TSG-RAN Meeting #19 ***RP-030116***
Birmingham, UK, 11 - 14 March 2003

Title: **CR (Rel-5) on TS 25.322**

Source: **TSG-RAN WG2**

Agenda item: **8.2.5**

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.322	217	-	Rel-5	Enhancement of MRW procedure	C	5.3.0	5.4.0	R2-030562	TEI5

3GPP TSG-RAN WG2 #34 ***R2-030562***
Sophia Antipolis, France, 17th-21st February, 2003

CR-Form-v7

CHANGE REQUEST

⌘ **25.322** **CR** **217** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☒ Core Network ☐

Title:	⌘	Enhancement of MRW procedure
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI5
Date:	⌘	February 2003
Category:	⌘	**C**
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)*
Rel-6 *(Release 6)*

Reason for change: ⌘

At the RAN2 #33 meeting, it was shown in R2-022919 that the current MRW procedure is not efficient when the SDUs are discretely discarded. In that document, the inefficiency is analysed to come from the following two restrictions.

- When a SDU is discarded by a discard trigger, the Sender discards all SDUs from the SDU that lies at the lower edge of the transmission window to the SDU that discarded by the discard trigger.

- When the Receiver receives a MRW command, the Receiver discards all SDUs from the SDU that lies at the lower edge of the reception window to the last SDU that indicated by the MRW command.

This CR aims at improving the MRW procedure at least from Rel-5 by removing such restrictions.

Summary of change: ⌘

The proposed change is;

- When a SDU is discarded by a discard trigger, the Sender checks all SDUs from the SDU that lies at the lower edge of the transmission window to the SDU that discarded by the discard trigger. Among those SDUs, the Sender discards only the SDUs that are not yet positively acknowledged.

- When the Receiver receives a MRW command, the Receiver checks all SDUs from the SDU that lies at the lower edge of the reception window to the last SDU that indicated by the MRW command. Among those SDUs, the Receiver discards only the SDUs that are not yet successfully received.

The related parts are changed in this light.

Consequences if not approved:	⌘	When several SDUs are discretely discarded, - either it takes long time to move the reception window - or loses transmission efficiency due to the discard of correctly received SDUs depending on the implementation

Clauses affected:	⌘	9.2.2.11.8, 11.6.3			
Other specs Affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	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.

9.2.2.11.8 The Move Receiving Window (MRW) super-field

The 'Move Receiving Window' super-field is used to request the Receiver to move its reception window and optionally to indicate the set of discarded RLC SDUs, as a result of an RLC SDU discard in the Sender. The format is given in figure 9.15 below.

Type = **MRW**
LENGTH
SN_MRW_1
SN_MRW_2
...
SN_MRW_{LENGTH}
N_{LENGTH}

Figure 9.15: The MRW fields in a STATUS PDU

LENGTH

Length: 4 bits

The number of SN_MRW_i fields in the super-field of type MRW.

The values "0001" through "1111" indicate 1 through 15 SN_MRW_i respectively. The value "0000" indicates that one SN_MRW_i field is present and that the RLC SDU to be discarded in the Receiver extends above the configured transmission window in the Sender.

SN_MRW_i

Length: 12 bits

When "Send MRW" is configured, an SN_MRW_i shall be used to indicate the end of each discarded RLC SDU, i.e. the number of SN_MRW_i fields shall equal the number of RLC SDUs discarded by that MRW SUFI. When "Send MRW" is not configured, an SN_MRW_i field shall be used to indicate the end of the last RLC SDU to be discarded in the Receiver and additional ones may optionally be used to indicate the end of other discarded RLC SDUs. SN_MRW_i is the "Sequence Number" of the AMD PDU that contains the "Length Indicator" of the i:th RLC SDU to be discarded in the Receiver (except for SN_MRW_{LENGTH} when $N_{LENGTH} = 0$, see definition of N_{LENGTH}). The order of the SN_MRW_i shall be in the same sequential order as the RLC SDUs that they refer to.

Additionally SN_MRW_{LENGTH} requests the Receiver to discard all not yet successfully received SDUs that have segments in the AMD PDUs with "Sequence Number" < SN_MRW_{LENGTH}, and to move the reception window accordingly. In addition, when $N_{LENGTH} > 0$, the Receiver has to discard the not yet successfully received SDUs that have segments 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} ~~first N_{LENGTH} "Length Indicators" and the corresponding data octets in the AMD PDU with "Sequence Number" SN_MRW_{LENGTH}~~.

N_{LENGTH}

Length: 4 bits

N_{LENGTH} is used together with SN_MRW_{LENGTH} to indicate the end of the last RLC SDU to be discarded in the Receiver.

N_{LENGTH} indicates which "Length Indicator" in the AMD PDU with "Sequence Number" SN_MRW_{LENGTH} corresponds to the last RLC SDU to be discarded in the Receiver. $N_{LENGTH} = 0$ indicates that the last RLC SDU ended in the AMD PDU with "Sequence Number" $SN\_MRW_{LENGTH} - 1$ and that the first data octet in the AMD PDU with "Sequence Number" SN_MRW_{LENGTH} is the first data octet to be reassembled next.

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.

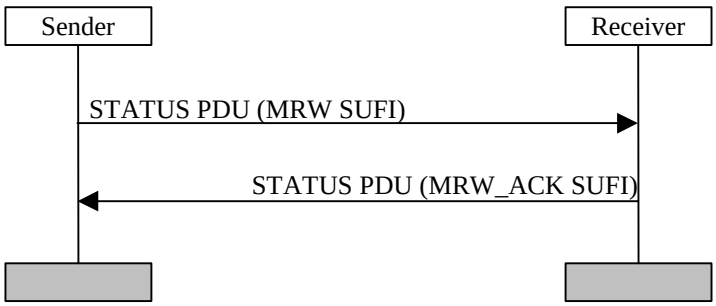

Figure 11.6: SDU discard with explicit signalling

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.
- if requested:
  - inform the upper layers of the discarded SDUs
- 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) ≤ 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};

- deliver all the successfully received SDUs from the SDU that have segments in AMD PDU with "Sequence Number" of VR(R) up to and including the last SDU that is indicated by the MRW SUFI;

- 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.