**3GPP TSG-SA3 Meeting #104-e *S3-21xxxx***

**e-meeting, 16 - 27 August 2021**

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| *CR-Form-v12.1* |
| **DRAFT CHANGE REQUEST** |
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|  | **33.501** | **CR** | **draft-CR** | **rev** | **<Rev#>** | **Current version:** | **<Version#>** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | Security aspects of eNPN |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | SA3  |
|  |  |
| ***Work item code:*** | eNPN |  | ***Date:*** | 2021-08-09 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | Security aspects for the Enhanced support of Non-Public Networks need to be specified. |
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| ***Summary of change:*** | Enhancements to 5GS on the security aspects for the Enhanced support of Non-Public Networks. Specifically:- Impact on primary authentication and key hierarchy when the credentials are owned by an external entity: - Credentials holder using AUSF and UDM for primary authentication - Credentials holder using AAA server for primary authentication - Impact on roaming-related security mechanisms. |
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| ***Consequences if not approved:*** | Enhanced support of Non-Public Network will not have necessary security aspects specified. |
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| ***Clauses affected:*** | Annex I.2.2.x (new), Annex I.2.2.y (new), Annex I.2.2.z (new), Annex I.2.3.x (new), Annex I.2.3.y (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\* BEGIN CHANGES \*\*\*

Annex I (normative):
Non-public networks

I.1 General

This Annex provides details on security for non-public networks. Most of the security procedures are the same as public networks so this annex only summarizes and specifies where there are exceptions to the normal procedures.

The feature for support of non-public networks (NPN) by 5GS is described in clause 5.30 of 23.501 [2].

Editor's Note: Security aspects for other NPN issues including PNiNPN are ffs.

I.2 Authentication in standalone non-public networks

I.2.1 General

One of the major differences of non-public networks is that authentication methods other than AKA based ones may be used in a standalone non-public network (SNPN). When an AKA-based authentication method is used, clause 6.1 shall apply. When an authentication method other than 5G AKA or EAP-AKA' is used, only the non-AKA specific parts of clause 6.1 shall apply. An example of running such an authentication method is given in Annex B with EAP-TLS.

The choice of the supported authentication methods for access to SNPNs follows the principles described in clauses I.2.2 and I.2.3.

I.2.2 EAP framework, selection of authentication method, and EAP method credentials

### I.2.2.x General

The EAP authentication framework is supported by the 5GS as described in clause 6.1.1.2.

The UE and the serving network may support 5G AKA, EAP-AKA', or any other key-generating EAP authentication method.

Selection of the authentication methods is dependent on NPN configuration.

NOTE 1: For EAP-AKA' (as well as 5G AKA), the selection is described in clause 6.1.2. For authentication, that is not using EAP-AKA' (or 5G AKA), the selection is NPN operator deployment specific and out of scope of this specification.

When an EAP authentication method other than EAP-AKA' is selected, the chosen method determines the credentials needed in the UE and network. These credentials, called the EAP-method credentials, shall be used for authentication.

NOTE 2: How credentials for EAP methods other than EAP-AKA' are stored and processed within the UE is out of the scope for standalone non-public networks.

NOTE 3: Storage and processing of credentials for EAP-AKA' (as well as 5G AKA) is described in clause 6 of the present document.

### I.2.2.y Credentials holder using AUSF and UDM for primary authentication

Editor's Note: This clause will describe additions and modifications specific to the 5GS-aware CH case, e.g. the impact on interconnect and roaming security.

### I.2.2.z Credentials holder using AAA server for primary authentication

Editor's Note: This clause will describe additions and modifications specific for the non-5GS-aware CH case, e.g. refer to SA2 architecture, flow diagram.

I.2.3 Key hierarchy, key derivation and key distribution

### I.2.3.x General

The text in clauses 6.2.1 and 6.2.2 cannot apply directly for an EAP authentication method other than EAP-AKA' as these clauses assume that an AKA-based authentication method is used. The major differences are the way in which KAUSF is calculated and that the UDM/ARPF is not necessarily involved in the key derivation or distribution.

Depending on the selected authentication method, the KAUSF is generated as follows:

- For 5G AKA and EAP-AKA' refer to clause 6.2.1.

- When using a key-generating EAP authentication method other than EAP-AKA', the key derivation of KAUSF is based on the EAP-method credentials in the UE and AUSF and shall be done as shown in Figure I.2.3-1.

NOTE: For EAP authentication methods other than EAP-AKA', this key derivation replaces clauses 6.2.1 and 6.2.2 for the generation of KAUSF .

**Figure I.2.3-1: KAUSF derivation for key-generating EAP authentication methods other than EAP-AKA'**

KAUSF shall be derived by the AUSF and UE from the EMSK created by the EAP authentication as for EAP-AKA'.

All of figures 6.2.1-1, 6.2.2.1-1 and 6.2.2.2.2-1 from the KAUSF downwards are used without modification. Similarly, text relating to the key hierarchy, key derivation and key distribution in clauses 6.2.1, 6.2.2.1 and 6.2.2.2 for keys derived from KAUSF (e.g. KSEAF, KAMF, KgNB etc) apply without modification.

### I.2.3.y Credentials holder using AAA server for primary authentication

Editor's Note: This clause will describe the impact on the key hierarchy specific for the non-5GS aware CH case.

I.3 Serving network name for standalone non-public networks

I.3.1 General

The identification of standalone non-public networks uses Network Identifier (NID) in addition to PLMN ID. This means the definition of SN Id in clause 6.1.1.4.1 for the derivation of KSEAF for all authentication methods, CK' and IK' for EAP-AKA', and KAUSF and (X)RES\* for 5G AKA needs modification for standalone non-public networks.

I.3.2 Definition of SN Id for standalone non-public networks

For standalone non-public networks, the SN Id (used in the input for various key/parameter derivations) identifies the serving SNPN.

It is defined as follows:

SN Id = PLMN ID:NID

and is specified in detail in TS 24.501 [35].

I.4 Modification of CAG ID list in the UE

The following requirements apply to NAS messages that modify the list of CAG IDs stored in the UE:

- the AMF shall only send such a NAS message once NAS security has been established; and

- the UE shall only modify its list of CAG IDs after successful integrity verification of the integrity protected NAS message requesting such a modification.

I.5 SUPI privacy for standalone non-public networks

The UE shall support SUPI privacy as defined in clause 6.12 with the following exception. When using an authentication method other than 5G AKA or EAP-AKA', the location of the functionality related to SUPI privacy in the UE is out of scope.

Furthermore, the privacy considerations for EAP TLS (given in Annex B.2.1.2) should be taken into account when using an authentication method other than 5G AKA or EAP-AKA'.

I.6 Authentication in Public Network Integrated Non-Public Networks (PNI-NPN)

For public network integrated NPN (PNI-NPN), the primary authentication shall be performed with the public network as described in clause 6.1. Secondary authentication as described in clause 11 and slice-specific authentication as described in the main body can take place after a successful primary authentication.

\*\*\* END CHANGES \*\*\*