuthentication_Get service operation to retrieve a 5G authentication vector from the HSS.

Figure 5.2.2-1 shows the scenario where the authentication vector request for a 5G subscriber who also has an EPS subscription is received by the UDM.

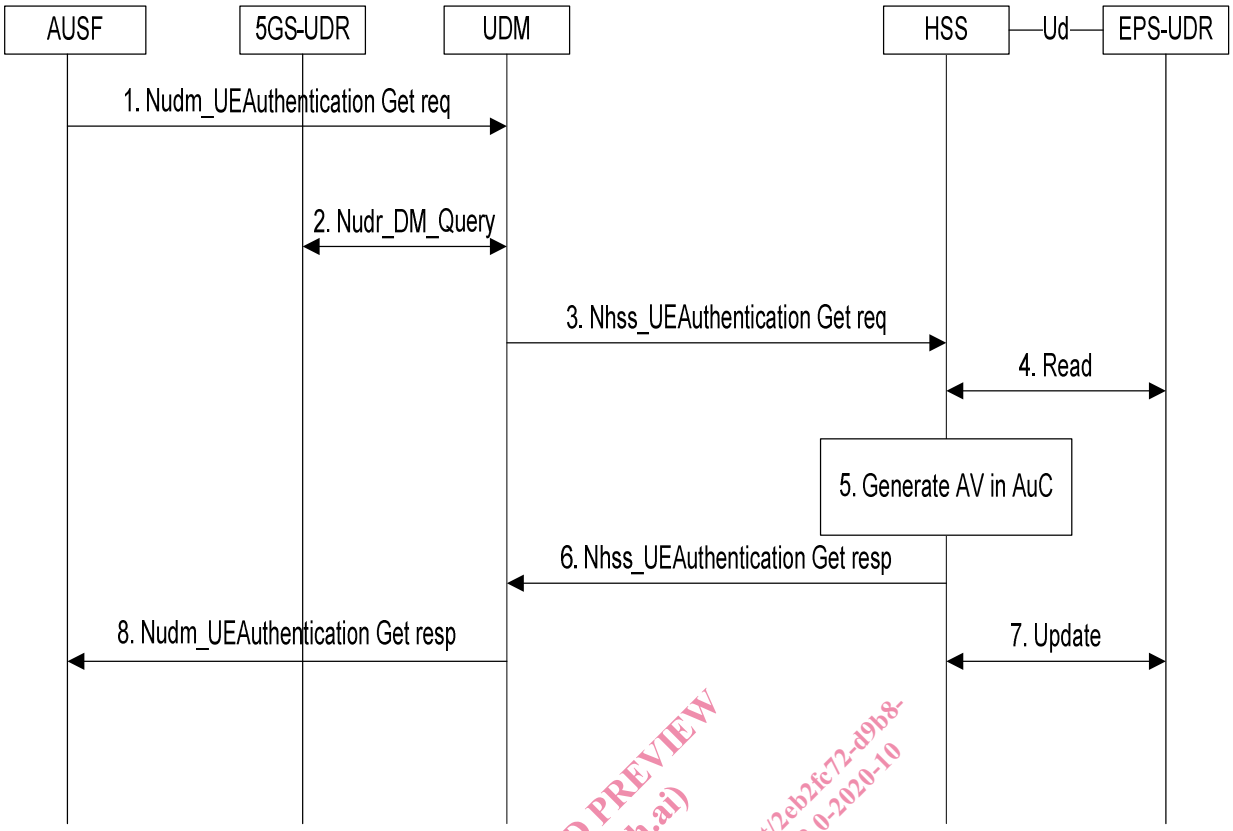

Figure 5.2.2-1: Authentication for 5G subscriber with authentication vector generation in HSS

1. The UDM receives an Authentication Vector request, containing the identity of the user (SUPI or SUCI). If SUCI is received, the UDM performs SUCI to SUPI de-concealment. For details of the Nudm_UEAuthentication Service see 3GPP TS 23.502 [5] and 3GPP TS 33.501 [6].

Editor's Note: According to TS 33.501 [6], the ARPF holds the home network private key that is used by the SIDF to deconceal the SUCI and reconstruct the SUPI. It needs to be confirmed if UDM would still be able to deconceal the SUPI in the case that the ARPF is colocated with the HSS rather than with the UDM.

2. If the 5GS-UDR is used, the UDM queries the 5GS-UDR using the SUPI to retrieve Authentication Subscription Information. In this scenario the Authentication Subscription Information contains a subscribed authentication method of 5G_AKA or EAP_AKA_PRIME and an indicator indicating that authentication vector generation shall be performed in the HSS. Optionally, the indication that the authentication vector generation shall be performed in the HSS could be locally configured at the UDM/ARPF.

3. The UDM uses the Nhss_UEAuthentication_Get service operation to retrieve an authentication vector from the HSS. The request contains the IMSI the authentication method and serving network name.

4. The HSS reads authentication subscription data from the EPS-UDR. This step is omitted if all relevant authentication subscription data are stored locally in the HSS.

5. The HSS (AuC/ARPF) calculates the requested authentication vector taking into account the serving network name and authentication method received in step 3 and the authentication subscription information retrieved from the EPS-UDR.

6. The calculated authentication vector is sent to the UDM.

7. The HSS updates the EPS-UDR with the new sequence number. This step is omitted if the sequence number is stored locally in the HSS.

8. The UDM forwards the authentication vector to the AUSF.