What are the reasons for and benefits of creating this new document or Change Request?

More accurate AS RAI tests to detect UE implementations that, while being officially AS RAI capable UE, behave like AS RAI non-capable UE, i.e. UE sending BSR=0 whenever UL buffer is empty, which results in a too early connection release.

Test Environment Classification: Field Test and Open-Lab Test

### ~~2.3.4 Release Assistance Indication - RAN Initiate Connection Release~~

**~~Description~~**

~~CAT-NB and CAT-M device should support Access Stratum (AS) Release Assistance Indication (RAI) to indicate the network release the connection if the device does not expect to send or receive more data in the near future.~~

**~~Applicability~~**

~~3GPP Release 14 or later~~

**~~Related core specifications~~**

~~GSMA TS.39_2.4.2_REQ_003~~

~~3GPP TS 36.321 and TS 36.331~~

**~~Reason for test~~**

~~To verify that CAT-NB and CAT-M device could support AS Release Assistance Indication (RAI)~~

**~~Initial configuration~~**

~~DUT and network is configured to support AS RAI~~

~~DUT is in RRC_IDLE state~~

**~~Test procedure~~**

| ~~Step~~ | ~~Test procedure~~ | ~~Expected behaviour~~ |
|---|---|---|
| ~~1~~ | ~~Initiate Data transfer on DUT~~ | ~~DUT receives RRCConnectionSetup with "rai-Activation " set to true~~<br>~~DUT is in RRC_CONNECTED~~ |
| ~~2~~ | ~~Verify that DUT enters RRC_IDLE state right after the completion of data transfer~~ | ~~DUT triggers a Buffer Status Report (BSR) with buffer size of zero bytes~~<br>~~DUT receives RRCConnectionRelease and enters into RRC_IDLE~~ |

**~~Example message flow:~~**

| ~~Step~~ | ~~Direction UE – NW~~ | ~~Message~~ | ~~Comments~~ |
|---|---|---|---|
| ~~1a~~ | ~~-->~~ | ~~RRC: RRCConnection Request~~ | |
| ~~1b~~ | ~~<--~~ | ~~RRC: RRCConnectionSetup~~ | ~~"rai-Activation" set to true~~ |
| ~~1c~~ | ~~-->~~ | ~~RRC: RRCConnectionSetupComplete~~ | |
| ~~2a~~ | ~~-->~~ | ~~MAC: BSR MAC control element~~ | ~~Buffer Size=0~~ |
| ~~2b~~ | ~~<--~~ | ~~RRC: RRCConnectionRelease~~ | |

## 2.3.4 Release Assistance Indication - RAN Initiate Connection Release

### 2.3.4.1 Release Assistance Indication – BSR=0 cancellation

**Description**

CAT-NB and CAT-M device should support the Access Stratum (AS) Release Assistance Indication (RAI) to inform the network if it may expect data exchange in the near future and thus assist the network in deciding whether to keep the ongoing radio connection.

**Applicability**

3GPP Release 14 or later

**Related core specifications**

GSMA TS.39_2.4.2_REQ_003
3GPP TS 36.321 and TS 36.331

**Reason for test**

To verify that CAT-NB and CAT-M device cancels Buffer Status Report (BSR) with zero data volume (BSR=0) if there is no valid reason to assume that data exchange will not continue in the near future.

**Initial configuration**

DUT and network is configured to support AS RAI.
DUT is Switched ON (EMM-REGISTERED)
DUT is in RRC_IDLE state.

**Test procedure**

| Step | Test procedure | Expected behaviour |
|---|---|---|
| 1 | Initiate data transfer on DUT according to the pattern: at least 4 transactions of short UL packet quickly followed by short DL packet with 1 s gap between UL packets ("ping-like sequence"). | DUT receives RRCConnectionSetup or RRCConnectionReconfiguration with "rai-Activation" set to true<br>DUT is in RRC_CONNECTED |
| 2 | Verify that DUT remains in RRC_CONNECTED until the successful transmission of the last DL packet. | DUT does not send any BSR=0 before the last DL packet is successfully received. |

**Example message flow (optional)**

Void

#### 2.3.4.2 Release Assistance Indication – BSR=0 transmission

**Description**

CAT-NB and CAT-M device should support the Access Stratum (AS) Release Assistance Indication (RAI) to inform the network if it does not expect data exchange in the near future and thus assist the network in deciding to immediately release radio connection.

**Applicability**

3GPP Release 14 or later

**Related core specifications**

GSMA TS.39_2.4.2_REQ_003
3GPP TS 36.321, TS 36.331, TS 27.007

**Reason for test**

To verify that CAT-NB and CAT-M device transmits Buffer Status Report (BSR) with zero data volume (BSR=0) to enable fast release of the radio connection.

**Initial configuration**

DUT and network is configured to support AS RAI.
DUT is Switched ON (EMM-REGISTERED)
DUT is in RRC_IDLE state.

**Test procedure**

| Step | Test procedure | Expected behaviour |
|---|---|---|
| 1 | Initiate data exchange on DUT with a pattern typical for a given UE type (see Note 1). | DUT receives RRCConnectionSetup or RRCConnectionReconfiguration with “rai-Activation” set to true<br>DUT is in RRC_CONNECTED |
| 2 | Verify that at any phase of data exchange or after it is finished DUT transmits BSR=0 and immediately enters RRC_IDLE (see Note 2). | DUT transmits BSR=0 when it does not expect data exchange in the near future.<br>DUT receives RRCConnectionRelease and enters RRC_IDLE |

Note 1: The test data pattern may be selected arbitrary and may be a DUT-favouring sequence to allow for utilisation of implementation and application dependent functions.

Note 2: The possible triggers for BSR=0 include but are not limited to:
- explicit request from the application (for example AT+CNMPSD command [3GPP 27.007]),
- UE internal data traffic pattern analyser.

**Example message flow (optional)**

Void

#### 2.3.4.3 Release Assistance Indication – assistance reliability

**Description**

CAT-NB and CAT-M device should support the Access Stratum (AS) Release Assistance Indication (RAI) to inform the network if it does not expect data exchange in the near future, per se RAI information must be trustworthy in order for the feature to work correctly.

**Applicability**

3GPP Release 14 or later

**Related core specifications**

GSMA TS.39_2.4.2_REQ_003
3GPP TS 36.321 and TS 36.331

**Reason for test**

To verify that for CAT-NB and CAT-M device the new radio connection is not established soon after the previous radio connection was RAI (BSR=0) based released.

**Initial configuration**

DUT and network is configured to support AS RAI.
DUT is Switched ON (EMM-REGISTERED)
DUT is in RRC_IDLE state.

**Test procedure**

| Step | Test procedure | Expected behaviour |
|---|---|---|
| 1 | Initiate a longer discontinuous data exchange on DUT that results in at least: 10 RRC_IDLE to RRC_CONNECTED transitions, 10 RRC_CONNECTED to RRC_IDLE transitions and 10 transmissions of BSR=0. | During each RRC connection establishment DUT receives RRCConnectionSetup or RRCConnectionReconfiguration with “rai-Activation” set to true. |
| 2 | Verify that after each BSR=0 triggered RRC connection release the UE remains in RRC_IDLE for at least 3 seconds (see Note 1). | DUT transmits BSR=0 when it does not expect data exchange in the near future.<br>The new MO/MT connection is not established for the purpose of data exchange soon after the RAI based release of the previous connection. |

Note 1: The value of 3 seconds was chosen to be less than typical vale of RRC Activity timer, which controls transition from RRC_CONNECTED to RRC_IDLE due to regular UE inactivity without configured RAI.

**Example message flow (optional)**

Void