TSG-RAN Meeting #16
Marco Island, FL, USA, 4 - 7 June 2002

RP-020327

Title: **Agreed CRs (Release '99 and Rel-4/Rel-5 category A) to TS 25.322**

Source: **TSG-RAN WG2**

Agenda item: **7.2.3**

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio
R2-021218	agreed	25.322	184		R99	Handling abnormal UMD PDUs and AMD PDUs	F	3.10.0	3.11.0
R2-021219	agreed	25.322	185		Rel-4	Handling abnormal UMD PDUs and AMD PDUs	A	4.4.0	4.5.0
R2-021220	agreed	25.322	186		Rel-5	Handling abnormal UMD PDUs and AMD PDUs	A	5.0.0	5.1.0
R2-021224	agreed	25.322	187		R99	Clarification of the use of Length Indicators	F	3.10.0	3.11.0
R2-021225	agreed	25.322	188		Rel-4	Clarification of the use of Length Indicators	A	4.4.0	4.5.0
R2-021226	agreed	25.322	189		Rel-5	Clarification of the use of Length Indicators	A	5.0.0	5.1.0
R2-021413	agreed	25.322	190	1	R99	Correction to MaxDAT, MaxRST and MaxMRW	F	3.10.0	3.11.0
R2-021414	agreed	25.322	191	1	Rel-4	Correction to MaxDAT, MaxRST and MaxMRW	A	4.4.0	4.5.0
R2-021415	agreed	25.322	192	1	Rel-5	Correction to MaxDAT, MaxRST and MaxMRW	A	5.0.0	5.1.0
R2-021410	agreed	25.322	193		R99	Clarification on polling functions	F	3.10.0	3.11.0
R2-021411	agreed	25.322	194		Rel-4	Clarification on polling functions	A	4.4.0	4.5.0
R2-021412	agreed	25.322	195		Rel-5	Clarification on polling functions	A	5.0.0	5.1.0

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13 - 17 May 2002

Tdoc R2-021218

CR-Form-v5.1

CHANGE REQUEST

⌘ **25.322** **CR** **184** ⌘ **rev** **-** ⌘ Current version: **3.10.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Handling abnormal UMD PDUs and AMD PDUs
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-16
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
REL-4 *(Release 4)*
REL-5 *(Release 5)*

Reason for change: ⌘

1. In subclause 11.2.3, it is specified that if missing UMD PDUs are detected, the Receiver shall discard the SDUs that have segments in the missing UMD PDUs. And in subclauses 11.2.4.1 and 11.2.4.2, UMD PDUs with invalid or reserved LI shall be discarded and treated as missing. This may mislead that the SDUs that have segments in SN of the abnormal UMD PDUs with invalid or reserved LI shall be discarded. The problem is that this kind of abnormal UMD PDUs may come from CRC residue error and their SN fields may also contain error so that the Receiver might discard wrong SDUs.
2. In subclause 11.3.4.5, it is specified that, when the Receiver receives an AMD PDU with invalid LI value, the "Sender" shall discard the AMD PDU. The Sender shall not send that AMD PDU in the beginning. This is apparently a typo.
3. In subclauses 11.3.4.5 and 11.3.4.6, the received AMD PDU with invalid or reserved LI shall be discarded and treated as missing. In subclause 11.5.2.2, it is specified that the Receiver shall include negative acknowledgement for all AMD PDUs detected as missing. If the error causing invalid or reserved LI value comes from CRC residue error, the sequence number of the AMD PDU might also be contaminated. If the contaminated SN is negatively acknowledged and is outside the transmission window, an unnecessary RLC reset procedure will be initiated by the Sender.

Summary of change: ⌘

1. In subclauses 11.2.4.1 and 11.2.4.2, "treat … as missing" is deleted and "discard that UMD PDU" is clarified to be "ignore that UMD PDU".~~treat … as never received".~~
2. In subclause 11.3.4.5, the typo "Sender" is corrected to "Receiver".
3. In subclauses 11.3.4.5 and 11.3.4.6, "treat … as missing" is deleted and "discard that AMD PDU" is clarified to be "ignore that AMD PDU". ~~"treat … as never received while setting the content of a STATUS PDU".~~

Impact analysis:

The affected functionalities are isolated in the handling of abnormal UMD PDUs and abnormal AMD PDUs. No other functionalities are affected.
There are no backwards compatibility problems since this CR contains only obvious typo correction and functionality clarifications that affect UE or UTRAN

		locally.
Consequences if not approved:	⌘	Ambiguous specification. Misled UE implementation might discard wrong UM SDUs or initiate unnecessary RLC reset procedure.

Clauses affected:	⌘	11.2.4.1, 11.2.4.2, 11.3.4.5, 11.3.4.6		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.322 v4.4.0, CR 185 25.322 v5.0.0, CR 186
Other comments:	⌘	This CR will not affect relevant test cases: 7_2_2_5, 7_2_2_6, 7_2_2_11, 7_2_2_12, 7_2_3_5, 7_2_3_6, 7_2_3_10 and 7_2_3_11.		

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

11.2.3 Reception of UMD PDU

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

- update VR(US) according to each received UMD PDU (see subclause 9.4);
- if the updating step of VR(US) is not equal to one (i.e. one or more UMD PDUs are missing):
  - discard the SDUs that have segments in the missing UMD PDUs.
- if the special "Length Indicator" "1111 100" or "1111 1111 1111 100" is the first "Length Indicator" of a UMD PDU received on the downlink:
  - consider the first data octet in this UMD PDU as the first octet of an RLC SDU.
- reassemble the received UMD PDUs into RLC SDUs;
- submit the RLC SDUs to upper layers through the UM-SAP.

11.2.4 Abnormal cases

11.2.4.1 Length Indicator value reserved for UMD PDU

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ~~discard~~ ignore that UMD PDU.~~; and~~

~~- treat the UMD PDU as missing.~~

11.2.4.2 Invalid length indicator value

If the "Length Indicator" of an UMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the Receiver shall:

- ~~discard~~ ignore the UMD PDU.~~; and~~

~~- treat the UMD PDU as missing.~~

11.2.4.3 SDU discard without explicit signalling

Upon expiry of the timer Timer_Discard in the Sender, the Sender shall:

- discard the associated SDU;
- for the first UMD PDU to be transmitted after the discard operation, the Sender shall:
  - increment VT(US) so that the "Sequence Number" field in this UMD PDU is incremented with two compared with the previous UMD PDU;
  - fill the first data octet in this UMD PDU with the first octet of an RLC SDU;
  - set the first "Length Indicator" in this UMD PDU to indicate that the previous RLC PDU was exactly filled with the last segment of an RLC SDU (to avoid that the Receiver unnecessarily discards an extra SDU).

In the case where the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the UE may wait until after it provides MAC with the requested set of UMD PDUs before discarding the afore-mentioned SDU.

11.3.4 Abnormal cases

11.3.4.1 Void

11.3.4.2 Receiving an AMD PDU outside the reception window

Upon reception of an AMD PDU with "Sequence Number" outside the interval VR(R)≤SN<VR(MR), the Receiver shall:

- discard the AMD PDU;
- if the "polling bit" in the discarded AMD PDU is set to "1":
  - initiate the STATUS PDU transfer procedure.

11.3.4.3 Timer_Discard timeout

11.3.4.3.1 SDU discard with explicit signalling

Upon expiry of the timer Timer_Discard, the Sender shall:

- initiate the SDU discard with explicit signalling procedure, see subclause 11.6.2.

In the case where the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the UE may wait until after it provides MAC with the requested set of PDUs before discarding the afore-mentioned SDUs.

11.3.4.4 VT(DAT) ≥ MaxDAT

The Sender shall:

- if VT(DAT) ≥ MaxDAT for any AMD PDU:
  - if "No_discard after MaxDAT number of transmissions" is configured:
    - initiate the RLC reset procedure, see subclause 11.4;
  - if "SDU discard after MaxDAT number of transmissions" is configured:
    - initiate the "SDU discard with explicit signalling" procedure, see subclause 11.6.

11.3.4.5 Invalid length indicator value

If the "Length Indicator" of an AMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the ~~Sender~~ Receiver shall:

- ~~discard~~ ignore that AMD PDU~~; and~~

~~treat the discarded AMD PDU as missing.~~

11.3.4.6 Length Indicator value reserved for AMD PDU

Upon delivery by the lower layer of an AMD PDU that contains a "Length Indicator" value specified to be reserved for AMD PDUs in this version of the protocol, the Receiver shall:

- ~~discard~~ ignore that AMD PDU~~;~~

~~treat the discarded AMD PDU as missing.~~

11.3.4.7 VT(DAT) ≥ MaxDAT-1

The Sender shall not perform the transmission of the AMD PDU. Instead, it will only increment the corresponding VT(DAT).

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13 - 17 May 2002

Tdoc R2-021219

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CHANGE REQUEST

⌘ **25.322** **CR** **185** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Handling abnormal UMD PDUs and AMD PDUs
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-16
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

1. In subclause 11.2.3, it is specified that if missing UMD PDUs are detected, the Receiver shall discard the SDUs that have segments in the missing UMD PDUs. And in subclauses 11.2.4.1 and 11.2.4.2, UMD PDUs with invalid or reserved LI shall be discarded and treated as missing. This may mislead that the SDUs that have segments in SN of the abnormal UMD PDUs with invalid or reserved LI shall be discarded. The problem is that this kind of abnormal UMD PDUs may come from CRC residue error and their SN fields may also contain error so that the Receiver might discard wrong SDUs.
2. In subclause 11.3.4.5, it is specified that, when the Receiver receives an AMD PDU with invalid LI value, the "Sender" shall discard the AMD PDU. The Sender shall not send that AMD PDU in the beginning. This is apparently a typo.
3. In subclauses 11.3.4.5 and 11.3.4.6, the received AMD PDU with invalid or reserved LI shall be discarded and treated as missing. In subclause 11.5.2.2, it is specified that the Receiver shall include negative acknowledgement for all AMD PDUs detected as missing. If the error causing invalid or reserved LI value comes from CRC residue error, the sequence number of the AMD PDU might also be contaminated. If the contaminated SN is negatively acknowledged and is outside the transmission window, an unnecessary RLC reset procedure will be initiated by the Sender.

Summary of change: ⌘

1. In subclauses 11.2.4.1 and 11.2.4.2, "treat … as missing" is deleted and "discard that UMD PDU" is clarified to be "ignore that UMD PDU".
2. In subclause 11.3.4.5, the typo "Sender" is corrected to "Receiver".
3. In subclauses 11.3.4.5 and 11.3.4.6, "treat … as missing" is deleted and "discard that AMD PDU" is clarified to be "ignore that AMD PDU".

Consequences if not approved: ⌘ Ambiguous specification. Misled UE implementation might discard wrong UM SDUs or initiate unnecessary RLC reset procedure.

Clauses affected: ⌘ 11.2.4.1, 11.2.4.2, 11.3.4.5, 11.3.4.6

Other specs ⌘ ☐ Other core specifications ⌘ 25.322 v3.10.0, CR 184

affected:	☐ Test specifications ☐ O&M Specifications	25.322 v5.0.0, CR 186
Other comments:	⌘	This CR will not affect relevant test cases: 7_2_2_5, 7_2_2_6, 7_2_2_11, 7_2_2_12, 7_2_3_5, 7_2_3_6, 7_2_3_10 and 7_2_3_11.

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

11.2.3 Reception of UMD PDU

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

- update VR(US) according to each received UMD PDU (see subclause 9.4);
- if the updating step of VR(US) is not equal to one (i.e. one or more UMD PDUs are missing):
  - discard the SDUs that have segments in the missing UMD PDUs.
- if the special "Length Indicator" "1111 100" or "1111 1111 1111 100" is the first "Length Indicator" of a UMD PDU received on the downlink:
  - consider the first data octet in this UMD PDU as the first octet of an RLC SDU.
- reassemble the received UMD PDUs into RLC SDUs;
- submit the RLC SDUs to upper layers through the UM-SAP.

11.2.4 Abnormal cases

11.2.4.1 Length Indicator value reserved for UMD PDU

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ~~discard~~ ignore that UMD PDU~~; and~~

~~- treat the UMD PDU as missing.~~

11.2.4.2 Invalid length indicator value

If the "Length Indicator" of an UMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the Receiver shall:

- ~~discard~~ ignore that UMD PDU~~; and~~

~~- treat the UMD PDU as missing.~~

11.2.4.3 SDU discard without explicit signalling

Upon expiry of the timer Timer_Discard in the Sender, the Sender shall:

- discard the associated SDU;
- if requested:
  - inform the upper layers of the discarded SDU;
- for the first UMD PDU to be transmitted after the discard operation, the Sender shall:
  - increment VT(US) so that the "Sequence Number" field in this UMD PDU is incremented with two compared with the previous UMD PDU;
  - fill the first data octet in this UMD PDU with the first octet of an RLC SDU;
  - set the first "Length Indicator" in this UMD PDU to indicate that the previous RLC PDU was exactly filled with the last segment of an RLC SDU (to avoid that the Receiver unnecessarily discards an extra SDU).

In the case where the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the UE may wait until after it provides MAC with the requested set of UMD PDUs before discarding the afore-mentioned SDU.

11.3.4 Abnormal cases

11.3.4.1 Void

11.3.4.2 Receiving an AMD PDU outside the reception window

Upon reception of an AMD PDU with "Sequence Number" outside the interval VR(R)≤SN<VR(MR), the Receiver shall:

- discard the AMD PDU;
- if the "polling bit" in the discarded AMD PDU is set to "1":
  - initiate the STATUS PDU transfer procedure.

11.3.4.3 Timer_Discard timeout

11.3.4.3.1 SDU discard with explicit signalling

Upon expiry of the timer Timer_Discard, the Sender shall:

- initiate the SDU discard with explicit signalling procedure, see subclause 11.6.2.

In the case where the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the UE may wait until after it provides MAC with the requested set of PDUs before discarding the afore-mentioned SDUs.

11.3.4.4 VT(DAT) ≥ MaxDAT

The Sender shall:

- if VT(DAT) ≥ MaxDAT for any AMD PDU:
  - if "No_discard after MaxDAT number of transmissions" is configured:
    - initiate the RLC reset procedure, see subclause 11.4;
  - if "SDU discard after MaxDAT number of transmissions" is configured:
    - initiate the "SDU discard with explicit signalling" procedure, see subclause 11.6.

11.3.4.5 Invalid length indicator value

If the "Length Indicator" of an AMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the ~~Sender~~ Receiver shall:

- ~~discard~~ ignore that AMD PDU~~; and~~

~~- treat the discarded AMD PDU as missing.~~

11.3.4.6 Length Indicator value reserved for AMD PDU

Upon delivery by the lower layer of an AMD PDU that contains a "Length Indicator" value specified to be reserved for AMD PDUs in this version of the protocol, the Receiver shall:

- ~~discard~~ ignore that AMD PDU~~;~~

~~- treat the discarded AMD PDU as missing.~~

11.3.4.7 VT(DAT) ≥ MaxDAT-1

The Sender shall not perform the transmission of the AMD PDU. Instead, it will only increment the corresponding VT(DAT).

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13 - 17 May 2002

Tdoc R2-021220

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CHANGE REQUEST

⌘ **25.322** **CR** **186** ⌘ **rev** **-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☒ Core Network ☐

Title:	⌘	Handling abnormal UMD PDUs and AMD PDUs
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-16
Category:	⌘	**A**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

1. In subclause 11.2.3, it is specified that if missing UMD PDUs are detected, the Receiver shall discard the SDUs that have segments in the missing UMD PDUs. And in subclauses 11.2.4.1 and 11.2.4.2, UMD PDUs with invalid or reserved LI shall be discarded and treated as missing. This may mislead that the SDUs that have segments in SN of the abnormal UMD PDUs with invalid or reserved LI shall be discarded. The problem is that this kind of abnormal UMD PDUs may come from CRC residue error and their SN fields may also contain error so that the Receiver might discard wrong SDUs.
2. In subclause 11.3.4.5, it is specified that, when the Receiver receives an AMD PDU with invalid LI value, the "Sender" shall discard the AMD PDU. The Sender shall not send that AMD PDU in the beginning. This is apparently a typo.
3. In subclauses 11.3.4.5 and 11.3.4.6, the received AMD PDU with invalid or reserved LI shall be discarded and treated as missing. In subclause 11.5.2.2, it is specified that the Receiver shall include negative acknowledgement for all AMD PDUs detected as missing. If the error causing invalid or reserved LI value comes from CRC residue error, the sequence number of the AMD PDU might also be contaminated. If the contaminated SN is negatively acknowledged and is outside the transmission window, an unnecessary RLC reset procedure will be initiated by the Sender.

Summary of change: ⌘

1. In subclauses 11.2.4.1 and 11.2.4.2, "treat … as missing" is deleted and "discard that UMD PDU" is clarified to be "ignore that UMD PDU".
2. In subclause 11.3.4.5, the typo "Sender" is corrected to "Receiver".
3. In subclauses 11.3.4.5 and 11.3.4.6, "treat … as missing" is deleted and "discard that AMD PDU" is clarified to be "ignore that AMD PDU".

Consequences if not approved: ⌘ Ambiguous specification. Misled UE implementation might discard wrong UM SDUs or initiate unnecessary RLC reset procedure.

Clauses affected:	⌘	11.2.4.1, 11.2.4.2, 11.3.4.5, 11.3.4.6
Other specs	⌘	☐ Other core specifications ⌘ 25.322 v3.10.0, CR 184

affected:	☐ Test specifications ☐ O&M Specifications	25.322 v4.4.0, CR 185
Other comments:	⌘	This CR will not affect relevant test cases: 7_2_2_5, 7_2_2_6, 7_2_2_11, 7_2_2_12, 7_2_3_5, 7_2_3_6, 7_2_3_10 and 7_2_3_11.

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

11.2.3 Reception of UMD PDU

Upon delivery of a set of UMD PDUs from the lower layer, the Receiver shall:

- update VR(US) according to each received UMD PDU (see subclause 9.4);
- if the updating step of VR(US) is not equal to one (i.e. one or more UMD PDUs are missing):
  - discard the SDUs that have segments in the missing UMD PDUs.
- if the special "Length Indicator" "1111 100" or "1111 1111 1111 100" is the first "Length Indicator" of a UMD PDU received on the downlink:
  - consider the first data octet in this UMD PDU as the first octet of an RLC SDU.
- reassemble the received UMD PDUs into RLC SDUs;
- submit the RLC SDUs to upper layers through the UM-SAP.

11.2.4 Abnormal cases

11.2.4.1 Length Indicator value reserved for UMD PDU

Upon delivery by the lower layer of an UMD PDU that contains a "Length Indicator" value specified to be reserved for UMD PDUs in this version of the protocol, the Receiver shall:

- ~~discard~~ ignore that UMD PDU~~; and~~

~~- treat the UMD PDU as missing.~~

11.2.4.2 Invalid length indicator value

If the "Length Indicator" of an UMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the Receiver shall:

- ~~discard~~ ignore that UMD PDU~~; and~~

~~- treat the UMD PDU as missing.~~

11.2.4.3 SDU discard without explicit signalling

Upon expiry of the timer Timer_Discard in the Sender, the Sender shall:

- discard the associated SDU;
- if requested:
  - inform the upper layers of the discarded SDU;
- for the first UMD PDU to be transmitted after the discard operation, the Sender shall:
  - increment VT(US) so that the "Sequence Number" field in this UMD PDU is incremented with two compared with the previous UMD PDU;
  - fill the first data octet in this UMD PDU with the first octet of an RLC SDU;
  - set the first "Length Indicator" in this UMD PDU to indicate that the previous RLC PDU was exactly filled with the last segment of an RLC SDU (to avoid that the Receiver unnecessarily discards an extra SDU).

In the case where the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the UE may wait until after it provides MAC with the requested set of UMD PDUs before discarding the afore-mentioned SDU.

11.3.4 Abnormal cases

11.3.4.1 Void

11.3.4.2 Receiving an AMD PDU outside the reception window

Upon reception of an AMD PDU with "Sequence Number" outside the interval VR(R)≤SN<VR(MR), the Receiver shall:

- discard the AMD PDU;
- if the "polling bit" in the discarded AMD PDU is set to "1":
  - initiate the STATUS PDU transfer procedure.

11.3.4.3 Timer_Discard timeout

11.3.4.3.1 SDU discard with explicit signalling

Upon expiry of the timer Timer_Discard, the Sender shall:

- initiate the SDU discard with explicit signalling procedure, see subclause 11.6.2.

In the case where the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the UE may wait until after it provides MAC with the requested set of PDUs before discarding the afore-mentioned SDUs.

11.3.4.4 VT(DAT) ≥ MaxDAT

The Sender shall:

- if VT(DAT) ≥ MaxDAT for any AMD PDU:
  - if "No_discard after MaxDAT number of transmissions" is configured:
    - initiate the RLC reset procedure, see subclause 11.4;
  - if "SDU discard after MaxDAT number of transmissions" is configured:
    - initiate the "SDU discard with explicit signalling" procedure, see subclause 11.6.

11.3.4.5 Invalid length indicator value

If the "Length Indicator" of an AMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the ~~Sender~~ Receiver shall:

- ~~discard~~ ignore that AMD PDU~~; and~~

~~- treat the discarded AMD PDU as missing.~~

11.3.4.6 Length Indicator value reserved for AMD PDU

Upon delivery by the lower layer of an AMD PDU that contains a "Length Indicator" value specified to be reserved for AMD PDUs in this version of the protocol, the Receiver shall:

- ~~discard~~ ignore that AMD PDU~~;~~

~~- treat the discarded AMD PDU as missing.~~

11.3.4.7 VT(DAT) ≥ MaxDAT-1

The Sender shall not perform the transmission of the AMD PDU. Instead, it will only increment the corresponding VT(DAT).

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13th-17th of May 2002

Tdoc R2-021224

CR-Form-v5.1

CHANGE REQUEST

⌘ **25.322** **CR** **187** ⌘ **rev** **-** ⌘ Current version: **3.10.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of the use of Length Indicators
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-06
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

- 1) The "special Lengh Indicator" should in R99 only be used in downlink and only when this is configured by RRC. After some discussions with T1 it seems like the use of this LI in uplink is unclear.
- 2) The precense of padding is indicated by Length Indicators. However this is currently not well described.

Summary of change: ⌘

1) It is clarified that the "Special LI" shall not be used in uplink in R99

2) It is clarified that length indicators indicating padding shall be used when padding is present in a RLC PDU.

Isolated impact analysis: It is assumes that the clarifications are inline with RAN2 assumptions. However, if a UE or UTRAN have had another interpretation the following may occur:

- If the CR is not implemented in UE or UTRAN: Erroneous interpretation of the current specification may lead to RLC protocol error and failure in communication.

- If UE and UTRAN is implemented according to current RAN2 assumptions, the CR has no impact.

Consequences if not approved: ⌘ Ambiguous specification. Risk for RLC failure which would prohibit the UE and UTRAN to exchange information.

Clauses affected: ⌘ 9.2.2.8

Other specs ⌘ ☐ Other core specifications ⌘ 25.322 v4.4.0, CR 188
25.322 v5.0.0, CR 189

Affected:	☐ Test specifications ☐ O&M Specifications	
Other comments: ⌘		

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.2.2.8 Length Indicator (LI)

A "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU.

Except for the predefined values reserved for special purposes and listed in the tables below, the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;
- be included in the PDUs that they refer to.

The size of the "Length Indicator" may be either 7 bits or 15 bits. The value of a "Length Indicator" shall not exceed the values specified in subclauses 11.2.4.2 and 11.3.4.5 respectively for UMD and AMD PDUs.

The "Length Indicators"~~,~~ which refer to the same PDU, shall:

- not be reordered in case of retransmission;
- be in the same order as the RLC SDUs that they refer to.

For AM:

- if the "AMD PDU size" is ≤ l26 octets:
  - 7-bit "Length Indicators" shall be used.
- else:
  - 15-bit "Length Indicators" shall be used.
- the size of the "Length Indicator" is always the same for all AMD PDUs, for one RLC entity.

For UM:

- if the "largest UMD PDU size" is ≤ l25 octets:
  - 7-bit "Length Indicators" shall be used.
- else:
  - 15-bit "Length Indicators" shall be used.
- between modifications of the "largest UMD PDU size", the size of the "Length Indicator" is the same for all UMD PDUs;
- if the parameter Use special LI is configured on the downlink; and
- if the RLC SDU begins in the beginning of the RLC PDU; and
- if the "Length Indicators" indicating that a RLC SDU ended exactly in the end or one octet short (only when 15-bit "Length Indicators" is used) of the previous RLC PDU are not present:
  - if 7-bit "Length Indicator" is used:
    - the "Length Indicator" with value "111 1100" shall be used;
  - if 15-bit "Length Indicator" is used:
    - the "Length Indicator" with value "111 1111 1111 1100" shall be used.
- in the uplink:
  - the "Length Indicator" with value "111 1100" or "111 1111 1111 1100" shall not be used.

In the case where the end of the last segment of an RLC SDU exactly ends at the end of a PDU and there is no "Length Indicator" that indicates the end of the RLC SDU:

- if 7-bit "Length Indicator" is used:
  - a "Length Indicator" with value "000 0000" shall be placed as the first "Length Indicator" in the following PDU;
- if 15-bit "Length Indicator" is used:
  - a "Length Indicator" with value "000 0000 0000 0000" shall be placed as the first "Length Indicator" in the following PDU.

In the case where a PDU contains a 15-bit "Length Indicator" indicating that an RLC SDU ends with one octet left in the PDU, the last octet of this PDU shall:

- be padded by the Sender and ignored by the Receiver though there is no "Length Indicator" indicating the existence of Padding; and
- not be filled with the first octet of the next RLC SDU data.

In the case where 15-bit "Length Indicators" are used in a PDU and the last segment of an RLC SDU is one octet short of exactly filling the PDU:

- if a 15-bit "Length Indicator" is used for the following PDU:
  - the "Length Indicator" with value "111 1111 1111 1011" shall be placed as the first "Length Indicator" in the following PDU;
  - the remaining one octet in the current PDU shall be padded by the Sender and ignored at the Receiver though there is no "Length Indicator" indicating the existence of Padding;
- if a 7-bit "Length Indicator" is used for the following PDU:
  - if RLC is configured for UM mode:
    - the "Length Indicator" with value "000 0000" shall be placed as the first "Length indicator" in the following PDU and its "Sequence Number" shall be incremented by 2 before it is transmitted.

For UM and AM RLC:

- if a 7 bit "Length Indicator" is used in a RLC PDU and one or more padding octets are present in the RLC PDU after the end of the last RLC SDU:
  - Indicate the ~~precense~~presence of padding by including a "Length Indicator" with value "1111111" as the last "Length Indicator" in the PDU;
- if a 15 bit "Length Indicator" is used in a RLC PDU and ~~and~~ two or more padding octets are present in the RLC PDU after the end of the last RLC SDU:
  - Indicate the ~~precense~~presence of padding by including a "Length Indicator" with value "111 1111 1111 1111" as the last "Length Indicator" in the PDU.~~;~~

Note: After the "Length Indicator" indicating the ~~precense~~presence of padding has been included in the RLC PDU, the length of the ~~additional~~ padding may be zero.

If a "Length Indicator" is still awaiting transmission and there is no RLC SDU available, an RLC PDU consisting of this "Length Indicator", the appropriate padding "Length Indicator" and padding may be transmitted.

Predefined values of the "Length Indicator" are used to indicate padding. The values that are reserved for special purposes are listed in the tables below depending on the size of the "Length Indicator". Only predefined "Length Indicator" values can refer to the padding space. These values shall only be placed after all other "Length Indicators" for a PDU.

STATUS PDUs can be piggybacked on the AMD PDU by using part or all of the padding space. A predefined "Length Indicator" shall be used to indicate the presence of a piggybacked STATUS PDU. This "Length Indicator" replaces the padding "Length Indicator". The piggybacked STATUS PDU shall be appended immediately following the PDU data.

When only part of the padding space is used, the end of the piggybacked STATUS PDU is indicated by one of the SUFI fields NO_MORE or ACK. Thus no additional "Length Indicator" is required to show that there is still padding in the AMD PDU.

If "SDU discard with explicit signalling" is configured:

- an AMD PDU can contain a maximum number of 15 "Length Indicators" indicating the end of 15 corresponding SDUs; and
- the rest of the AMD PDU space shall be used as padding or as piggybacked STATUS PDU.

Length: 7 bits

Bit	Description
0000000	The previous RLC PDU was exactly filled with the last segment of an RLC SDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU.
1111100	UMD PDU: The first data octet in this RLC PDU is the first octet of an RLC SDU. AMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111111	The rest of the RLC PDU is padding. The padding length can be zero.

Length: 15bits

Bit	Description
000000000000000	The previous RLC PDU was exactly filled with the last segment of an RLC SDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU.
111111111111011	The last segment of an RLC SDU was one octet short of exactly filling the previous RLC PDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU. The remaining one octet in the previous RLC PDU is ignored.
111111111111100	UMD PDU: The first data octet in this RLC PDU is the first octet of an RLC SDU. AMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111111	The rest of the RLC PDU is padding. The padding length can be zero.

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13th-17th of May 2002

Tdoc R2-021225

CR-Form-v5.1

CHANGE REQUEST

⌘ **25.322** **CR** **188** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of the use of Length Indicators
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-06
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	• The precense of padding is indicated by Length Indicators. However this is currently not well described. • The use of the special LI is unclear
Summary of change:	⌘	It is clarified that length indicators indicating padding shall be used when padding is present in a RLC PDU. The use of the special LI is clarified Isolated impact analysis: It is assumes that the clarifications are inline with RAN2 assumptions. However, if a UE or UTRAN have had another interpretation the following may occur: - If the CR is not implemented in UE or UTRAN: Erroneous interpretation of the current specification may lead to RLC protocol error and failure in communication. - If UE and UTRAN is implemented according to current RAN2 assumptions, the CR has no impact.
Consequences if not approved:	⌘	Ambiguous specification. Risk for RLC failure which would prohibit the UE and UTRAN to exchange information.

Clauses affected:	⌘	9.2.2.8		
Other specs Affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.322 v3.10.0, CR 187 25.322 v5.0.0, CR 189

Other comments: ⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.2.2.8 Length Indicator (LI)

A "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU.

Except for the predefined values reserved for special purposes and listed in the tables below, the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;
- be included in the PDUs that they refer to.

The size of the "Length Indicator" may be either 7 bits or 15 bits. The value of a "Length Indicator" shall not exceed the values specified in subclauses 11.2.4.2 and 11.3.4.5 respectively for UMD and AMD PDUs.

The "Length Indicators"~~,~~ which refer to the same PDU, shall:

- not be reordered in case of retransmission;
- be in the same order as the RLC SDUs that they refer to.

For AM:

- if the "AMD PDU size" is ≤ l26 octets:
  - 7-bit "Length Indicators" shall be used.
- else:
  - 15-bit "Length Indicators" shall be used.
- the size of the "Length Indicator" is always the same for all AMD PDUs, for one RLC entity.

For UM:

- if the "largest UMD PDU size" is ≤ l25 octets:
  - 7-bit "Length Indicators" shall be used.
- else:
  - 15-bit "Length Indicators" shall be used.
- between modifications of the "largest UMD PDU size", the size of the "Length Indicator" is the same for all UMD PDUs;
- if the RLC SDU begins in the beginning of the RLC PDU; and
- if the RLC PDU is transmitted in uplink; and
- if the "Length Indicators" indicating that a RLC SDU ended exactly in the end or one octet short (only when 15-bit "Length Indicators" is used) of the previous RLC PDU are not present:
  - if 7-bit "Length Indicator" is used:
    - the "Length Indicator" with value "111 1100" shall be used;
  - if 15-bit "Length Indicator" is used:
    - the "Length Indicator" with value "111 1111 1111 1100" shall be used.
- In downlink:
  - if 7-bit "Length Indicator" is used:
    - the Receiver shall be prepared to receive the "Length Indicator" with value "111 1100";

- the Receiver shall follow the discard rules in subclause 11.2.3 both when the “Length Indicator” with value “111 1100” is present and when it is absent;

- if 15-bit "Length Indicator" is used:

- the Receiver shall be prepared to receive the "Length Indicator" with value "111 1111 1111 1100";

- the Receiver shall follow the discard rules in subclause 11.2.3 both when the “Length Indicator” with value “111 1111 1111 1100” is present and when it is absent.;

In the case where the end of the last segment of an RLC SDU exactly ends at the end of a PDU and there is no "Length Indicator" that indicates the end of the RLC SDU:

- if 7-bit "Length Indicator" is used:

  - a "Length Indicator" with value "000 0000" shall be placed as the first "Length Indicator" in the following PDU;

- if 15-bit "Length Indicator" is used:

  - a "Length Indicator" with value "000 0000 0000 0000" shall be placed as the first "Length Indicator" in the following PDU.

In the case where a PDU contains a 15-bit "Length Indicator" indicating that an RLC SDU ends with one octet left in the PDU, the last octet of this PDU shall:

- be padded by the Sender and ignored by the Receiver though there is no "Length Indicator" indicating the existence of Padding; and

- not be filled with the first octet of the next RLC SDU data.

In the case where 15-bit "Length Indicators" are used in a PDU and the last segment of an RLC SDU is one octet short of exactly filling the PDU:

- if a 15-bit "Length Indicator" is used for the following PDU:

  - the "Length Indicator" with value "111 1111 1111 1011" shall be placed as the first "Length Indicator" in the following PDU;

  - the remaining one octet in the current PDU shall be padded by the Sender and ignored at the Receiver though there is no "Length Indicator" indicating the existence of Padding;

- if a 7-bit "Length Indicator" is used for the following PDU:

  - if RLC is configured for UM mode:

    - the "Length Indicator" with value "000 0000" shall be placed as the first "Length indicator" in the following PDU and its "Sequence Number" shall be incremented by 2 before it is transmitted.

For UM and AM RLC:

- if a 7 bit "Length Indicator" is used in a RLC PDU and one or more padding octets are present in the RLC PDU after the end of the last RLC SDU:

  - Indicate the presence of padding by including a "Length Indicator" with value "1111111" as the last "Length Indicator" in the PDU;

- if a 15 bit "Length Indicator" is used in a RLC PDU and two or more padding octets are present in the RLC PDU after the end of the last RLC SDU:

  - Indicate the presence of padding by including a "Length Indicator" with value "111 1111 1111 1111" as the last "Length Indicator" in the PDU.

Note: After the "Length Indicator" indicating the presence of padding has been included in the RLC PDU, the length of the padding may be zero.

If a "Length Indicator" is still awaiting transmission and there is no RLC SDU available, an RLC PDU consisting of this "Length Indicator", the appropriate padding "Length Indicator" and padding may be transmitted.

Predefined values of the "Length Indicator" are used to indicate padding. The values that are reserved for special purposes are listed in the tables below depending on the size of the "Length Indicator". Only predefined "Length Indicator" values can refer to the padding space. These values shall only be placed after all other "Length Indicators" for a PDU.

STATUS PDUs can be piggybacked on the AMD PDU by using part or all of the padding space. A predefined "Length Indicator" shall be used to indicate the presence of a piggybacked STATUS PDU. This "Length Indicator" replaces the padding "Length Indicator". The piggybacked STATUS PDU shall be appended immediately following the PDU data. When only part of the padding space is used, the end of the piggybacked STATUS PDU is indicated by one of the SUFI fields NO_MORE or ACK. Thus no additional "Length Indicator" is required to show that there is still padding in the AMD PDU.

If "SDU discard with explicit signalling" is configured:

- an AMD PDU can contain a maximum number of 15 "Length Indicators" indicating the end of 15 corresponding SDUs; and

- the rest of the AMD PDU space shall be used as padding or as piggybacked STATUS PDU.

Length: 7 bits

Bit	Description
0000000	The previous RLC PDU was exactly filled with the last segment of an RLC SDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU.
1111100	UMD PDU: The first data octet in this RLC PDU is the first octet of an RLC SDU. AMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111111	The rest of the RLC PDU is padding. The padding length can be zero.

Length: 15bits

Bit	Description
000000000000000	The previous RLC PDU was exactly filled with the last segment of an RLC SDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU.
111111111111011	The last segment of an RLC SDU was one octet short of exactly filling the previous RLC PDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU. The remaining one octet in the previous RLC PDU is ignored.
111111111111100	UMD PDU: The first data octet in this RLC PDU is the first octet of an RLC SDU. AMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111111	The rest of the RLC PDU is padding. The padding length can be zero.

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13th-17th of May 2002

Tdoc R2-021226

CR-Form-v5.1

CHANGE REQUEST

⌘ **25.322** **CR** **189** ⌘ **rev** **-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of the use of Length Indicators
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-06
Category:	⌘	**A**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

- The precense of padding is indicated by Length Indicators. However this is currently not well described.
- The use of the special LI is unclear

Summary of change: ⌘ It is clarified that length indicators indicating padding shall be used when padding is present in a RLC PDU.

The use of the special LI is clarified

Isolated impact analysis: It is assumes that the clarifications are inline with RAN2 assumptions. However, if a UE or UTRAN have had another interpretation the following may occur:

- If the CR is not implemented in UE or UTRAN: Erroneous interpretation of the current specification may lead to RLC protocol error and failure in communication.

- If UE and UTRAN is implemented according to current RAN2 assumptions, the CR has no impact.

Consequences if not approved: ⌘ Ambiguous specification. Risk for RLC failure which would prohibit the UE and UTRAN to exchange information.

Clauses affected: ⌘ 9.2.2.8

Other specs Affected: ⌘
☐ Other core specifications ⌘ 25.322 v3.10.0, CR 187
25.322 v4.4.0, CR 188
☐ Test specifications

☐ O&M Specifications	
Other comments: ⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.2.2.8 Length Indicator (LI)

A "Length Indicator" is used to indicate the last octet of each RLC SDU ending within the PDU.

Except for the predefined values reserved for special purposes and listed in the tables below, the "Length Indicator" shall:

- be set to the number of octets between the end of the RLC header and up to and including the last octet of an RLC SDU segment;
- be included in the PDUs that they refer to.

The size of the "Length Indicator" may be either 7 bits or 15 bits. The value of a "Length Indicator" shall not exceed the values specified in subclauses 11.2.4.2 and 11.3.4.5 respectively for UMD and AMD PDUs.

The "Length Indicators"~~,~~ which refer to the same PDU, shall:

- not be reordered in case of retransmission;
- be in the same order as the RLC SDUs that they refer to.

For AM:

- if the "AMD PDU size" is ≤ l26 octets:
  - 7-bit "Length Indicators" shall be used.
- else:
  - 15-bit "Length Indicators" shall be used.
- the size of the "Length Indicator" is always the same for all AMD PDUs, for one RLC entity.

For UM:

- if the "largest UMD PDU size" is ≤ l25 octets:
  - 7-bit "Length Indicators" shall be used.
- else:
  - 15-bit "Length Indicators" shall be used.
- between modifications of the "largest UMD PDU size", the size of the "Length Indicator" is the same for all UMD PDUs;
- if the RLC SDU begins in the beginning of the RLC PDU; and
- if the RLC PDU is transmitted in uplink; and
- if the "Length Indicators" indicating that a RLC SDU ended exactly in the end or one octet short (only when 15-bit "Length Indicators" is used) of the previous RLC PDU are not present:
  - if 7-bit "Length Indicator" is used:
    - the "Length Indicator" with value "111 1100" shall be used;
  - if 15-bit "Length Indicator" is used:
    - the "Length Indicator" with value "111 1111 1111 1100" shall be used.
- In downlink:
  - if 7-bit "Length Indicator" is used:
    - the Receiver shall be prepared to receive the "Length Indicator" with value "111 1100";

- the Receiver shall follow the discard rules in subclause 11.2.3 both when the “Length Indicator” with value “111 1100” is present and when it is absent;

- if 15-bit "Length Indicator" is used:

- the Receiver shall be prepared to receive the "Length Indicator" with value "111 1111 1111 1100";

- the Receiver shall follow the discard rules in subclause 11.2.3 both when the “Length Indicator” with value “111 1111 1111 1100” is present and when it is absent.;

In the case where the end of the last segment of an RLC SDU exactly ends at the end of a PDU and there is no "Length Indicator" that indicates the end of the RLC SDU:

- if 7-bit "Length Indicator" is used:

  - a "Length Indicator" with value "000 0000" shall be placed as the first "Length Indicator" in the following PDU;

- if 15-bit "Length Indicator" is used:

  - a "Length Indicator" with value "000 0000 0000 0000" shall be placed as the first "Length Indicator" in the following PDU.

In the case where a PDU contains a 15-bit "Length Indicator" indicating that an RLC SDU ends with one octet left in the PDU, the last octet of this PDU shall:

- be padded by the Sender and ignored by the Receiver though there is no "Length Indicator" indicating the existence of Padding; and

- not be filled with the first octet of the next RLC SDU data.

In the case where 15-bit "Length Indicators" are used in a PDU and the last segment of an RLC SDU is one octet short of exactly filling the PDU:

- if a 15-bit "Length Indicator" is used for the following PDU:

  - the "Length Indicator" with value "111 1111 1111 1011" shall be placed as the first "Length Indicator" in the following PDU;

  - the remaining one octet in the current PDU shall be padded by the Sender and ignored at the Receiver though there is no "Length Indicator" indicating the existence of Padding;

- if a 7-bit "Length Indicator" is used for the following PDU:

  - if RLC is configured for UM mode:

    - the "Length Indicator" with value "000 0000" shall be placed as the first "Length indicator" in the following PDU and its "Sequence Number" shall be incremented by 2 before it is transmitted.

For UM and AM RLC:

- if a 7 bit "Length Indicator" is used in a RLC PDU and one or more padding octets are present in the RLC PDU after the end of the last RLC SDU:

  - Indicate the presence of padding by including a "Length Indicator" with value "1111111" as the last "Length Indicator" in the PDU;

- if a 15 bit "Length Indicator" is used in a RLC PDU and two or more padding octets are present in the RLC PDU after the end of the last RLC SDU:

  - Indicate the presence of padding by including a "Length Indicator" with value "111 1111 1111 1111" as the last "Length Indicator" in the PDU.

Note: After the "Length Indicator" indicating the presence of padding has been included in the RLC PDU, the length of the padding may be zero.

If a "Length Indicator" is still awaiting transmission and there is no RLC SDU available, an RLC PDU consisting of this "Length Indicator", the appropriate padding "Length Indicator" and padding may be transmitted.

Predefined values of the "Length Indicator" are used to indicate padding. The values that are reserved for special purposes are listed in the tables below depending on the size of the "Length Indicator". Only predefined "Length Indicator" values can refer to the padding space. These values shall only be placed after all other "Length Indicators" for a PDU.

STATUS PDUs can be piggybacked on the AMD PDU by using part or all of the padding space. A predefined "Length Indicator" shall be used to indicate the presence of a piggybacked STATUS PDU. This "Length Indicator" replaces the padding "Length Indicator". The piggybacked STATUS PDU shall be appended immediately following the PDU data. When only part of the padding space is used, the end of the piggybacked STATUS PDU is indicated by one of the SUFI fields NO_MORE or ACK. Thus no additional "Length Indicator" is required to show that there is still padding in the AMD PDU.

If "SDU discard with explicit signalling" is configured:

- an AMD PDU can contain a maximum number of 15 "Length Indicators" indicating the end of 15 corresponding SDUs; and

- the rest of the AMD PDU space shall be used as padding or as piggybacked STATUS PDU.

Length: 7 bits

Bit	Description
0000000	The previous RLC PDU was exactly filled with the last segment of an RLC SDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU.
1111100	UMD PDU: The first data octet in this RLC PDU is the first octet of an RLC SDU. AMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
1111111	The rest of the RLC PDU is padding. The padding length can be zero.

Length: 15bits

Bit	Description
000000000000000	The previous RLC PDU was exactly filled with the last segment of an RLC SDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU.
111111111111011	The last segment of an RLC SDU was one octet short of exactly filling the previous RLC PDU and there is no "Length Indicator" that indicates the end of the RLC SDU in the previous RLC PDU. The remaining one octet in the previous RLC PDU is ignored.
111111111111100	UMD PDU: The first data octet in this RLC PDU is the first octet of an RLC SDU. AMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111101	Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111110	AMD PDU: The rest of the RLC PDU includes a piggybacked STATUS PDU. UMD PDU: Reserved (PDUs with this coding will be discarded by this version of the protocol).
111111111111111	The rest of the RLC PDU is padding. The padding length can be zero.

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13-17 April 2002

Tdoc R2-021413

CR-Form-v4

CHANGE REQUEST

⌘ **25.322 CR 190** ⌘ rev **r1** ⌘ Current version: **3.10.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title: ⌘	Correction to MaxDAT, MaxRST and MaxMRW	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ 13 April 02
Category: ⌘	**F**	***Release:*** ⌘ R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

#1 MaxRST: In had been decided that on SRB, no RLC Reset would be allowed and therefore that the value MaxRST = 1 would mean that NO RESET should be transmitted to the per RLC entity. The maximum number of RESET is MaxRST-1 (see section 9.6). But the procedural text of section 11.4 is wrong and corresponds to a maximum of RESET of 1 MaxRST it case MaxRST=1. It would allow one RESET to sent when MaxRST=1.

~~#2 MaxDAT: To be aligned with MaxRST, the maximum number of transmission of a PDU has been decided to be MaxDAT-1 (see section 9.6), but in the procedural text of section 11.3 it is in fact MaxDAT.~~

#3 MaxMRW: To be aligned with MaxRST, the maximum number of transmission of status containing an MRW is MaxMRW-1 (see section 9.6), but in the procedural text of section 11.6 it is in fact MaxMRW.

Summary of change: ⌘

#1 MaxRST: Changes to 11.4 and subclauses

The section has been modified to be aligned with 9.6. VT(RST) is incremented before the RESET is submitted to lower layer so that in case of MaxRST=1, no RESET shall be send. For R99 it is still allowed in case MaxRST=1 to send one RESET, before sending the indication of Unrecoverable Error to RRC.

#2 MaxDAT: Changes to 11.3 and subclauses

The section has been modified to be aligned with 9.6. VT(DAT) is incremented before the PDU is submitted to lower layer. Only rewritting alignment have been done on previous behavior.

#3 MaxMRW: Changes to 11.6 and subclauses

The section has been modified to be aligned with 9.6. VT(MRW) is incremented before the STATUS including MRW is submitted to lower layer. Section 9.6 has been corrected in addition rewritting alignment have been done on previous behaviour.

The changes compared with R2-021030 are highlighted in blue.

Impact analysis:

Impacted functionality: AM Reset~~, AM SDU Discard~~.

Correction to a function where the specification was uncorrect. The change only affects

	the AM Reset ~~and AM SDU Discard functionality~~. If the UE does not implement the change, but the UTRAN does: For #1, ~~it won't be possible to configure the UE RLC so that NO RESET should be sent to the peer entity. If MaxRST=1, one RESET would be allowed to be sent to the peer entity. This is problematic for SRBs. Major.~~ The UE would always have to send one useless RESET on SRB before an Urecoverable Error is sent to upper layer. ~~For #2, in the UE the maximum number of transmission of a PDU would be MaxDAT. Minor.~~ ~~For #3, in the UE the maximum number of transmission of status containing an MRW would be MaxMRW. Minor.~~ For #2 and #3: No impact. If the UTRAN does not implement the change, but the UE does, the same applies. Note that the same problem exists if neither of the peer entities implements the change
Consequences if not approved: ⌘	~~Major consequence: It won't be possible to configure RLC so that NO RESET should be sent to the peer entity. This was the wanted configuration for SRB2 and SRB3.~~ The UE would always have to sent one useless RESET on SRB before an Urecoverable Error is sent to upper layer. ~~Other consequence: Subsections 11.3, 11.4, 11.6 will not be not aligned with section 9.6 for the meaning of MaxDAT, MaxRST and MaxMRW. Unconsistence between sections.~~

Clauses affected:	⌘	9.4, 9.6, 9.7.3.3, 9.7.3.4, 11.3.2, 11.3.2.2, 11.3.3a (new), 11.3.4.4, 11.3.4.7, 11.4.2, 11.4.4a (new), 11.4.5.1, 11.4.5.2, 11.6.4a (new), 11.6.5, 11.6.6.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.322 v4.4.0, CR 191r1 25.322 v5.0.0, CR 192r1
Other comments:	⌘			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.4 State variables

The state variables defined in this subclause are normative.

This sub-clause describes the state variables used in AM and UM in order to specify the peer-to-peer protocol. All state variables are non-negative integers. UMD and AMD PDUs are numbered by modulo integer sequence numbers (SN) cycling through the field: 0 to $2^{12} - 1$ for AM and 0 to $2^{7} - 1$ for UM. All arithmetic operations contained in the present document on VT(S), VT(A), VT(MS), VR(R), VR(H) and VR(MR) are affected by the AM modulus. All arithmetic operations contained in the present document on VT(US) and VR(US) are affected by the UM modulus. When performing arithmetic comparisons of state variables or Sequence number values a modulus base shall be used. This modulus base is subtracted (within the appropriate field) from all the values involved and then an absolute comparison is performed. At the Sender, VT(A) and VT(US) shall be assumed to be the modulus base in AM and UM respectively. At the Receiver, VR(R) and VR(US) shall be assumed to be the modulus base in AM and UM respectively.

The RLC shall maintain the following state variables in the Sender.

a) VT(S) - Send state variable.

   This state variable contains the "Sequence Number" of the next AMD PDU to be transmitted for the first time (i.e. excluding retransmitted PDUs). It shall be updated after the aforementioned AMD PDU is transmitted or after transmission of a MRW SUFI which includes SN_MRW_{LENGTH} >VT(S) (see subclause 11.6). The initial value of this variable is 0.

b) VT(A) - Acknowledge state variable.

   This state variable contains the "Sequence Number" following the "Sequence Number" of the last in-sequence acknowledged AMD PDU. This forms the lower edge of the transmission window of acceptable acknowledgements. VT(A) shall be updated based on the receipt of a STATUS PDU including an ACK (see subclause 9.2.2.11.2) and/or an MRW_ACK SUFI (see subclause 11.6).

   The initial value of this variable is 0. For the purpose of initialising the protocol, this value shall be assumed to be the first "Sequence Number" following the last in-sequence acknowledged AMD PDU.

c) VT(DAT).

   This state variable counts the number of times a AMD PDU has been scheduled to be transmitted. There shall be one VT(DAT) for each PDU and each shall be incremented every time the corresponding AMD PDU is scheduled to be transmitted.

   The initial value of this variable is 0.

d) VT(MS) - Maximum Send state variable.

   This state variable contains the "Sequence Number" of the first AMD PDU that can be rejected by the peer Receiver, VT(MS) = VT(A) + VT(WS). This value represents the upper edge of the transmission window. The transmitter shall not transmit AMD PDUs with "Sequence Number" ≥ VT(MS) unless VT(S) ≥ VT(MS). In that case, the AMD PDU with "Sequence Number" = VT(S) - 1 can also be transmitted. VT(MS) shall be updated when VT(A) or VT(WS) is updated.

   The initial value of this variable is Configured_Tx_Window_size.

e) VT(US) – UM data state variable.

   This state variable contains the "Sequence Number" of the next UMD PDU to be transmitted. It shall be incremented by 1 each time a UMD PDU is transmitted.

   The initial value of this variable is 0.

NOTE: For the UTRAN side, the initial value of this variable can be different from 0.

f) VT(PDU).

   This state variable is used when the "poll every Poll_PDU PDU" polling trigger is configured. It shall be incremented by 1 for each AMD PDU that is transmitted including both new and retransmitted AMD PDUs.

When it becomes equal to the value Poll_PDU, a new poll shall be transmitted and the state variable shall be set to zero.

The initial value of this variable is 0.

g) VT(SDU).

This state variable is used when the "poll every Poll_SDU SDU" polling trigger is configured. It shall be incremented by 1 for a given SDU when all the AMD PDUs carrying a part of this SDU have been transmitted at least once. When it becomes equal to the value Poll_SDU a new poll shall be transmitted and the state variable shall be set to zero. The "Polling bit" shall be set to "1" in the first transmission of the AMD PDU that contains the last segment of the SDU.

The initial value of this variable is 0.

h) VT(RST) - Reset state variable.

This state variable is used to count the number of times a RESET PDU is scheduled to be transmitted before the reset procedure is completed. VT(RST) shall be incremented by 1 each time a RESET PDU is scheduled to be transmitted. VT(RST) shall only be reset upon the reception of a RESET ACK PDU, i.e. VT(RST) shall not be reset when an RLC reset initiated by the peer RLC entity occurs.

The initial value of this variable is 0.

i) VT(MRW) – MRW command send state variable.

This state variable is used to count the number of times a MRW command is transmitted. VT(MRW) is incremented by 1 each time an MRW SUFI is transmitted. VT(MRW) shall be reset when the SDU discard with explicit signalling procedure is terminated. The initial value of this variable is 0.

j) VT(WS) – Transmission window size state variable.

This state variable contains the size that shall be used for the transmission window. VT(WS) shall be set equal to the WSN field when the transmitter receives a STATUS PDU including a WINDOW SUFI.

The initial value of this variable is Configured_Tx_Window_size.

The RLC shall maintain the following state variables in the Receiver:

a) VR(R) - Receive state variable.

This state variable contains the "Sequence Number" following that of the last in-sequence AMD PDU received. It shall be updated upon the receipt of the AMD PDU with "Sequence Number" equal to VR(R).

The initial value of this variable is 0. For the purpose of initialising the protocol, this value shall be assumed to be the first "Sequence Number" following the last in-sequence received AMD PDU.

b) VR(H) - Highest expected state variable.

This state variable contains the "Sequence Number" following the highest "Sequence Number" of any received AMD PDU. When a AMD PDU is received with "Sequence Number" x such that VR(H)≤x<VR(MR), this state variable shall be set equal to x+1.

The initial value of this variable is 0.

c) VR(MR) - Maximum acceptable Receive state variable.

This state variable contains the "Sequence Number" of the first AMD PDU that shall be rejected by the Receiver, VR(MR) = VR(R) + Configured_Rx_Window_Size.

d) VR(US) - Receiver Send Sequence state variable.

This state variable contains the "Sequence Number" following that of the last UMD PDU received. When a UMD PDU with "Sequence Number" equal to x is received, the state variable shall set equal to x + 1.

The initial value of this variable is 0.

e) VR(EP) - Estimated PDU Counter state variable.

This state variable contains the number of AMD PDUs whose re-transmission is still expected as a consequence of the transmission of the latest status report. At the end of each TTI it is decremented by the total number of AMD PDUs that were received during that time.

9.6 Protocol Parameters

The behaviour defined in this subclause is normative. The values of the protocol parameters defined in this subclause are signalled by upper layers.

a) MaxDAT.

The maximum number of transmissions of an AMD PDU is equal to MaxDAT – 1. This protocol parameter represents the upper limit for state variable VT(DAT). When VT(DAT) equals the value MaxDAT, either RLC RESET procedure or SDU discard procedure shall be initiated according to the configuration by upper layers.

b) Poll_PDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_PDU PDU" is configured by upper layers. It represents the upper limit for the state variable VT(PDU). When VT(PDU) equals the value Poll_PDU a poll shall be transmitted to the peer entity.

c) Poll_SDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_SDU SDU" is configured by upper layers. It represents the upper limit for state variable VT(SDU). When VT(SDU) equals the value Poll_SDU a poll shall be transmitted to the peer entity.

d) Poll_Window.

This protocol parameter indicates when the transmitter shall poll the Receiver in the case where "window-based polling" is configured by upper layers. A poll is triggered for each AMD PDU when $J \geq$ Poll_Window, where J is the transmission window percentage defined as:

$$J = \frac{(4096+VT(S)+1-VT(A)) \textbf{ mod } 4096}{VT(WS)} * 100 ,$$

where the constant 4096 is the modulus for AM described in subclause 9.4 and VT(S) is the value of the variable before the AMD PDU is submitted to lower layer.

e) MaxRST.

The maximum number of transmissions of a RESET PDU is equal to MaxRST – 1. This protocol parameter represents the upper limit for state variable VT(RST). When VT(RST) equals the value MaxRST, unrecoverable error shall be indicated to upper layers.

f) Configured_Tx_Window_Size.

This protocol parameter indicates both the maximum allowed transmission window size and the value for the state variable VT(WS).

g) Configured_Rx_Window_Size.

This protocol parameter indicates the reception window size.

h) MaxMRW.

The maximum number of transmissions of an MRW command is equal to MaxMRW~~ – 1~~. This protocol parameter represents the upper limit for state variable VT(MRW). When VT(MRW) equals the value MaxMRW, the RLC RESET procedure shall be initiated.

9.7.3.3 SDU discard after MaxDAT number of transmissions

This alternative uses the number of transmissions as a trigger for SDU discard, and is therefore only applicable for acknowledged mode RLC. This makes the SDU discard function dependent on the channel rate. Also, this variant of the SDU discard function strives to keep the SDU loss rate constant for the connection, on the cost of a variable delay.

If the number of times an AMD PDU is scheduled for transmission reaches MaxDAT~~If MaxDAT number of transmissions is reached for an AMD PDU~~, the Sender shall:

- discard all SDUs segments of which are contained in the AMD PDU; and
- utilise explicit signalling to inform the Receiver according to clause 11.6.

9.7.3.4 No_discard after MaxDAT number of transmissions

This alternative uses the number of transmissions, and is therefore only applicable for acknowledged mode RLC.

If the number of times an AMD PDU is scheduled for transmission reaches MaxDAT~~If MaxDAT number of transmissions is reached for an AMD PDU~~, the Sender shall:

- initiate the RLC Reset procedure (see subclause 11.3.4.4).

11.3 Acknowledged mode data transfer procedure

11.3.1 General

The acknowledged mode data transfer procedure is used for transferring data between two RLC peer entities, which are operating in acknowledged mode. Data is transferred from Sender to Receiver. This procedure should only apply to RLC entities in DATA_TRANSFER_READY state or LOCAL_SUSPEND state. Figure 11.3 below illustrates the elementary procedure for acknowledged mode data transfer.

The AMD PDUs shall be transmitted on the DCCH logical channel if the Sender is located in the control plane and on the DTCH if it is located in the user plane. One or several PDUs may be transmitted in each transmission time interval (TTI) and MAC decides how many PDUs shall be transmitted in each TTI.

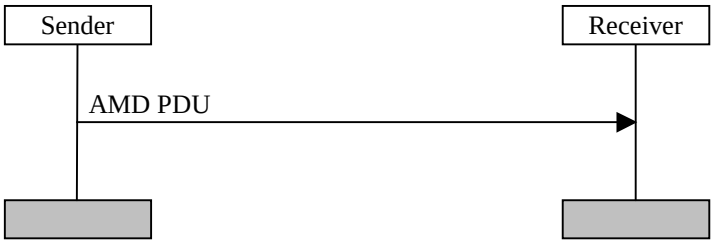

Figure 11.3: Acknowledged mode data transfer procedure

11.3.2 Transmission of AMD PDU

Upon a request of acknowledged mode data transfer from upper layers or upon retransmission of AMD PDUs, the Sender shall:

- when RLC SDUs are received from upper layers:
  - segment the RLC SDUs into AMD PDUs where the fixed PDU size is configured by upper layer;
  - set a "Length Indicator" field for each SDU that ends in the AMD PDU according to subclause 9.2.2.8;
  - if "Timer based SDU Discard with explicit signalling" is configured:
    - start a timer Timer_Discard for each SDU received from upper layer (see subclause 9.7.3);
  - schedule the AMD PDUs for transmission;

- if one or several AMD PDUs have been negatively acknowledged (see subclause 11.5.3):
  - schedule the AMD PDUs that were negatively acknowledged for retransmission;
- if a poll has been triggered by either the poll triggers "Poll timer" or "Timer based" (see subclause 9.7.1); and
- if polling is not prohibited (see subclause 9.5); and
- if no AMD PDU is scheduled for transmission or retransmission:
  - if the value of "Configured_Tx_Window_Size" is larger than or equal to "2048":
    - select the AMD PDU with "Sequence Number" equal to VT(S)-1.
  - otherwise if the "Configured_Tx_Window_Size" is less than "2048";
    - select the AMD PDU with "Sequence Number" equal to VT(S)-1; or
    - select an AMD PDU that has not yet been acknowledged by the peer entity;
  - schedule the selected AMD PDU for retransmission (in order to transmit a poll).

The Sender may also schedule an AMD PDU for retransmission even if none of the criteria above is fulfilled. In this case, the Sender may:

- if the value of "Configured_Tx_Window_Size" is larger than or equal to "2048":
  - select the AMD PDU with "Sequence Number" equal to VT(S)-1.
- otherwise if the "Configured_Tx_Window_Size" is less than "2048":
  - select the AMD PDU with "Sequence Number" equal to VT(S)-1; or
  - select an AMD PDU that has not yet been acknowledged by the peer entity;
- schedule the selected AMD PDU for retransmission.

Each time an AMD PDU is scheduled for transmission or retransmission, the Sender shall:

- increment the value of the corresponding VT(DAT);
- if VT(DAT) = MaxDAT:
  - perform the actions specified in subclause 11.3.3a;
- e1se:
  - notify the lower layer that data is available for transmission; [Indentation changed to B2]
  - perform the actions specified in subclause 11.3.2.2. [Indentation changed to B2]

In AM, a PDU shall be considered to be a padding PDU if it is:

- an AMD PDU consisting only of an RLC Header with one "Length Indicator" (indicating that the rest of the PDU is padding) and padding; or
- a STATUS PDU consisting only of a NO_MORE SUFI.

11.3.2.1 AMD PDU contents to set

If the AMD PDU is transmitted for the first time, the Sender shall:

- set the "Sequence Number" field equal to VT(S);
- set a "Length Indicator" field for each SDU that ends in the AMD PDU according to subclause 9.2.2.8;
- set the "Polling bit" to the value specified in subclause 11.3.2.1.1.

Otherwise if the AMD PDU is retransmitted:

- use the same value of the "Sequence Number" field as in the original transmission of the AMD PDU;
- if the "Length Indicator" fields needed in the AMD PDU according to subclause 9.2.2.8 has changed due to that a piggybacked STATUS PDU is included in the AMD PDU or a piggybacked STATUS PDU was included in the previous transmission of the AMD PDU:
  - update the "Length Indicator" fields according to 9.2.2.8.
- set the "Polling bit" to the value specified in subclause 11.3.2.1.1.

11.3.2.1.1 Setting of the Polling bit

The Sender shall:

- if a poll has been triggered by one or several poll triggers (see subclause 9.7.1):
  - if polling is not prohibited, see subclause 9.5:
    - set the "Polling bit" in the AMD PDU header to "1";
- otherwise:
  - set the "Polling bit" in the AMD PDU header to "0".

11.3.2.1.2 Void

11.3.2.2 Submission of AMD PDUs to lower layer

If one or more AMD PDUs have been scheduled for transmission or retransmission according to subclause 11.3.2, the Sender shall:

- not submit any AMD PDUs to lower layer that is not allowed to transmit. AMD PDUs are only allowed to transmit:
  - if the AMD PDU has a "Sequence Number" < VT(MS)~~;~~ or the AMD PDU has a "Sequence Number" equal to VT(S)-1; and
  - ~~if the AMD PDU has a "Sequence Number" equal to VT(S)-1; and~~
  - if the AMD PDU is not restricted to be transmitted by the local suspend function, see subclause 9.7.5~~;~~.
- inform the lower layer of both the numbers of AMD PDUs scheduled and allowed for transmission or retransmission;
- set the AMD PDU contents according to clause 11.3.2.1;
- submit to the lower layer the requested number of AMD PDUs;
- ~~set the AMD PDU contents according to clause 11.3.2.1;~~
- treat retransmissions with higher priority than AMD PDUs transmitted for the first time;
- update the state variables in clause 9.4 for each AMD PDU submitted to lower layer except VT(DAT) which has already been updated, see subclause 11.3.2;
- if the "Polling bit" is set to "1" in any of the AMD PDUs; and
- if the timer Timer_Poll is configured;
  - start the timer Timer_Poll according to subclause 9.5;

- buffer the AMD PDUs that are not submitted to the lower layer according to the discard configuration (see subclause 9.7.3).

11.3.3 Reception of AMD PDU by the Receiver

Upon reception of an AMD PDU, the Receiver shall:

- update VR(R), VR(H) and VR(MR) state variables for each received AMD PDU (see clause 9.4);
- if a received AMD PDU includes a "Polling bit" set to "1", or "Missing PDU Indicator" is configured and the Receiver detects that a PDU is missing:
  - initiate the STATUS PDU transfer procedure;
- reassemble the received AMD PDUs into RLC SDUs;
- if "In-Sequence Delivery" is configured:
  - deliver the RLC SDUs in-sequence (i.e. in the same order as the RLC SDUs were originally transmitted by the peer entity) to upper layers through the AM-SAP.
- otherwise:
  - deliver the RLC SDUs in arbitrary order to upper layers through the AM-SAP.

11.3.3a Reached maximum number of attempts

If VT(DAT) = MaxDAT, the Sender shall:

- if "No discard after MaxDAT number of transmissions" is configured:
  - initiate the RLC reset procedure, see subclause 11.4;
- if "SDU discard after MaxDAT number of transmissions" is configured:
  - initiate the "SDU discard with explicit signalling" procedure for the corresponding SDU, see subclause 11.6.

11.3.4 Abnormal cases

11.3.4.1 Void

11.3.4.2 Receiving an AMD PDU outside the reception window

Upon reception of an AMD PDU with "Sequence Number" outside the interval VR(R)≤SN<VR(MR), the Receiver shall:

- discard the AMD PDU;
- if the "polling bit" in the discarded AMD PDU is set to "1":
  - initiate the STATUS PDU transfer procedure.

11.3.4.3 Timer_Discard timeout

11.3.4.3.1 SDU discard with explicit signalling

Upon expiry of the timer Timer_Discard, the Sender shall:

- initiate the SDU discard with explicit signalling procedure, see subclause 11.6.2.

In the case where the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the UE may wait until after it provides MAC with the requested set of PDUs before discarding the afore-mentioned SDUs.

11.3.4.4 ~~VT(DAT) =≥ MaxDAT-1~~Void

~~The Sender shall perform the actions specified in subclause 11.3.x.:~~

- ~~if VT(DAT) ≥ MaxDAT_1 for any AMD PDU:~~
- ~~if "No_discard after MaxDAT number of transmissions" is configured:~~
  - ~~initiate the RLC reset procedure, see subclause 11.4;~~
- ~~if "SDU discard after MaxDAT number of transmissions" is configured:~~
  - ~~initiate the "SDU discard with explicit signalling" procedure, see subclause 11.6.~~

11.3.4.5 Invalid length indicator value

If the "Length Indicator" of an AMD PDU has a value that is larger than the PDU size – RLC header size and is not one of the predefined values listed in the table of subclause 9.2.2.8, the Sender shall:

- discard that AMD PDU; and
- treat the discarded AMD PDU as missing.

11.3.4.6 Length Indicator value reserved for AMD PDU

Upon delivery by the lower layer of an AMD PDU that contains a "Length Indicator" value specified to be reserved for AMD PDUs in this version of the protocol, the Receiver shall:

- discard that AMD PDU;
- treat the discarded AMD PDU as missing.

11.3.4.7 ~~VT(DAT) ≥ MaxDAT-1~~Void

~~The Sender shall not perform the transmission of the AMD PDU. Instead, it will only increment the corresponding VT(DAT).~~

11.4 RLC reset procedure

11.4.1 General

The RLC reset procedure is used to reset two RLC peer entities, which are operating in acknowledged mode. Figure 11.4 below illustrates the elementary procedure for an RLC reset. During the reset procedure the hyper frame numbers (HFN) in UTRAN and UE are synchronised. Two HFNs used for ciphering needs to be synchronised, DL HFN in downlink and UL HFN in uplink. In the reset procedure, the highest UL HFN and DL HFN used by the RLC entity in the transmitting sides, i.e. the HFNs associated with AMD PDUs of "Sequence Number"=VT(S)-1 if at least one AMD PDU had been transmitted or of "Sequence Number"=0 if no AMD PDU had been transmitted, are exchanged between UE and UTRAN.

The RESET PDUs and the RESET ACK PDUs have higher priority than AMD PDUs.

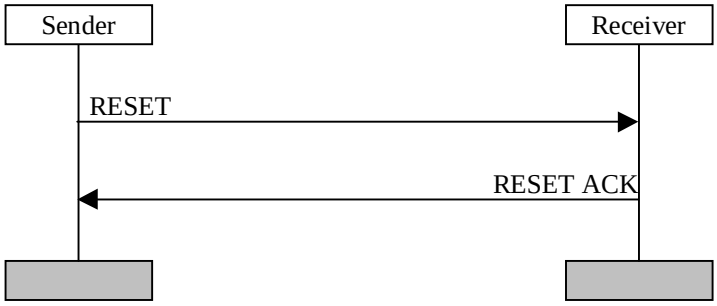

Figure 11.4: RLC reset procedure

11.4.2 Initiation

The Sender shall:

- if one of the following triggers is detected:

1) "No_Discard after MaxDAT number of retransmissions" is configured and VT(DAT) equals the value MaxDAT (see subclause 9.7.3.4);

2) VT(MRW) equals the value MaxMRW;

3) A STATUS PDU including "erroneous Sequence Number" is received (see clause 10);

   - stop transmitting any AMD PDU or STATUS PDU;

   - increment VT(RST) by 1;

   - if VT(RST) = MaxRST:

     - the Sender may submit to the lower layer a RESET PDU;

     - perform the actions specified in subclause 11.4.4a;

   - else (if VT(RST) < MaxRST):

     - submit a RESET PDU to the lower layer; [Intentation changed to B3]

     - start the timer Timer_RST ~~and increase VT(RST) with 1.~~ [Intendation changed to B3]

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC reset procedure until the end of the next TTI.

When a reset procedure has been initiated it can only be ended upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, or upon request of re-establishment or release from upper layer, a reset procedure is not interrupted by the reception of a RESET PDU from the peer entity.

11.4.2.1 RESET PDU contents to set

The Sender shall:

- set the HFNI field to the currently highest used HFN (DL HFN when the RESET PDU is sent by UTRAN or UL HFN when the RESET PDU is sent by the UE);

- set the RSN field to the sequence number of the RESET PDU. The sequence number of the first RESET PDU after the AM entity is established or re-established shall be "0". This sequence number is incremented every time a new RESET PDU is transmitted, but not when a RESET PDU is retransmitted.

11.4.3 Reception of the RESET PDU by the Receiver

Upon reception of a RESET PDU the Receiver shall:

- if the RSN value in the RESET PDU is the same as the RSN value in the last received RESET PDU:
  - either only submit a RESET ACK PDU to the lower layer with the contents set exactly as in the last transmitted RESET ACK PDU (i.e., in this case the RLC entity is not reset); or
  - perform the actions specified below as if the RSN value was different from the RSN value in the last received RESET PDU.
- otherwise, if the RESET PDU is the first RESET PDU received since the entity was (re-)established or the RSN value is different from the RSN value in the last received RESET PDU:
  - submit a RESET ACK PDU to the lower layer with the content set as specified in subclause 11.4.3.1;
  - reset the state variables described in subclause 9.4 except VT(RST) to their initial values;
  - stop all the timers described in subclause 9.5 except Timer_RST;
  - reset configurable parameters to their configured values;
  - discard all RLC PDUs in the receiving side of the AM RLC entity;
  - discard all RLC SDUs that were transmitted before the reset in the transmitting side of the AM RLC entity;
  - set the HFN (DL HFN when the RESET PDU is received in UE or UL HFN when the RESET PDU is received in UTRAN) equal to the HFNI field in the received RESET PDU;
  - increase with one the UL HFN and DL HFN, and the updated HFN values shall be used for the first transmitted and received AMD PDUs after the reset procedure.

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC SDUs discard in the transmitting side of the AM RLC entity until the end of the next TTI.

11.4.3.1 RESET ACK PDU contents to set

The Receiver shall:

- set the hyper frame number indicator field (HFNI) to the currently highest used HFN (DL HFN when the RESET ACK PDU is sent by UTRAN or UL HFN when the RESET ACK PDU is sent by the UE);
- set the RSN field to the same value as in the corresponding received RESET PDU.

11.4.4 Reception of the RESET ACK PDU by the Sender

Upon reception of a RESET ACK PDU, the Sender shall:

- if the Sender has already transmitted a RESET PDU which has not been yet acknowledged by a RESET ACK PDU:
  - if the received RSN value is the same as the one in the corresponding RESET PDU:
    - set the HFN value (DL HFN when the RESET ACK PDU is received in UE or UL HFN when the RESET ACK PDU is received in UTRAN) to the HFNI field of the received RESET ACK PDU;
    - reset the state variables described in subclause 9.4 to their initial values;
    - stop all the timers described in subclause 9.5;
    - reset configurable parameters to their configured values;
    - discard all RLC PDUs in the receiving side of the AM RLC entity;
    - discard all RLC SDUs that were transmitted before the reset in the transmitting side of the AM RLC entity;

- increase with one the UL HFN and DL HFN, and the updated HFN values shall be used for the first transmitted and received AMD PDUs after the reset procedure;

- otherwise (if the received RSN value is not the same as the one in the corresponding RESET PDU):

- discard the RESET ACK PDU;

- otherwise (if the Sender has not transmitted a RESET PDU which has not been yet acknowledged by a RESET ACK PDU):

- discard the RESET ACK PDU.

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC SDUs discard in the transmitting side until the end of the next TTI.

11.4.4a Reached maximum number of attempts

If VT(RST) = MaxRST, the Sender shall:

- terminate the ongoing RLC RESET procedure;

- stop the timer Timer_RST if it was started;

- indicate unrecoverable error to upper layer.

11.4.5 Abnormal cases

11.4.5.1 Timer_RST timeout

If Timer_RST expires before the reset procedure is terminated, the Sender shall:

- increment VT(RST) by one;

- if VT(RST)<MaxRST~~-1~~:

- set the RESET PDU as previously transmitted (even if additional SDUs were discarded in the mean-time);

- transmit the RESET PDU;

~~- increment VT(RST) by one;~~

- restart Timer_RST; [Indentation changed]

- else, (if VT(RST) = MaxRST):

- perform the actions specified in subclause 11.4.4a.

11.4.5.2 ~~Unrecoverable error (VT(RST) =≥ MaxRST-1)~~Void

~~The Sender shall perform the actions described in subclause 11.4.x.:~~

~~if it was started- if VT(RST) becomes larger than or equal to MaxRST:~~

~~- indicate unrecoverable error to upper layer.~~

11.4.5.3 Reception of the RESET PDU by the Sender

Upon reception of a RESET PDU, the Sender shall:

- submit a RESET ACK PDU to the lower layer with the content set as specified in subclause 11.4.3.1;

- reset the state variables described in subclause 9.4 except VT(RST) to their initial values;

- stop all the timers described in subclause 9.5 except Timer_RST;

- reset configurable parameters to their configured values;
- discard all RLC PDUs in the receiving side of the AM RLC entity;
- discard all RLC SDUs that were transmitted before the reset in the transmitting side of the AM RLC entity;
- set the HFN (DL HFN when the RESET PDU is received in UE or UL HFN when the RESET PDU is received in UTRAN) equal to the HFNI field in the received RESET PDU;
- increase with one the UL HFN and DL HFN, and the updated HFN values shall be used for the first transmitted and received AMD PDUs after the reset procedure.

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC SDUs discard in the transmitting side until the end of the next TTI.

11.6 SDU discard with explicit signalling procedure

11.6.1 General

The SDU discard with explicit signalling procedure is used for discarding SDUs and transferring the discard information between two peer entities, which are operating in acknowledged mode. The Sender shall discard an SDU that has not been successfully transmitted for a period of time or for a number of transmissions, and send a Move Receiving Window (MRW) SUFI to the Receiver. According to the MRW SUFI, the Receiver shall discard AMD PDUs carrying that SDU and update the reception window. Figure 11.6 below illustrates the elementary procedure for SDU discard with explicit signalling.

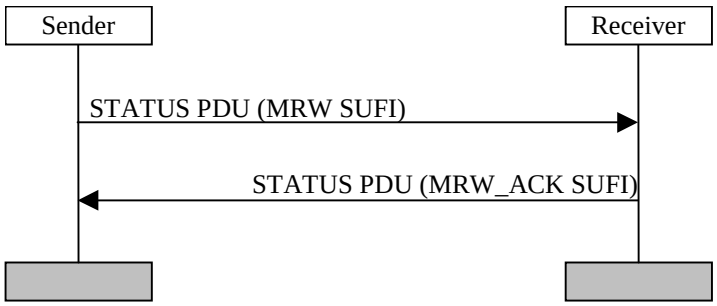

Figure 11.6: SDU discard with explicit signalling

11.6.2 Initiation

The Sender shall initiate the SDU discard with explicit signalling procedure if one of the following triggers is detected:

- "Timer based SDU discard with explicit signalling" is configured, Timer_Discard expires for an SDU, and one or more segments of the SDU have been submitted to lower layer;
- "Timer based SDU discard with explicit signalling" is configured, Timer_Discard expires for an SDU, and "Send MRW" is configured;
- "SDU discard after MaxDAT number of transmissions" is configured, and MaxDAT number of transmissions is reached (i.e. VT(DAT) ≥ MaxDAT) for an AMD PDU.

Upon initiation of the SDU discard with explicit signalling procedure, the Sender shall:

- if "Timer based SDU discard with explicit signalling" is configured:
  - discard all SDUs up to and including the SDU for which the timer Timer_Discard expired.
- if "SDU discard after MaxDAT number of retransmissions" is configured:
  - discard all SDUs that have segments in AMD PDUs with "Sequence Number" SN inside the interval VT(A) ≤ SN ≤ X, where X is the value of the "Sequence Number" of the AMD PDU with VT(DAT) ≥ MaxDAT.

- discard all AMD PDUs including segments of the discarded SDUs, unless they also carry a segment of a SDU whose timer has not expired;
- if more than 15 discarded SDUs are to be informed to the Receiver (see subclause 11.6.2.2):
  - if "Send MRW" is not configured:
    - assemble an MRW SUFI with the discard information of the SDUs.
  - otherwise ("Send MRW" is configured):
    - assemble an MRW SUFI with the discard information of the first 15 SDUs; and
    - include the discard information of the rest SDUs in another MRW SUFI which shall be sent by the next SDU discard with explicit signalling procedure (after the current SDU discard with explicit signalling procedure is terminated).
- otherwise (less than or equal to 15 discarded SDUs are to be informed to the Receiver):
  - assemble an MRW SUFI with the discard information of the SDUs.
- schedule and submit to lower layer a STATUS PDU/piggybacked STATUS PDU containing the MRW SUFI;
- if SN_MRW_{LENGTH} in the MRW SUFI >VT(S):
  - update VT(S) to SN_MRW_{LENGTH}.
- start a timer Timer_MRW according to subclause 9.5.

If a new SDU discard with explicit signalling procedure is triggered when the timer Timer_MRW is active, no new MRW SUFIs shall be sent before the current SDU discard with explicit signalling procedure is terminated by one of the termination criteria specified in subclause 11.6.4.

11.6.2.1 Void

11.6.2.2 STATUS PDU contents to set

The Sender shall:

- if "Send MRW" is configured:
  - if the last discarded SDU ended in an AMD PDU, and its "Length Indicator" is present in the same AMD PDU, and no new SDU is present inside this AMD PDU:
    - set the last SN_MRW_i field in the MRW SUFI to 1 + "Sequence Number" of the AMD PDU which contains the "Length Indicator" of the last discarded SDU;
    - set the N_{LENGTH} field in the MRW SUFI to "0000".
  - otherwise:
    - set the last SN_MRW_i field in the MRW SUFI to the "Sequence Number" of the AMD PDU which contains the "Length Indicator" of the last discarded SDU;
    - set the N_{LENGTH} field in the MRW SUFI so that the last data octet to be discarded in the Receiver shall be the octet indicated by the N_{LENGTH}:th "Length Indicator" field of the AMD PDU which contains the "Length Indicator" of the last discarded SDU;
  - set each of the other SN_MRW_i fields in the MRW SUFI to the "Sequence Number" of the AMD PDU which contains the "Length Indicator" of the i:th discarded SDU.
- otherwise ("Send MRW" is not configured):

- if the last SDU to be discarded in the Receiver ended in an AMD PDU, and its "Length Indicator" is present in the same AMD PDU, and no new SDU is present inside this AMD PDU:
  - set the last SN_MRW_i field in the MRW SUFI to 1 + "Sequence Number" of the AMD PDU which contains the "Length Indicator" of the last SDU to be discarded in the Receiver;
  - set the N_{LENGTH} field in the MRW SUFI to "0000".
- otherwise:
  - set the last SN_MRW_i field in the MRW SUFI to the "Sequence Number" of the AMD PDU which contains the "Length Indicator" of the last SDU to be discarded in the Receiver;
  - set the N_{LENGTH} field in the MRW SUFI so that the last data octet to be discarded in the Receiver shall be the octet indicated by the N_{LENGTH}:th "Length Indicator" field of the AMD PDU which contains the "Length Indicator" of the last SDU to be discarded in the Receiver;
- optionally set each of the other SN_MRW_i fields in the MRW SUFI to the "Sequence Number" of the AMD PDU which contains the "Length Indicator" of the i:th SDU to be discarded in the Receiver;

- if the MRW SUFI contains only one SN_MRW_i field and the value of SN_MRW_i field ≥ VT(A)+Configured_Tx_Window_Size:
  - set the LENGTH field in the MRW SUFI to "0000".
- otherwise:
  - set the LENGTH field in the MRW SUFI to the number of SN_MRW_i fields in the same MRW SUFI. In this case, SN_MRW_1 shall be in the interval $VT(A) \leq SN\_MRW_1 < VT(A)+Configured\_Tx\_Window\_Size$.

11.6.3 Reception of the STATUS PDU by the Receiver

Upon reception of the STATUS PDU/piggybacked STATUS PDU containing an MRW SUFI, the Receiver shall:

- if the LENGTH field in the received MRW SUFI is "0000":
  - consider SN_MRW_1 to be above or equal to VR(R).
- otherwise:
  - consider SN_MRW_1 to be less than VR(MR);
- consider all the SN_MRW_is other than SN_MRW_1 to be in sequential order within the list and sequentially above or equal to SN_MRW_{i-1}.
- discard AMD PDUs up to and including the PDU with sequence number $SN\_MRW_{LENGTH}-1$;
- if the N_{LENGTH} field in the received MRW SUFI is "0000":
  - reassemble from the first data octet of the AMD PDU with sequence number SN_MRW_{LENGTH} after the discard.
- otherwise:
  - discard further the data octets in the AMD PDU with sequence number SN_MRW_{LENGTH} up to and including the octet indicated by the N_{LENGTH}:th "Length Indicator" field of the PDU with sequence number SN_MRW_{LENGTH};
  - reassemble from the succeeding data octet in the AMD PDU with sequence number SN_MRW_{LENGTH} after the discard;
- if "Send MRW" is configured:
  - inform upper layers about all of the discarded SDUs that were not previously delivered to upper layer or discarded by other MRW SUFIs;

- update the state variables VR(R), VR(H) and VR(MR) according to the received STATUS PDU/piggybacked STATUS PDU;
- assemble a MRW_ACK SUFI according to subclause 11.6.3.1;
- schedule and submit to lower layer a STATUS PDU/piggybacked STATUS PDU containing the MRW_ACK SUFI.

11.6.3.1 STATUS PDU contents to set

The Receiver shall:

- set the SN_ACK field in the MRW_ACK SUFI to the new value of VR(R), updated after reception of the MRW SUFI;
- if the SN_ACK field in the MRW_ACK SUFI is set equal to the SN_MRW_{LENGTH} field in the received MRW SUFI:
  - set the N field in the MRW_ACK SUFI to the N_{LENGTH} field in the received MRW SUFI.
- otherwise:
  - set the N field in the MRW_ACK SUFI to "0000".
- include the MRW_ACK SUFI in the next STATUS PDU/piggybacked STATUS PDU to be transmitted, according to subclause 11.5.2.

11.6.4 Termination

The Sender shall terminate the SDU discard with explicit signalling procedure if one of the following criteria is fulfilled:

- a STATUS PDU/piggybacked STATUS PDU containing an MRW_ACK SUFI is received, and the SN_ACK field in the received MRW_ACK SUFI > the SN_MRW_{LENGTH} field in the transmitted MRW_SUFI, and the N field in the received MRW_ACK SUFI is set equal to "0000";
- a STATUS PDU/piggybacked STATUS PDU containing an MRW_ACK SUFI is received, and the SN_ACK field in the received MRW_ACK SUFI = the SN_MRW_{LENGTH} field in the transmitted MRW_SUFI, and the N field in the received MRW_ACK SUFI is set equal to the N_{LENGTH} field in the transmitted MRW SUFI;
- a STATUS PDU/piggybacked STATUS PDU containing an ACK SUFI is received, and this STATUS PDU/piggybacked STATUS PDU indicates that all AMD PDUs up to and including the AMD PDU with "Sequence Number" equal to the SN_MRW_{LENGTH} field in the transmitted MRW SUFI has been received or discarded by the peer entity.

Upon termination of the SDU discard with explicit signalling procedure, the Sender shall:

- stop the timer Timer_MRW;
- update VT(A) and VT(MS) according to the received STATUS PDU/piggybacked STATUS PDU;

The Sender shall not confirm to upper layers the SDUs that are requested to be discarded.

11.6.4a Reached maximum number of attempts

If VT(MRW) = MaxMRW, the Sender shall:

- terminate the SDU discard with explicit signalling procedure;
- stop the timer Timer_MRW if it was started;
- initiate the RLC RESET procedure (see clause 11.4).

11.6.5 Expiration of timer Timer_MRW

If Timer_MRW expires before the discard procedure is terminated, the Sender shall:

- increment VT(RST) by one;
- if VT(MRW)<MaxMRW ~~-1~~:
  - set the MRW SUFI as previously transmitted (even if additional SDUs were discarded in the mean-time);
  - include the MRW SUFI in a new status report (if other SUFIs are included, their contents shall be updated);
  - transmit the status report by either including it in a STATUS PDU or piggybacked in an AMD PDU;
- ~~increment VT(MRW) by one;~~
  - restart Timer_MRW for this discard procedure~~;~~ [Indentation changed to B2]
- else (if VT(MRW) = MaxMRW):
  - perform the actions specified in subclause 11.6.4a.

11.6.6 Abnormal cases

11.6.6.1 Reception of obsolete/corrupted MRW SUFI by the Receiver

If the received MRW SUFI contains outdated information about the reception window (reception window already moved further than MRW SUFI is indicating), the Receiver shall:

- discard the MRW SUFI;
- set the SN_ACK field in the MRW_ACK SUFI to the current value of VR(R);
- set the N field in the MRW_ACK SUFI to "0000";
- include the MRW_ACK SUFI in the next STATUS PDU/piggybacked STATUS PDU to be transmitted, according to subclause 11.5.2.

11.6.6.2 ~~VT(MRW) equals ≥= MaxMRW - 1~~Void

~~If the number of retransmission of an MRW SUFI (i.e. VT(MRW)) ≥ equals MaxMRW 1, t~~The Sender ~~shall~~ perform ~~the actions specified in subclause 11.6.x.:~~

- ~~terminate the SDU discard with explicit signalling procedure;~~
- ~~stop the timer Timer_MRW if it was started;~~
- ~~deliver an error indication to upper layers;~~
- ~~initiate the RLC RESET procedure (see clause 11.4).~~

11.6.6.3 Reception of obsolete/corrupted MRW_ACK SUFI by the Sender

The Sender shall discard the received MRW_ACK SUFI if one of the following cases occurs:

- the timer Timer_MRW is not active; or
- the SN_ACK field in the received MRW_ACK SUFI < the SN_MRW_{LENGTH} field in the transmitted MRW SUFI; or
- the SN_ACK field in the received MRW_ACK SUFI = the SN_MRW_{LENGTH} field in the transmitted MRW SUFI, and the N field in the received MRW_ACK SUFI is not equal to the N_{LENGTH} field in the transmitted MRW SUFI; or

- the SN_ACK field in the received MRW_ACK SUFI > the SN_MRW_{LENGTH} field in the transmitted MRW SUFI, and the N field in the received MRW_ACK SUFI is not equal to "0000".

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13-17 April 2002

Tdoc R2-021414

CR-Form-v4

CHANGE REQUEST

⌘ **25.322 CR 191** ⌘ rev **r1** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Correction to MaxDAT, MaxRST and MaxMRW
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	13 April 02
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

#1 MaxRST: In had been decided that on SRB, no RLC Reset would be allowed and therefore that the value MaxRST = 1 would mean that NO RESET should be transmitted to the per RLC entity. The maximum number of RESET is MaxRST-1 (see section 9.6). But the procedural text of section 11.4 is wrong and corresponds to a maximum of RESET of MaxRST. It would allow one RESET to sent when MaxRST=1.

~~#2 MaxDAT: To be aligned with MaxRST, the maximum number of transmission of a PDU has been decided to be MaxDAT-1 (see section 9.6), but in the procedural text of section 11.3 it is in fact MaxDAT.~~

#3 MaxMRW: To be aligned with MaxRST, the maximum number of transmission of status containing an MRW is MaxMRW-1 (see section 9.6), but in the procedural text of section 11.6 it is in fact MaxMRW.

Summary of change: ⌘

#1 MaxRST: Changes to 11.4 and subclauses

The section has been modified to be aligned with 9.6. VT(RST) is incremented before the RESET is submitted to lower layer so that in case of MaxRST=1, no RESET shall be send. For R99 it is still allowed in case MaxRST=1 to send one RESET, before sending the indication of Unrecoverable Error to RRC.

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The section has been modified to be aligned with 9.6. VT(DAT) is incremented before the PDU is submitted to lower layer. Only rewritting alignment have been done on previous behavior.

#3 MaxMRW: Changes to 11.6 and subclauses

The section has been modified to be aligned with 9.6. VT(MRW) is incremented before the STATUS including MRW is submitted to lower layer. Section 9.6 has been corrected in addition rewritting alignment have been done on previous behaviour.

The changes compared with R2-021030 are highlighted in blue.

Rel4 shadow CR

Consequences if not approved:	⌘	~~Major consequence: It won't be possible to configure RLC so that NO RESET should be sent to the peer entity. This was the wanted configuration for SRB2 and SRB3.~~ The UE would always have to sent one useless RESET on SRB before an Urecoverable Error is sent to upper layer. ~~Other consequence: Subsections 11.3, 11.4, 11.6 will not be not aligned with section 9.6 for the meaning of MaxDAT, MaxRST and MaxMRW. Unconsistence between sections.~~

Clauses affected:	⌘	9.4, 9.6, 9.7.3.3, 9.7.3.4, 11.3.2, 11.3.2.2, 11.3.3a (new), 11.3.4.4, 11.3.4.7, 11.4.2, 11.4.4a (new), 11.4.5.1, 11.4.5.2, 11.6.4a (new), 11.6.5, 11.6.6.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.322 v3.10.0, CR 190r1 25.322 v5.0.0, CR 192r1
Other comments:	⌘			

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9.4 State variables

The state variables defined in this subclause are normative.

This sub-clause describes the state variables used in AM and UM in order to specify the peer-to-peer protocol. All state variables are non-negative integers. UMD and AMD PDUs are numbered by modulo integer sequence numbers (SN) cycling through the field: 0 to $2^{12} - 1$ for AM and 0 to $2^{7} - 1$ for UM. All arithmetic operations contained in the present document on VT(S), VT(A), VT(MS), VR(R), VR(H) and VR(MR) are affected by the AM modulus. All arithmetic operations contained in the present document on VT(US) and VR(US) are affected by the UM modulus. When performing arithmetic comparisons of state variables or Sequence number values a modulus base shall be used. This modulus base is subtracted (within the appropriate field) from all the values involved and then an absolute comparison is performed. At the Sender, VT(A) and VT(US) shall be assumed to be the modulus base in AM and UM respectively. At the Receiver, VR(R) and VR(US) shall be assumed to be the modulus base in AM and UM respectively.

The RLC shall maintain the following state variables in the Sender.

a) VT(S) - Send state variable.

   This state variable contains the "Sequence Number" of the next AMD PDU to be transmitted for the first time (i.e. excluding retransmitted PDUs). It shall be updated after the aforementioned AMD PDU is transmitted or after transmission of a MRW SUFI which includes SN_MRW_{LENGTH} >VT(S) (see subclause 11.6). The initial value of this variable is 0.

b) VT(A) - Acknowledge state variable.

   This state variable contains the "Sequence Number" following the "Sequence Number" of the last in-sequence acknowledged AMD PDU. This forms the lower edge of the transmission window of acceptable acknowledgements. VT(A) shall be updated based on the receipt of a STATUS PDU including an ACK (see subclause 9.2.2.11.2) and/or an MRW_ACK SUFI (see subclause 11.6).

   The initial value of this variable is 0. For the purpose of initialising the protocol, this value shall be assumed to be the first "Sequence Number" following the last in-sequence acknowledged AMD PDU.

c) VT(DAT).

   This state variable counts the number of times a AMD PDU has been scheduled to be transmitted. There shall be one VT(DAT) for each PDU and each shall be incremented every time the corresponding AMD PDU is scheduled to be transmitted.

   The initial value of this variable is 0.

d) VT(MS) - Maximum Send state variable.

   This state variable contains the "Sequence Number" of the first AMD PDU that can be rejected by the peer Receiver, VT(MS) = VT(A) + VT(WS). This value represents the upper edge of the transmission window. The transmitter shall not transmit AMD PDUs with "Sequence Number" ≥ VT(MS) unless VT(S) ≥ VT(MS). In that case, the AMD PDU with "Sequence Number" = VT(S) - 1 can also be transmitted. VT(MS) shall be updated when VT(A) or VT(WS) is updated.

   The initial value of this variable is Configured_Tx_Window_size.

e) VT(US) – UM data state variable.

   This state variable contains the "Sequence Number" of the next UMD PDU to be transmitted. It shall be incremented by 1 each time a UMD PDU is transmitted.

   The initial value of this variable is 0.

NOTE: For the UTRAN side, the initial value of this variable can be different from 0.

f) VT(PDU).

   This state variable is used when the "poll every Poll_PDU PDU" polling trigger is configured. It shall be incremented by 1 for each AMD PDU that is transmitted including both new and retransmitted AMD PDUs.

When it becomes equal to the value Poll_PDU, a new poll shall be transmitted and the state variable shall be set to zero.

The initial value of this variable is 0.

g) VT(SDU).

This state variable is used when the "poll every Poll_SDU SDU" polling trigger is configured. It shall be incremented by 1 for a given SDU when all the AMD PDUs carrying a part of this SDU have been transmitted at least once. When it becomes equal to the value Poll_SDU a new poll shall be transmitted and the state variable shall be set to zero. The "Polling bit" shall be set to "1" in the first transmission of the AMD PDU that contains the last segment of the SDU.

The initial value of this variable is 0.

h) VT(RST) - Reset state variable.

This state variable is used to count the number of times a RESET PDU is scheduled to be transmitted before the reset procedure is completed. VT(RST) shall be incremented by 1 each time a RESET PDU is scheduled to be transmitted. VT(RST) shall only be reset upon the reception of a RESET ACK PDU, i.e. VT(RST) shall not be reset when an RLC reset initiated by the peer RLC entity occurs.

The initial value of this variable is 0.

i) VT(MRW) – MRW command send state variable.

This state variable is used to count the number of times a MRW command is scheduled to be transmitted. VT(MRW) is incremented by 1 each time an MRW SUFI is scheduled to be transmitted. VT(MRW) shall be reset when the SDU discard with explicit signalling procedure is terminated. The initial value of this variable is 0.

j) VT(WS) – Transmission window size state variable.

This state variable contains the size that shall be used for the transmission window. VT(WS) shall be set equal to the WSN field when the transmitter receives a STATUS PDU including a WINDOW SUFI.

The initial value of this variable is Configured_Tx_Window_size.

The RLC shall maintain the following state variables in the Receiver:

a) VR(R) - Receive state variable.

This state variable contains the "Sequence Number" following that of the last in-sequence AMD PDU received. It shall be updated upon the receipt of the AMD PDU with "Sequence Number" equal to VR(R).

The initial value of this variable is 0. For the purpose of initialising the protocol, this value shall be assumed to be the first "Sequence Number" following the last in-sequence received AMD PDU.

b) VR(H) - Highest expected state variable.

This state variable contains the "Sequence Number" following the highest "Sequence Number" of any received AMD PDU. When a AMD PDU is received with "Sequence Number" x such that $VR(H) \leq x < VR(MR)$, this state variable shall be set equal to x+1.

The initial value of this variable is 0.

c) VR(MR) - Maximum acceptable Receive state variable.

This state variable contains the "Sequence Number" of the first AMD PDU that shall be rejected by the Receiver, VR(MR) = VR(R) + Configured_Rx_Window_Size.

d) VR(US) - Receiver Send Sequence state variable.

This state variable contains the "Sequence Number" following that of the last UMD PDU received. When a UMD PDU with "Sequence Number" equal to x is received, the state variable shall set equal to x + 1.

The initial value of this variable is 0.

e) VR(EP) - Estimated PDU Counter state variable.

This state variable contains the number of AMD PDUs whose re-transmission is still expected as a consequence of the transmission of the latest status report. At the end of each TTI it is decremented by the total number of AMD PDUs that were received during that time.

9.6 Protocol Parameters

The behaviour defined in this subclause is normative. The values of the protocol parameters defined in this subclause are signalled by upper layers.

a) MaxDAT.

The maximum number of transmissions of an AMD PDU is equal to MaxDAT – 1. This protocol parameter represents the upper limit for state variable VT(DAT). When VT(DAT) equals the value MaxDAT, either RLC RESET procedure or SDU discard procedure shall be initiated according to the configuration by upper layers.

b) Poll_PDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_PDU PDU" is configured by upper layers. It represents the upper limit for the state variable VT(PDU). When VT(PDU) equals the value Poll_PDU a poll shall be transmitted to the peer entity.

c) Poll_SDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_SDU SDU" is configured by upper layers. It represents the upper limit for state variable VT(SDU). When VT(SDU) equals the value Poll_SDU a poll shall be transmitted to the peer entity.

d) Poll_Window.

This protocol parameter indicates when the transmitter shall poll the Receiver in the case where "window-based polling" is configured by upper layers. A poll is triggered for each AMD PDU when $J \geq$ Poll_Window, where J is the transmission window percentage defined as:

$$J = \frac{(4096+VT(S)+1-VT(A)) \textbf{ mod } 4096}{VT(WS)} * 100 ,$$

where the constant 4096 is the modulus for AM described in subclause 9.4 and VT(S) is the value of the variable before the AMD PDU is submitted to lower layer.

e) MaxRST.

The maximum number of transmissions of a RESET PDU is equal to MaxRST – 1. This protocol parameter represents the upper limit for state variable VT(RST). When VT(RST) equals the value MaxRST, unrecoverable error shall be indicated to upper layers.

f) Configured_Tx_Window_Size.

This protocol parameter indicates both the maximum allowed transmission window size and the value for the state variable VT(WS).

g) Configured_Rx_Window_Size.

This protocol parameter indicates the reception window size.

h) MaxMRW.

The maximum number of transmissions of an MRW command is equal to MaxMRW~~—1~~. This protocol parameter represents the upper limit for state variable VT(MRW). When VT(MRW) equals the value MaxMRW, the RLC RESET procedure shall be initiated.

9.7.3.3 SDU discard after MaxDAT number of transmissions

This alternative uses the number of transmissions as a trigger for SDU discard, and is therefore only applicable for acknowledged mode RLC. This makes the SDU discard function dependent on the channel rate. Also, this variant of the SDU discard function strives to keep the SDU loss rate constant for the connection, on the cost of a variable delay.

If the number of times an AMD PDU is scheduled for transmission reaches MaxDAT~~If MaxDAT number of transmissions is reached for an AMD PDU~~, the Sender shall:

- discard all SDUs segments of which are contained in the AMD PDU; and
- utilise explicit signalling to inform the Receiver according to clause 11.6.

9.7.3.4 No_discard after MaxDAT number of transmissions

This alternative uses the number of transmissions, and is therefore only applicable for acknowledged mode RLC.

If the number of times an AMD PDU is scheduled for transmission reaches MaxDAT~~If MaxDAT number of transmissions is reached for an AMD PDU~~, the Sender shall:

- initiate the RLC Reset procedure (see subclause 11.3.4.4).

11.3.2 Transmission of AMD PDU

Upon a request of acknowledged mode data transfer from upper layers or upon retransmission of AMD PDUs, the Sender shall:

- when RLC SDUs are received from upper layers:
  - segment the RLC SDUs into AMD PDUs where the fixed PDU size is configured by upper layer;
  - set a "Length Indicator" field for each SDU that ends in the AMD PDU according to subclause 9.2.2.8;
  - if "Timer based SDU Discard with explicit signalling" is configured:
    - start a timer Timer_Discard for each SDU received from upper layer (see subclause 9.7.3);
  - schedule the AMD PDUs for transmission;
- if one or several AMD PDUs have been negatively acknowledged (see subclause 11.5.3):
  - schedule the AMD PDUs that were negatively acknowledged for retransmission;
- if a poll has been triggered by either the poll triggers "Poll timer" or "Timer based" (see subclause 9.7.1); and
- if polling is not prohibited (see subclause 9.5); and
- if no AMD PDU is scheduled for transmission or retransmission:
  - if the value of "Configured_Tx_Window_Size" is larger than or equal to "2048":
    - select the AMD PDU with "Sequence Number" equal to VT(S)-1.
  - otherwise if the "Configured_Tx_Window_Size" is less than "2048";
    - select the AMD PDU with "Sequence Number" equal to VT(S)-1; or
    - select an AMD PDU that has not yet been acknowledged by the peer entity;
  - schedule the selected AMD PDU for retransmission (in order to transmit a poll).

The Sender may also schedule an AMD PDU for retransmission even if none of the criteria above is fulfilled. In this case, the Sender may:

- if the value of "Configured_Tx_Window_Size" is larger than or equal to "2048":

- select the AMD PDU with "Sequence Number" equal to VT(S)-1.

- otherwise if the "Configured_Tx_Window_Size" is less than "2048":
  - select the AMD PDU with "Sequence Number" equal to VT(S)-1; or
  - select an AMD PDU that has not yet been acknowledged by the peer entity;
- schedule the selected AMD PDU for retransmission.

Each time an AMD PDU is scheduled for transmission or retransmission, the Sender shall:

- increment the value of the corresponding VT(DAT);
- if VT(DAT) = MaxDAT:
  - perform the actions specified in subclause 11.3.3a;
- e1se:
  - notify the lower layer that data is available for transmission; [Indentation changed to B2]
  - perform the actions specified in subclause 11.3.2.2. [Indentation changed to B2]

In AM, a PDU shall be considered to be a padding PDU if it is:

- an AMD PDU consisting only of an RLC Header with one "Length Indicator" (indicating that the rest of the PDU is padding) and padding; or
- a STATUS PDU consisting only of a NO_MORE SUFI.

11.3.2.2 Submission of AMD PDUs to lower layer

If one or more AMD PDUs have been scheduled for transmission or retransmission according to subclause 11.3.2, the Sender shall:

- not submit any AMD PDUs to lower layer that is not allowed to transmit. AMD PDUs are only allowed to transmit:
  - if the AMD PDU has a "Sequence Number" < VT(MS)~~;~~ or the AMD PDU has a "Sequence Number" equal to VT(S)-1; and
  - ~~if the AMD PDU has a "Sequence Number" equal to VT(S)-1; and~~
  - if the AMD PDU is not restricted to be transmitted by the local suspend function, see subclause 9.7.5;~~.~~
- inform the lower layer of both the numbers of AMD PDUs scheduled and allowed for transmission or retransmission;
- set the AMD PDU contents according to clause 11.3.2.1;
- submit to the lower layer the requested number of AMD PDUs;
- ~~set the AMD PDU contents according to clause 11.3.2.1;~~
- treat retransmissions with higher priority than AMD PDUs transmitted for the first time;
- update the state variables in clause 9.4 for each AMD PDU submitted to lower layer except VT(DAT) which has already been updated, see subclause 11.3.2;
- if the "Polling bit" is set to "1" in any of the AMD PDUs; and
- if the timer Timer_Poll is configured;
  - start the timer Timer_Poll according to subclause 9.5;

- buffer the AMD PDUs that are not submitted to the lower layer according to the discard configuration (see subclause 9.7.3).

11.3.3a Reached maximum number of attempts

If VT(DAT) = MaxDAT, the Sender shall:

- if "No discard after MaxDAT number of transmissions" is configured:
  - initiate the RLC reset procedure, see subclause 11.4;
- if "SDU discard after MaxDAT number of transmissions" is configured:
  - initiate the "SDU discard with explicit signalling" procedure for the corresponding SDU, see subclause 11.6.

11.3.4.4 ~~VT(DAT) ≥ MaxDAT~~Void

~~The Sender shall:~~

- ~~if VT(DAT) ≥ MaxDAT for any AMD PDU:~~
  - ~~if "No_discard after MaxDAT number of transmissions" is configured:~~
    - ~~initiate the RLC reset procedure, see subclause 11.4;~~
  - ~~if "SDU discard after MaxDAT number of transmissions" is configured:~~
    - ~~initiate the "SDU discard with explicit signalling" procedure, see subclause 11.6.~~

11.3.4.7 ~~VT(DAT) ≥ MaxDAT-1~~Void

~~The Sender shall not perform the transmission of the AMD PDU. Instead, it will only increment the corresponding VT(DAT).~~

11.4.2 Initiation

The Sender shall:

- if one of the following triggers is detected:

1) "No_Discard after MaxDAT number of retransmissions" is configured and VT(DAT) equals the value MaxDAT (see subclause 9.7.3.4);
2) VT(MRW) equals the value MaxMRW;
3) A STATUS PDU including "erroneous Sequence Number" is received (see clause 10);
   - stop transmitting any AMD PDU or STATUS PDU;
   - increment VT(RST) by 1;
   - if VT(RST) = MaxRST:
     - perform the actions specified in subclause 11.4.4a;
   - else (if VT(RST) < MaxRST):
     - submit a RESET PDU to the lower layer; [Intentation changed to B3]
     - start the timer Timer_RST ~~and increase VT(RST) with 1~~. [Intentation changed to B3]

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC reset procedure until the end of the next TTI.

When a reset procedure has been initiated it can only be ended upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, or upon request of re-establishment or release from upper layer, a reset procedure is not interrupted by the reception of a RESET PDU from the peer entity.

11.4.4a Reached maximum number of attempts

If VT(RST) = MaxRST, the Sender shall:

- terminate the ongoing RLC RESET procedure;
- stop the timer Timer_RST if it was started;
- indicate unrecoverable error to upper layer.

11.4.5.1 Timer_RST timeout

If Timer_RST expires before the reset procedure is terminated, the Sender shall:

- increment VT(RST) by one;
- if VT(RST)<MaxRST ~~-1~~:
  - set the RESET PDU as previously transmitted (even if additional SDUs were discarded in the mean-time);
  - transmit the RESET PDU;
  - restart Timer_RST;
- else (if VT(RST) = MaxRST):
  - perform the actions specified in subclause 11.4.4a.

~~- increment VT(RST) by one;~~

~~- restart Timer_RST.~~

11.4.5.2 ~~Unrecoverable error (VT(RST) ≥ MaxRST)~~Void

~~The Sender shall:~~

~~- if VT(RST) becomes larger than or equal to MaxRST:~~

~~- indicate unrecoverable error to upper layer.~~

11.6.4a Reached maximum number of attempts

If VT(MRW) = MaxMRW, the Sender shall:

- terminate the SDU discard with explicit signalling procedure;
- stop the timer Timer_MRW if it was started;
- initiate the RLC RESET procedure (see clause 11.4).

11.6.5 Expiration of timer Timer_MRW

If Timer_MRW expires before the discard procedure is terminated, the Sender shall:

- increment VT(RST) by one;
- if VT(MRW)<MaxMRW ~~-1~~:
  - set the MRW SUFI as previously transmitted (even if additional SDUs were discarded in the mean-time);
  - include the MRW SUFI in a new status report (if other SUFIs are included, their contents shall be updated);

- transmit the status report by either including it in a STATUS PDU or piggybacked in an AMD PDU;

~~- increment VT(MRW) by one;~~

- restart Timer_MRW for this discard procedure~~;~~ [Indentation changed to B2]

- else (if VT(MRW) = MaxMRW):

  - perform the actions specified in subclause 11.6.4a.

11.6.6.2 ~~VT(MRW) equals MaxMRW~~Void

~~If the number of retransmission of an MRW SUFI (i.e. VT(MRW)) equals MaxMRW, the Sender shall:~~

~~- terminate the SDU discard with explicit signalling procedure;~~

~~- stop the timer Timer_MRW;~~

~~- deliver an error indication to upper layers;~~

~~- initiate the RLC RESET procedure (see clause 11.4).~~

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13-17 April 2002

Tdoc R2-021415

CR-Form-v4

CHANGE REQUEST

⌘ **25.322 CR 192** ⌘ rev **r1** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☒ Core Network ☐

Title:	⌘	Correction to MaxDAT, MaxRST and MaxMRW
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	13 April 02
Category:	⌘	**A**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
REL-4 *(Release 4)*
REL-5 *(Release 5)*

Reason for change: ⌘

#1 MaxRST: In had been decided that on SRB, no RLC Reset would be allowed and therefore that the value MaxRST = 1 would mean that NO RESET should be transmitted to the per RLC entity. The maximum number of RESET is MaxRST-1 (see section 9.6). But the procedural text of section 11.4 is wrong and corresponds to a maximum of RESET of MaxRST. It would allow one RESET to sent when MaxRST=1.

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Summary of change: ⌘

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The section has been modified to be aligned with 9.6. VT(RST) is incremented before the RESET is submitted to lower layer so that in case of MaxRST=1, no RESET shall be send. For R99 it is still allowed in case MaxRST=1 to send one RESET, before sending the indication of Unrecoverable Error to RRC.

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Rel5 shadow CR

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Other comments:	⌘			

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This sub-clause describes the state variables used in AM and UM in order to specify the peer-to-peer protocol. All state variables are non-negative integers. UMD and AMD PDUs are numbered by modulo integer sequence numbers (SN) cycling through the field: 0 to $2^{12} - 1$ for AM and 0 to $2^{7} - 1$ for UM. All arithmetic operations contained in the present document on VT(S), VT(A), VT(MS), VR(R), VR(H) and VR(MR) are affected by the AM modulus. All arithmetic operations contained in the present document on VT(US) and VR(US) are affected by the UM modulus. When performing arithmetic comparisons of state variables or Sequence number values a modulus base shall be used. This modulus base is subtracted (within the appropriate field) from all the values involved and then an absolute comparison is performed. At the Sender, VT(A) and VT(US) shall be assumed to be the modulus base in AM and UM respectively. At the Receiver, VR(R) and VR(US) shall be assumed to be the modulus base in AM and UM respectively.

The RLC shall maintain the following state variables in the Sender.

a) VT(S) - Send state variable.

   This state variable contains the "Sequence Number" of the next AMD PDU to be transmitted for the first time (i.e. excluding retransmitted PDUs). It shall be updated after the aforementioned AMD PDU is transmitted or after transmission of a MRW SUFI which includes SN_MRW_{LENGTH} >VT(S) (see subclause 11.6). The initial value of this variable is 0.

b) VT(A) - Acknowledge state variable.

   This state variable contains the "Sequence Number" following the "Sequence Number" of the last in-sequence acknowledged AMD PDU. This forms the lower edge of the transmission window of acceptable acknowledgements. VT(A) shall be updated based on the receipt of a STATUS PDU including an ACK (see subclause 9.2.2.11.2) and/or an MRW_ACK SUFI (see subclause 11.6).

   The initial value of this variable is 0. For the purpose of initialising the protocol, this value shall be assumed to be the first "Sequence Number" following the last in-sequence acknowledged AMD PDU.

c) VT(DAT).

   This state variable counts the number of times a AMD PDU has been scheduled to be transmitted. There shall be one VT(DAT) for each PDU and each shall be incremented every time the corresponding AMD PDU is scheduled to be transmitted.

   The initial value of this variable is 0.

d) VT(MS) - Maximum Send state variable.

   This state variable contains the "Sequence Number" of the first AMD PDU that can be rejected by the peer Receiver, VT(MS) = VT(A) + VT(WS). This value represents the upper edge of the transmission window. The transmitter shall not transmit AMD PDUs with "Sequence Number" ≥ VT(MS) unless VT(S) ≥ VT(MS). In that case, the AMD PDU with "Sequence Number" = VT(S) - 1 can also be transmitted. VT(MS) shall be updated when VT(A) or VT(WS) is updated.

   The initial value of this variable is Configured_Tx_Window_size.

e) VT(US) – UM data state variable.

   This state variable contains the "Sequence Number" of the next UMD PDU to be transmitted. It shall be incremented by 1 each time a UMD PDU is transmitted.

   The initial value of this variable is 0.

NOTE: For the UTRAN side, the initial value of this variable can be different from 0.

f) VT(PDU).

   This state variable is used when the "poll every Poll_PDU PDU" polling trigger is configured. It shall be incremented by 1 for each AMD PDU that is transmitted including both new and retransmitted AMD PDUs.

When it becomes equal to the value Poll_PDU, a new poll shall be transmitted and the state variable shall be set to zero.

The initial value of this variable is 0.

g) VT(SDU).

This state variable is used when the "poll every Poll_SDU SDU" polling trigger is configured. It shall be incremented by 1 for a given SDU when all the AMD PDUs carrying a part of this SDU have been transmitted at least once. When it becomes equal to the value Poll_SDU a new poll shall be transmitted and the state variable shall be set to zero. The "Polling bit" shall be set to "1" in the first transmission of the AMD PDU that contains the last segment of the SDU.

The initial value of this variable is 0.

h) VT(RST) - Reset state variable.

This state variable is used to count the number of times a RESET PDU is scheduled to be transmitted before the reset procedure is completed. VT(RST) shall be incremented by 1 each time a RESET PDU is scheduled to be transmitted. VT(RST) shall only be reset upon the reception of a RESET ACK PDU, i.e. VT(RST) shall not be reset when an RLC reset initiated by the peer RLC entity occurs.

The initial value of this variable is 0.

i) VT(MRW) – MRW command send state variable.

This state variable is used to count the number of times a MRW command is scheduled to be transmitted. VT(MRW) is incremented by 1 each time an MRW SUFI is scheduled to be transmitted. VT(MRW) shall be reset when the SDU discard with explicit signalling procedure is terminated. The initial value of this variable is 0.

j) VT(WS) – Transmission window size state variable.

This state variable contains the size that shall be used for the transmission window. VT(WS) shall be set equal to the WSN field when the transmitter receives a STATUS PDU including a WINDOW SUFI.

The initial value of this variable is Configured_Tx_Window_size.

The RLC shall maintain the following state variables in the Receiver:

a) VR(R) - Receive state variable.

This state variable contains the "Sequence Number" following that of the last in-sequence AMD PDU received. It shall be updated upon the receipt of the AMD PDU with "Sequence Number" equal to VR(R).

The initial value of this variable is 0. For the purpose of initialising the protocol, this value shall be assumed to be the first "Sequence Number" following the last in-sequence received AMD PDU.

b) VR(H) - Highest expected state variable.

This state variable contains the "Sequence Number" following the highest "Sequence Number" of any received AMD PDU. When a AMD PDU is received with "Sequence Number" x such that $VR(H) \leq x < VR(MR)$, this state variable shall be set equal to x+1.

The initial value of this variable is 0.

c) VR(MR) - Maximum acceptable Receive state variable.

This state variable contains the "Sequence Number" of the first AMD PDU that shall be rejected by the Receiver, VR(MR) = VR(R) + Configured_Rx_Window_Size.

d) VR(US) - Receiver Send Sequence state variable.

This state variable contains the "Sequence Number" following that of the last UMD PDU received. When a UMD PDU with "Sequence Number" equal to x is received, the state variable shall set equal to x + 1.

The initial value of this variable is 0.

e) VR(EP) - Estimated PDU Counter state variable.

This state variable contains the number of AMD PDUs whose re-transmission is still expected as a consequence of the transmission of the latest status report. At the end of each TTI it is decremented by the total number of AMD PDUs that were received during that time.

9.6 Protocol Parameters

The behaviour defined in this subclause is normative. The values of the protocol parameters defined in this subclause are signalled by upper layers.

a) MaxDAT.

The maximum number of transmissions of an AMD PDU is equal to MaxDAT – 1. This protocol parameter represents the upper limit for state variable VT(DAT). When VT(DAT) equals the value MaxDAT, either RLC RESET procedure or SDU discard procedure shall be initiated according to the configuration by upper layers.

b) Poll_PDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_PDU PDU" is configured by upper layers. It represents the upper limit for the state variable VT(PDU). When VT(PDU) equals the value Poll_PDU a poll shall be transmitted to the peer entity.

c) Poll_SDU.

This protocol parameter indicates how often the transmitter shall poll the Receiver in the case where "polling every Poll_SDU SDU" is configured by upper layers. It represents the upper limit for state variable VT(SDU). When VT(SDU) equals the value Poll_SDU a poll shall be transmitted to the peer entity.

d) Poll_Window.

This protocol parameter indicates when the transmitter shall poll the Receiver in the case where "window-based polling" is configured by upper layers. A poll is triggered for each AMD PDU when $J \geq$ Poll_Window, where J is the transmission window percentage defined as:

$$J = \frac{(4096+VT(S)+1-VT(A)) \textbf{ mod } 4096}{VT(WS)} * 100 ,$$

where the constant 4096 is the modulus for AM described in subclause 9.4 and VT(S) is the value of the variable before the AMD PDU is submitted to lower layer.

e) MaxRST.

The maximum number of transmissions of a RESET PDU is equal to MaxRST – 1. This protocol parameter represents the upper limit for state variable VT(RST). When VT(RST) equals the value MaxRST, unrecoverable error shall be indicated to upper layers.

f) Configured_Tx_Window_Size.

This protocol parameter indicates both the maximum allowed transmission window size and the value for the state variable VT(WS).

g) Configured_Rx_Window_Size.

This protocol parameter indicates the reception window size.

h) MaxMRW.

The maximum number of transmissions of an MRW command is equal to MaxMRW~~—1~~. This protocol parameter represents the upper limit for state variable VT(MRW). When VT(MRW) equals the value MaxMRW, the RLC RESET procedure shall be initiated.

9.7.3.3 SDU discard after MaxDAT number of transmissions

This alternative uses the number of transmissions as a trigger for SDU discard, and is therefore only applicable for acknowledged mode RLC. This makes the SDU discard function dependent on the channel rate. Also, this variant of the SDU discard function strives to keep the SDU loss rate constant for the connection, on the cost of a variable delay.

If the number of times an AMD PDU is scheduled for transmission reaches MaxDAT~~If MaxDAT number of transmissions is reached for an AMD PDU~~, the Sender shall:

- discard all SDUs segments of which are contained in the AMD PDU; and
- utilise explicit signalling to inform the Receiver according to clause 11.6.

9.7.3.4 No_discard after MaxDAT number of transmissions

This alternative uses the number of transmissions, and is therefore only applicable for acknowledged mode RLC.

If the number of times an AMD PDU is scheduled for transmission reaches MaxDAT~~If MaxDAT number of transmissions is reached for an AMD PDU~~, the Sender shall:

- initiate the RLC Reset procedure (see subclause 11.3.4.4).

11.3.2 Transmission of AMD PDU

Upon a request of acknowledged mode data transfer from upper layers or upon retransmission of AMD PDUs, the Sender shall:

- when RLC SDUs are received from upper layers:
  - segment the RLC SDUs into AMD PDUs where the fixed PDU size is configured by upper layer;
  - set a "Length Indicator" field for each SDU that ends in the AMD PDU according to subclause 9.2.2.8;
  - if "Timer based SDU Discard with explicit signalling" is configured:
    - start a timer Timer_Discard for each SDU received from upper layer (see subclause 9.7.3);
  - schedule the AMD PDUs for transmission;
- if one or several AMD PDUs have been negatively acknowledged (see subclause 11.5.3):
  - schedule the AMD PDUs that were negatively acknowledged for retransmission;
- if a poll has been triggered by either the poll triggers "Poll timer" or "Timer based" (see subclause 9.7.1); and
- if polling is not prohibited (see subclause 9.5); and
- if no AMD PDU is scheduled for transmission or retransmission:
  - if the value of "Configured_Tx_Window_Size" is larger than or equal to "2048":
    - select the AMD PDU with "Sequence Number" equal to VT(S)-1.
  - otherwise if the "Configured_Tx_Window_Size" is less than "2048";
    - select the AMD PDU with "Sequence Number" equal to VT(S)-1; or
    - select an AMD PDU that has not yet been acknowledged by the peer entity;
  - schedule the selected AMD PDU for retransmission (in order to transmit a poll).

The Sender may also schedule an AMD PDU for retransmission even if none of the criteria above is fulfilled. In this case, the Sender may:

- if the value of "Configured_Tx_Window_Size" is larger than or equal to "2048":

- select the AMD PDU with "Sequence Number" equal to VT(S)-1.

- otherwise if the "Configured_Tx_Window_Size" is less than "2048":
  - select the AMD PDU with "Sequence Number" equal to VT(S)-1; or
  - select an AMD PDU that has not yet been acknowledged by the peer entity;
- schedule the selected AMD PDU for retransmission.

Each time an AMD PDU is scheduled for transmission or retransmission, the Sender shall:

- increment the value of the corresponding VT(DAT);
- if VT(DAT) = MaxDAT:
  - perform the actions specified in subclause 11.3.3a;
- e1se:
  - notify the lower layer that data is available for transmission; [Indentation changed to B2]
  - perform the actions specified in subclause 11.3.2.2. [Indentation changed to B2]

In AM, a PDU shall be considered to be a padding PDU if it is:

- an AMD PDU consisting only of an RLC Header with one "Length Indicator" (indicating that the rest of the PDU is padding) and padding; or
- a STATUS PDU consisting only of a NO_MORE SUFI.

11.3.2.2 Submission of AMD PDUs to lower layer

If one or more AMD PDUs have been scheduled for transmission or retransmission according to subclause 11.3.2, the Sender shall:

- not submit any AMD PDUs to lower layer that is not allowed to transmit. AMD PDUs are only allowed to transmit:
  - if the AMD PDU has a "Sequence Number" < VT(MS)~~;~~ or the AMD PDU has a "Sequence Number" equal to VT(S)-1; and
  - ~~if the AMD PDU has a "Sequence Number" equal to VT(S)-1; and~~
  - if the AMD PDU is not restricted to be transmitted by the local suspend function, see subclause 9.7.5;~~.~~
- inform the lower layer of both the numbers of AMD PDUs scheduled and allowed for transmission or retransmission;
- set the AMD PDU contents according to clause 11.3.2.1;
- submit to the lower layer the requested number of AMD PDUs;
- ~~set the AMD PDU contents according to clause 11.3.2.1;~~
- treat retransmissions with higher priority than AMD PDUs transmitted for the first time;
- update the state variables in clause 9.4 for each AMD PDU submitted to lower layer except VT(DAT) which has already been updated, see subclause 11.3.2;
- if the "Polling bit" is set to "1" in any of the AMD PDUs; and
- if the timer Timer_Poll is configured;
  - start the timer Timer_Poll according to subclause 9.5;

- buffer the AMD PDUs that are not submitted to the lower layer according to the discard configuration (see subclause 9.7.3).

11.3.3a Reached maximum number of attempts

If VT(DAT) = MaxDAT, the Sender shall:

- if "No discard after MaxDAT number of transmissions" is configured:
  - initiate the RLC reset procedure, see subclause 11.4;
- if "SDU discard after MaxDAT number of transmissions" is configured:
  - initiate the "SDU discard with explicit signalling" procedure for the corresponding SDU, see subclause 11.6.

11.3.4.4 ~~VT(DAT) ≥ MaxDAT~~Void

~~The Sender shall:~~

- ~~if VT(DAT) ≥ MaxDAT for any AMD PDU:~~
  - ~~if "No_discard after MaxDAT number of transmissions" is configured:~~
    - ~~initiate the RLC reset procedure, see subclause 11.4;~~
  - ~~if "SDU discard after MaxDAT number of transmissions" is configured:~~
    - ~~initiate the "SDU discard with explicit signalling" procedure, see subclause 11.6.~~

11.3.4.7 ~~VT(DAT) ≥ MaxDAT-1~~Void

~~The Sender shall not perform the transmission of the AMD PDU. Instead, it will only increment the corresponding VT(DAT).~~

11.4.2 Initiation

The Sender shall:

- if one of the following triggers is detected:

1) "No_Discard after MaxDAT number of retransmissions" is configured and VT(DAT) equals the value MaxDAT (see subclause 9.7.3.4);
2) VT(MRW) equals the value MaxMRW;
3) A STATUS PDU including "erroneous Sequence Number" is received (see clause 10);
   - stop transmitting any AMD PDU or STATUS PDU;
   - increment VT(RST) by 1;
   - if VT(RST) = MaxRST:
     - perform the actions specified in subclause 11.4.4a;
   - else (if VT(RST) < MaxRST):
     - submit a RESET PDU to the lower layer; [Intentation changed to B3]
     - start the timer Timer_RST ~~and increase VT(RST) with 1~~. [Intentation changed to B3]

NOTE: If the TFC selection exchange has been initiated by sending the RLC Entity Info parameter to MAC, the RLC entity may delay the RLC reset procedure until the end of the next TTI.

When a reset procedure has been initiated it can only be ended upon reception of a RESET ACK PDU with the same RSN value as in the corresponding RESET PDU, or upon request of re-establishment or release from upper layer, a reset procedure is not interrupted by the reception of a RESET PDU from the peer entity.

11.4.4a Reached maximum number of attempts

If VT(RST) = MaxRST, the Sender shall:

- terminate the ongoing RLC RESET procedure;
- stop the timer Timer_RST if it was started;
- indicate unrecoverable error to upper layer.

11.4.5.1 Timer_RST timeout

If Timer_RST expires before the reset procedure is terminated, the Sender shall:

- increment VT(RST) by one;
- if VT(RST)<MaxRST ~~-1~~:
  - set the RESET PDU as previously transmitted (even if additional SDUs were discarded in the mean-time);
  - transmit the RESET PDU;
  - restart Timer_RST;
- else (if VT(RST) = MaxRST):
  - perform the actions specified in subclause 11.4.4a.

~~- increment VT(RST) by one;~~

~~- restart Timer_RST.~~

11.4.5.2 ~~Unrecoverable error (VT(RST) ≥ MaxRST)~~Void

~~The Sender shall:~~

~~- if VT(RST) becomes larger than or equal to MaxRST:~~

~~- indicate unrecoverable error to upper layer.~~

11.6.4a Reached maximum number of attempts

If VT(MRW) = MaxMRW, the Sender shall:

- terminate the SDU discard with explicit signalling procedure;
- stop the timer Timer_MRW if it was started;
- initiate the RLC RESET procedure (see clause 11.4).

11.6.5 Expiration of timer Timer_MRW

If Timer_MRW expires before the discard procedure is terminated, the Sender shall:

- increment VT(RST) by one;
- if VT(MRW)<MaxMRW ~~-1~~:
  - set the MRW SUFI as previously transmitted (even if additional SDUs were discarded in the mean-time);
  - include the MRW SUFI in a new status report (if other SUFIs are included, their contents shall be updated);

- transmit the status report by either including it in a STATUS PDU or piggybacked in an AMD PDU;

~~- increment VT(MRW) by one;~~

- restart Timer_MRW for this discard procedure~~;~~ [Indentation changed to B2]

- else (if VT(MRW) = MaxMRW):

  - perform the actions specified in subclause 11.6.4a.

11.6.6.2 ~~VT(MRW) equals MaxMRW~~Void

~~If the number of retransmission of an MRW SUFI (i.e. VT(MRW)) equals MaxMRW, the Sender shall:~~

~~- terminate the SDU discard with explicit signalling procedure;~~

~~- stop the timer Timer_MRW;~~

~~- deliver an error indication to upper layers;~~

~~- initiate the RLC RESET procedure (see clause 11.4).~~

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CHANGE REQUEST

⌘ **25.322** **CR** **193** ⌘ **rev** **-** ⌘ Current version: **3.10.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Clarification on polling functions
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-16
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

1. The behaviour of "Last PDU in buffer" is specified ambiguously. The subject of "is allowed to …" is unclear.
2. The behaviour of "Last PDU in Retransmission buffer" is specified ambiguously. The subject of "is allowed to …" is unclear. In addition, since any un-acknowledged PDU and acknowledged PDU of SN=VT(S)-1 are also allowed to re-transmit, it should be clarified whether the last of NACKed PDUs will ~~not~~ triggered the polling function.
3. The statement in subclause 9.7.2, "The Receiver shall always send a status report when receiving a poll request", misleads that the poll request has higher priority to the status prohibit functions.

Summary of change: ⌘

1. The wording specifying the behaviour of "Last PDU in buffer" is modified.
2. The wording specifying the behaviour of "Last PDU in Retransmission buffer" is modified ~~and "Negatively acknowledged" criterion is added~~ to clarify the functionality.
3. The mentioned statement in subclause 9.7.2 is clarified to mean that the poll request does not have higher priority to the status prohibit functions.

Impact analysis:

The affected functionalities are isolated to the proposed changing topics.
There are no backwards compatibility problems since this CR contains clarifying corrections only.

Consequences if not approved: ⌘ Ambiguous specification. UEs implemented according to misled behaviours may not pass some test cases.

Clauses affected: ⌘ 9.7.1, 9.7.2

Other specs affected: ⌘

- ☐ Other core specifications ⌘ 25.322 v4.4.0, CR 194
  25.322 v5.0.0, CR 195
- ☐ Test specifications
- ☐ O&M Specifications

Other comments:	⌘	The current Package 1 test case tc_7_2_~~2~~3_16 was based on the assumption that UE shall poll at the last of NACKed PDUs. The assumption is not true by clarification of this CR so that some UEs conformed to the specification may not pass the current test case. This test case need be corrected.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.7.1 Polling function for acknowledged mode

The Polling function is used by the Sender to request the peer RLC entity for a status report. The "Polling bit" in the AMD PDU indicates the poll request. There are several triggers for initiating the Polling function. Which of the triggers shall be used is configured by upper layers for each RLC entity. The following triggers can be configured:

1) Last PDU in buffer.

   When an AMD PDU to be transmitted for the first time is submitted to lower layer, the Sender shall:

   - if the AMD PDU is the last AMD PDU scheduled for transmission according to subclause 11.3.2 (i.e. no data received from upper layer remains to be segmented into AMD PDUs); or

   - if the AMD PDU is the last AMD PDU that is allowed to transmit according to subclause 11.3.2.2:

     - trigger a poll for this AMD PDU.

   ~~The Sender triggers the Polling function when the last AMD PDU to be transmitted for the first time and is allowed to transmit according to subclause 11.3.2.2 is submitted to lower layer.~~

2) Last PDU in Retransmission buffer.

   When a retransmitted AMD PDU is submitted to lower layer, the Sender shall:

   - if the AMD PDU is the last AMD PDU scheduled for retransmission according to subclause 11.3.2; or

   - if the AMD PDU is the last of the AMD PDUs scheduled for retransmission that are allowed to transmit according to subclause 11.3.2.2:

     - trigger a poll for this AMD PDU.

   ~~The Sender triggers the Polling function when the last AMD PDU to be retransmitted and is allowed to transmit according to subclause 11.3.2.2 is submitted to lower layer.~~

3) Poll timer.

   The timer Timer_Poll is started and stopped according to subclause 9.5 a). When the timer Timer_Poll expires the Sender triggers the Polling function.

4) Every Poll_PDU PDU.

   The Sender triggers the Polling function for every Poll_PDU PDU. Both retransmitted and new AMD PDUs shall be counted.

5) Every Poll_SDU SDU.

   The Sender triggers the Polling function for every Poll_SDU SDU. The poll shall be triggered for the first transmission of the last AMD PDU that contains segments of the RLC SDU.

6) Window based.

   The Sender triggers the Polling function when the condition described in subclause 9.6 d) ("Poll_Window") is fulfilled.

7) Timer based.

   The Sender triggers the Polling function periodically.

UTRAN should configure RLC to avoid deadlock situations.

The Poll Prohibit function is used by the Sender to delay the initiation of the Polling function. Usage of the Poll Prohibit function is configured by upper layers. The Poll Prohibit function consists of starting the timer Timer_Poll_Prohibit according to subclause 9.5 b) and delaying the Polling function according to the following rules:

When the Polling function is triggered, the Sender shall:

- if polling is not prohibited (see subclause 9.5 b)); and

- if there is one or more AMD PDUs to be transmitted or there are AMD PDUs not acknowledged by the Receiver:
  - initiate the Polling function by setting the polling bit according to subclause 11.3.2.1.1.
- otherwise (if there is no PDU to be transmitted and all PDUs have already been acknowledged):
  - not initiate the Polling function.

Upon expiry of the timer Timer_Poll_Prohibit, the Sender shall:

- if the Polling function was triggered at least once while the timer Timer_Poll_Prohibit was active; and
- if there is one or more AMD PDUs to be transmitted or there are AMD PDUs not acknowledged by the Receiver:
  - initiate the Polling function once by setting the polling bit according to subclause 11.3.2.1.1.
- otherwise (if there is no PDU to be transmitted and all PDUs have already been acknowledged):
  - not initiate the Polling function.

9.7.2 STATUS transmission for acknowledged mode

The Receiver ~~of~~ transmits status reports to the Sender in order to inform the Sender about which AMD PDUs have been received and not received. Each status report consists of one or several STATUS PDUs. The Receiver shall trigger the transmission of ~~always send~~ a status report when receiving a poll request. Additionally, the following triggers for transmission of status reports are configurable by upper layers:

1) Detection of missing PDU(s).

   If the Receiver detects one or several missing AMD PDUs it shall trigger the transmission of a status report to the Sender.

2) Timer based status report transfer.

   The Receiver triggers the transmission of a status report to the Sender periodically. The timer Timer_Status_Periodic controls the time period according to subclause 9.5 g). When "Periodical Status blocking" is configured by upper layers, the trigger shall not be active.

3) The EPC mechanism.

   The timer Timer_EPC is started according to subclause 9.5 c) and the state variable VR(EP) is set and decreased according to subclause 9.7.4. If not all AMD PDUs requested for retransmission have been received before the variable VR(EP) equalled zero, a new status report is triggered by the Receiver. A more detailed description of the EPC mechanism is given in subclause 9.7.4.

There are two functions that can prohibit the Receiver from sending a status report containing any of the SUFIs LIST, BITMAP, RLIST or ACK. Status reports containing other SUFIs are not prohibited. Upper layers control which functions should be used for each RLC entity. If any of the following functions is used the transmission of the status report shall be delayed, even if any of the triggering conditions above are fulfilled:

1) STATUS prohibit.

   The timer Timer_Status_Prohibit is started according to subclause 9.5 f). The Receiver is not allowed to transmit a status report while acknowledgement is prohibited (see subclause 9.5 f)). If a status report was triggered during this time, the status report is transmitted after the timer Timer_Status_Prohibit has expired, as described below.

2) The EPC mechanism.

   If the "EPC mechanism" is active and the transmission of a status report is triggered it shall be delayed until the "EPC mechanism" has ended, as described below.

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CHANGE REQUEST

⌘ **25.322** **CR** **194** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Clarification on polling functions
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-17
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘
1. The behaviour of "Last PDU in buffer" is specified ambiguously. The subject of "is allowed to …" is unclear.
2. The behaviour of "Last PDU in Retransmission buffer" is specified ambiguously. The subject of "is allowed to …" is unclear. In addition, since any un-acknowledged PDU and acknowledged PDU of SN=VT(S)-1 are also allowed to re-transmit, it should be clarified whether the last of NACKed PDUs will triggered the polling function.
3. The statement in subclause 9.7.2, "The Receiver shall always send a status report when receiving a poll request", misleads that the poll request has higher priority to the status prohibit functions.

Summary of change: ⌘
1. The wording specifying the behaviour of "Last PDU in buffer" is modified.
2. The wording specifying the behaviour of "Last PDU in Retransmission buffer" is modified to clarify the functionality.
3. The mentioned statement in subclause 9.7.2 is clarified to mean that the poll request does not have higher priority to the status prohibit functions.

Consequences if not approved: ⌘ Ambiguous specification. UEs implemented according to misled behaviours may not pass some test cases.

Clauses affected: ⌘ 9.7.1, 9.7.2

Other specs affected: ⌘

☐	Other core specifications	25.322 v3.10.0, CR 193 25.322 v5.0.0, CR 195
☐	Test specifications	
☐	O&M Specifications	

Other comments: ⌘

How to create CRs using this form:
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Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

9.7.1 Polling function for acknowledged mode

The Polling function is used by the Sender to request the peer RLC entity for a status report. The "Polling bit" in the AMD PDU indicates the poll request. There are several triggers for initiating the Polling function. Which of the triggers shall be used is configured by upper layers for each RLC entity. The following triggers can be configured:

1) Last PDU in buffer.

   When an AMD PDU to be transmitted for the first time is submitted to lower layer, the Sender shall:

   - if the AMD PDU is the last AMD PDU scheduled for transmission according to subclause 11.3.2 (i.e. no data received from upper layer remains to be segmented into AMD PDUs); or

   - if the AMD PDU is the last AMD PDU that is allowed to transmit according to subclause 11.3.2.2:

     - trigger a poll for this AMD PDU.

   ~~The Sender triggers the Polling function when the last AMD PDU to be transmitted for the first time and is allowed to transmit according to subclause 11.3.2.2 is submitted to lower layer.~~

2) Last PDU in Retransmission buffer.

   When a retransmitted AMD PDU is submitted to lower layer, the Sender shall:

   - if the AMD PDU is the last AMD PDU scheduled for retransmission according to subclause 11.3.2; or

   - if the AMD PDU is the last of the AMD PDUs scheduled for retransmission that are allowed to transmit according to subclause 11.3.2.2:

     - trigger a poll for this AMD PDU.

   ~~The Sender triggers the Polling function when the last AMD PDU to be retransmitted and is allowed to transmit according to subclause 11.3.2.2 is submitted to lower layer.~~

3) Poll timer.

   The timer Timer_Poll is started and stopped according to subclause 9.5 a). When the timer Timer_Poll expires the Sender triggers the Polling function.

4) Every Poll_PDU PDU.

   The Sender triggers the Polling function for every Poll_PDU PDU. Both retransmitted and new AMD PDUs shall be counted.

5) Every Poll_SDU SDU.

   The Sender triggers the Polling function for every Poll_SDU SDU. The poll shall be triggered for the first transmission of the last AMD PDU that contains segments of the RLC SDU.

6) Window based.

   The Sender triggers the Polling function when the condition described in subclause 9.6 d) ("Poll_Window") is fulfilled.

7) Timer based.

   The Sender triggers the Polling function periodically.

UTRAN should configure RLC to avoid deadlock situations.

The Poll Prohibit function is used by the Sender to delay the initiation of the Polling function. Usage of the Poll Prohibit function is configured by upper layers. The Poll Prohibit function consists of starting the timer Timer_Poll_Prohibit according to subclause 9.5 b) and delaying the Polling function according to the following rules:

When the Polling function is triggered, the Sender shall:

- if polling is not prohibited (see subclause 9.5 b)); and

- if there is one or more AMD PDUs to be transmitted or there are AMD PDUs not acknowledged by the Receiver:
  - initiate the Polling function by setting the polling bit according to subclause 11.3.2.1.1.
- otherwise (if there is no PDU to be transmitted and all PDUs have already been acknowledged):
  - not initiate the Polling function.

Upon expiry of the timer Timer_Poll_Prohibit, the Sender shall:

- if the Polling function was triggered at least once while the timer Timer_Poll_Prohibit was active; and
- if there is one or more AMD PDUs to be transmitted or there are AMD PDUs not acknowledged by the Receiver:
  - initiate the Polling function once by setting the polling bit according to subclause 11.3.2.1.1.
- otherwise (if there is no PDU to be transmitted and all PDUs have already been acknowledged):
  - not initiate the Polling function.

9.7.2 STATUS transmission for acknowledged mode

The Receiver ~~of~~ transmits status reports to the Sender in order to inform the Sender about which AMD PDUs have been received and not received. Each status report consists of one or several STATUS PDUs. The Receiver shall trigger the transmission of ~~always send~~ a status report when receiving a poll request. Additionally, the following triggers for transmission of status reports are configurable by upper layers:

1) Detection of missing PDU(s).

   If the Receiver detects one or several missing AMD PDUs it shall trigger the transmission of a status report to the Sender.

2) Timer based status report transfer.

   The Receiver triggers the transmission of a status report to the Sender periodically. The timer Timer_Status_Periodic controls the time period according to subclause 9.5 g). When "Periodical Status blocking" is configured by upper layers, the trigger shall not be active.

3) The EPC mechanism.

   The timer Timer_EPC is started according to subclause 9.5 c) and the state variable VR(EP) is set and decreased according to subclause 9.7.4. If not all AMD PDUs requested for retransmission have been received before the variable VR(EP) equalled zero, a new status report is triggered by the Receiver. A more detailed description of the EPC mechanism is given in subclause 9.7.4.

There are two functions that can prohibit the Receiver from sending a status report containing any of the SUFIs LIST, BITMAP, RLIST or ACK. Status reports containing other SUFIs are not prohibited. Upper layers control which functions should be used for each RLC entity. If any of the following functions is used the transmission of the status report shall be delayed, even if any of the triggering conditions above are fulfilled:

1) STATUS prohibit.

   The timer Timer_Status_Prohibit is started according to subclause 9.5 f). The Receiver is not allowed to transmit a status report while acknowledgement is prohibited (see subclause 9.5 f)). If a status report was triggered during this time, the status report is transmitted after the timer Timer_Status_Prohibit has expired, as described below.

2) The EPC mechanism.

   If the "EPC mechanism" is active and the transmission of a status report is triggered it shall be delayed until the "EPC mechanism" has ended, as described below.

3GPP TSG-RAN WG2 Meeting #29
Gyeongju, Korea, 13 - 17 May 2002

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CR-Form-v5.1

CHANGE REQUEST

⌘ **25.322** **CR** **195** ⌘ **rev** **-** ⌘ Current version: **5.0.0** ⌘

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Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-05-17
Category:	⌘	**A**
Release:	⌘	REL-5

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Reason for change:	⌘	1. The behaviour of "Last PDU in buffer" is specified ambiguously. The subject of "is allowed to …" is unclear. 2. The behaviour of "Last PDU in Retransmission buffer" is specified ambiguously. The subject of "is allowed to …" is unclear. In addition, since any un-acknowledged PDU and acknowledged PDU of SN=VT(S)-1 are also allowed to re-transmit, it should be clarified whether the last of NACKed PDUs will triggered the polling function. 3. The statement in subclause 9.7.2, "The Receiver shall always send a status report when receiving a poll request", misleads that the poll request has higher priority to the status prohibit functions.
Summary of change:	⌘	1. The wording specifying the behaviour of "Last PDU in buffer" is modified. 2. The wording specifying the behaviour of "Last PDU in Retransmission buffer" is modified to clarify the functionality. 3. The mentioned statement in subclause 9.7.2 is clarified to mean that the poll request does not have higher priority to the status prohibit functions.
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