**3GPP TSG-SA3 Meeting #124 draft\_S3-253677-r4**

Wuhan, China, 13 - 17 October 2025

**Merger of S3-253281, S3-253270, S3-253271, S3-253504, S3-253505, S3-253472, S3-253531, S3-253251**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **017** | **rev** | 1 | **Current version:** | **0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Clarify randomness of parameter RANDAIoT\_D and privacy procedure alignment. | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | OPPO, CATT, InterDigital, Vivo, Huawei, HiSilicon, Lenovo, Ericsson, Qualcomm | | | | | | | | | |
| ***Source to TSG:*** | S3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AmbientIoT-SEC | | | | |  | ***Date:*** | | | 2025-09-22 |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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 can be 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Since TS 33.369 defines the requirement that AIoT device supports pseudo-random number generation, the randomness of RANDAIoT\_D generated by the AIoT device should follow the same requirement. The privacy procedure in Clause 5.4 is based on the authentication procedure in 5.2 with changes to to 5.2 clearly marked. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Clarified that the randomness of parameter RANDAIoT\_D is psedu-random. The related EN is removed. EN on alignment between authentication and privacy procedure is moved. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Procedure in which parameter RANDAIoT\_D is generated does not align with the AIoT device requirementon random number generation. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 4.2.1.2, 5.2.1, 5.2.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 OF CHANGES\*\*\*\*\*\*\*\*\*\*\*\*\*

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 23.369: “Architecture support for Ambient power-enabled Internet of Things”.

[3] 3GPP TS 38.300: “NR; NR and NG-RAN Overall description; Stage-2”.

[4] 3GPP TS 22.369 “Service requirements for Ambient power-enabled IoT”.

[5] 3GPP TS 33.501 “Security architecture and procedures for 5G System”.

[6] 3GPP TS 38.391: "Ambient IoT Medium Access Control Protocol specification".

[7] 3GPP TS 33.220: “Generic Authentication Architecture (GAA); Generic Bootstrapping Architecture (GBA”

[x] NIST Special Publication 800-90A (2015): "Recommendation for Random Number Generation Using Deterministic Random Bit Generators".

\* \* \* Next C hange \* \* \* \*

#### 4.2.1.2 Requirements related to authentication between device and network

The AIoT device shall support:

- a method for pseudo-random bit generation (e.g., following the recommendations in SP 800-90A [x]).

NOTE xx: The generation of RANDAIOT\_d is recommended to be sufficiently random such that both the probability of the device generating equal values of RANDAIOT\_d and the probability of an attacker being able to predict future values of RANDAIOT\_d over the duration of practical attacks on a particular device are extremely low.

\* \* \* Next Change \* \* \* \*

## 5.2 Authentication procedure

### 5.2.1 General

This clause describes the authentication procedure for Ambient IoT devices for both Inventory procedure and Command procedure when authentication is triggered by the network. Device authentication shall always be performed for the Inventory procedure.

NOTE: KAIOT\_root is the long-term key.

### 5.2.2 Authentication procedure

The authentication procedure is aligned with the inventory procedure and command procedure in Clause 6.2.2 and Clause 6.2.3 of TS 23.369[2].



Figure 5.2.1-1: Authentication procedure

0. Step 1-6 of Clause 6.2.2 for the inventory procedure or Clause 6.2.3 for the command procedure in TS 23.369 [2] is performed.

1. ADM shall generate RANDAIOT\_n. AIOTF shall retrieve RANDAIOT\_n from ADM.

2. AIOTF shall send Inventory Request message, including RANDAIOT\_n in addition to the AIoT Identification Information specified in clause 6.2.2 of TS 23.369 [2] to NG-RAN.

3. NG-RAN shall include RANDAIOT\_n in the paging message to the AIoT Device.

NOTE 1: An active attack may send a new paging message to the AIoT Device while there is an ongoing procedure in the AIoT Device. The AIoT Device will abort the ongoing procedure and respond to the new paging message. The security measure to such Denial-of-Service attack is not specified in present document.

NOTE 2: While a legitimate network is performing an inventory operation, an attacker may cause amplification of resource exhaustion at the legitimate network side by sending AIoT paging messages for all AIoT Devices or to a large group of AIoT Devices, which causes large number of AIoT Devices sending D2R messages to the legitimate network that the legitimate network does not expect to receive. The security measure to such amplification of resource exhaustion attack is not specified in present document.

4. Upon receiving the paging message, if the AIoT Device determines it needs to respond based on the AIoT Identification Information, the AIoT device shall generate a pseudo-random number RANDAIOT\_d, calculate RESAIOT using KAIoT\_root, RANDAIOT\_n, RAND\_AIOT\_d(see Annex A.2) for network authenticating AIoT Device.

5. AIoT Device shall send a D2R message including an AIOT NAS message to the NG-RAN. The AIOT NAS message includes RESAIOT and RANDAIOT\_d.

6. NG-RAN shall send an Inventory Report message to AIOTF, including the AIOT NAS message containing RESAIOT and RANDAIOT\_d.

7. AIOTF shall send the AIoT Identification Information, RANDAIOT\_n and RANDAIOT\_d to ADM.

NOTE 3: The authentication is expected to be run more often than normal UE (i.e., during each inventory procedure), which has load impact to ADM.

8. ADM shall calculate XRESAIOT using the same method as in AIoT Device (see Annex A.2).

9. ADM shall send the XRESAIOT to AIOTF. If Filtering Information is included in the AIOT Identification Information in step 7, the ADM shall also send the AIoT Device Permanent Identifier corresponding to XRESAIOT to AIOTF.

10. AIOTF shall verify RESAIOT. If the verification is successful, for command case, the AIOTF shall retrieve KAIoTF from ADM. ADM shall calculate KAIoTF if it receives a request from AIOTF (see AnnexA.3).

The steps 12-14 in clause 6.2.2 for inventory procedure or the step 8-11of clause 6.2.3 for command procedure in TS 23.369 [2] continue.

For the command procedure, the AIoT device implicitly authenticates the network via integrity check of the AIOT NAS Command Request message as specified in clause 5.3.2 of present document.

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