**3GPP TSG-SA3 Meeting #98 *S3-200336***

**e-meeting, 2-6 March 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **33.511** | **CR** | **0011** | **rev** | **-** | **Current version:** | **16.2.0** |  |
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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 |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Complete the test cases of key refresh at the gNB | | | | | | | | | |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Telecom Italia, NTT DoCoMo | | | | | | | | | |
| ***Source to TSG:*** | S3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | SCAS\_5G | | | | |  | ***Date:*** | | | 2020-02-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | According to the threat description in paper S3-200191, key reuse at the gNB could be exploited by attackers under different conditions. The current test case in TS 33.511 clause 4.2.2.1.13 only covers one condition which is PDCP COUNT reuse with the same bearer identity and the same KgNB.  However, the other condition that is the RB identity reuse with PDCP COUNT being reset to 0 is not captured yet for testing. The requirement to avoid RB identity reuse was already captured in TS 38.331 clause 5.3.1.2. Hence it is proposed to extend and add a sub-test case in TS 33.511 clause 4.2.2.1.13 to cover the requirement in TS 38.331 clause 5.3.1.2. | | | | | | | | |
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| ***Summary of change:*** | | Added TS 38.331 in the reference list.  Added the requirement from TS 38.331 clause 5.3.1.2 in TS 33.511 clause 4.2.2.1.13.  Extended the test cases in TS 33.511 clause 4.2.2.1.13 with specific purposes and details of execution steps. | | | | | | | | |
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| ***Consequences if not approved:*** | | The current test case of key refresh at the gNB does not cover all scenarios which could be exploited by attackers. | | | | | | | | |
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| ***Clauses affected:*** | | 2, 4.2.2.1.13 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 ... | | |
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| ***Other comments:*** | | This test is relevant from R15 for the gNB. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of the 1st Change \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# 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 33.501 (Release 15): "Security architecture and procedures for 5G system".

[3] 3GPP TS 33.117: "Catalogue of general security assurance requirements".

[4] 3GPP TS 33.216: "Security Assurance Specification (SCAS) for the evolved Node B (eNB) network product class".

[5] 3GPP TR 33.926: "Security Assurance Specification (SCAS) threats and critical assets in 3GPP network product classes".

[x] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Start of the 2nd Change \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

##### 4.2.2.1.13 Key refresh at the gNB

*Requirement Name*: Key refresh at the gNB

*Requirement Reference:* TS 33.501 [2], clause 6.9.4.1; TS 38.331 [x], clause 5.3.1.2.

*Requirement Description*: *"Key refresh shall be possible for KgNB, KRRC-enc, KRRC-int, KUP-int, and KUP-enc and shall be initiated by the gNB when a PDCP COUNTs are about to be re-used with the same Radio Bearer identity and with the same KgNB."* as specified in TS 33.501 [2], clause 6.9.4.1.

"The network is responsible for avoiding reuse of the COUNT with the same RB identity and with the same key, e.g. due to the transfer of large volumes of data, release and establishment of new RBs, and multiple termination point changes for RLC-UM bearers. In order to avoid such re-use, the network may e.g. use different RB identities for RB establishments, change the AS security key, or an RRC\_CONNECTED to RRC\_IDLE/RRC\_INACTIVE and then to RRC\_CONNECTED transition." as specified in TS 38.331 [x], clause 5.3.1.2.

*Threat References*: TR 33.926 [5], clause D.2.2.7 Key Reuse

*Test Case 1*:

**Test Name:** TC\_GNB\_KEY\_REFRESH\_ PDCP\_COUNT

**Purpose:**

Verify that the gNB performs KgNB refresh when PDCP COUNTs are about to wrap around.

**Pre-Conditions:**

The UE may be simulated.

**Execution Steps**

1) The gNB sends the AS Security Mode Command message to the UE, and the UE responds with the AS Security Mode Complete message.

2) The UE sends RRC messages or UP messages to the eNB with an increasing PDCP COUNT until the value wraps around.

**Expected Results:**

The gNB triggers an intra-cell handover and takes a new KgNB into use.

**Expected format of evidence:**

Part of log that shows the PDCP COUNT wraping around and the intra-cell handover. This part can be presented, for example, as a screenshot.

*Test Case 2:*

**Test Name:** TC\_GNB\_KEY\_REFRESH\_DRB\_ID

**Purpose:**

Verify that the gNB performs KgNB refresh when DRB-IDs are about to be reused under the following conditions:

* the successive Radio Bearer establishment uses the same RB identity while the PDCP COUNT is reset to 0, or
* the PDCP COUNT is reset to 0 but the RB identity is increased after multiple calls and wraps around.

**Pre-Conditions:**

The UE, AMF and SMF may be simulated.

**Execution Steps**

1) The gNB sends the AS Security Mode Command message to the UE, and the UE responds with the AS Security Mode Complete message.

2) A DRB is set up.

3) DRB is set up and torn down for multiple times within one active radio connection without the UE going to idle (e.g. by the UE making multiple IMS calls, or by the SMF requesting PDU session modification and deactivation via the AMF), until the DRB ID is reused.

**Expected Results:**

Before DRB ID reuse, the gNB takes a new KgNB into use by e.g. triggering an intra-cell handover or triggering a transition from RRC\_CONNECTED to RRC\_IDLE or RRC\_INACTIVE and then back to RRC\_CONNECTED.

**Expected format of evidence:**

Part of log that shows all the DRB identities and the intra-cell handover or the transition from RRC\_CONNECTED to RRC\_IDLE or RRC\_INACTIVE and then back to RRC\_CONNECTED. This part can be presented, for example, as a screenshot.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* End of the Changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*