TSG-RAN Meeting #6
Nice, France, 13 – 15 December 1999

TSGRP#6(99)643

Title: **Agreed CRs of category "B" (New feature) to TS 25.322**

Source: **TSG-RAN WG2**

Agenda item: **5.2.3**

Doc #	Status-	Spec	CR	Rev	Subject	Cat	Versio	Versio
R2-99g52	agreed	25.322	003	1	MRW procedure	B	3.0.0	3.1.0
R2-99h56	agreed	25.322	004		SDU Discard Functionality	B	3.0.0	3.1.0
R2-99k70	agreed	25.322	005	2	Change in RLC control PDU format	B	3.0.0	3.1.0
R2-99k72	agreed	25.322	016	1	Introduction of RLC suspend state	B	3.0.0	3.1.0

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***Document* (R2-99g52)**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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25.322	CR	003r1	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN #6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]

Source: TSG-RAN WG2 **Date:** 05/11/1999

Subject: MRW procedure

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: The use of the MRW SUFI was vulnerable to a failure. A more robust protocol is proposed.

Clauses affected:

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

9.2.2.12.7 The Move Receiving Window super-field

The 'Move Receiving Window' super-field is used to request the RLC receiver to move its receiving window, as a result of a SDU discard in the RLC transmitter. The format is given in the figure below.

Type = **MRW**
SN_MRW

Figure 9-15: The MRW fields in a STATUS PDU

SN_MRW
Length: 12 bits

Requests the RLC receiver to discard all PUs with sequence number < SN_MRW, and to move the receiving window accordingly.

9.5 Timers

i) Timer_MRW

This timer is used as part of the Move Receiving Window protocol. It is used to trigger the retransmission of a STATUS PDU containing an MRW SUFI field. The timer is started when the STATUS PDU is first transmitted. Each time the timer expires the STATUS PDU is retransmitted and the timer is restarted. It shall be stopped when a STATUS PDU is received that indicates that VR(R) ≥ SN_MRW. It shall also be stopped if a new MRW procedure is triggered whilst it is running.

9.4 State variables

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

It is used to count the number of times a MRW command is transmitted. VT(MRW) is incremented with 1 each time a MRW command is transmitted. VT(MRW) is reset upon the reception of a STATUS PDU which suggests the acknowledgement of a MRW command in the receiver or the occurrence of discarding new SDU. The initial value of this variable is 0.

9.6 Protocol Parameters

g) MaxMRW

It is the maximum value for the number of retransmissions of a MRW command. This parameter is an upper limit of counter VT(MRW). When the value of VT(MRW) comes to MaxMRW, error recovery procedure will be performed.

9.7.3 SDU discard function

9.7.3.1 Timer based discard, with explicit signalling

This alternative uses a timer based triggering of SDU discard (Timer_Discard). This makes the SDU discard function insensitive to variations in the channel rate and provides means for exact definition of maximum delay. However, the SDU loss rate of the connection is increased as SDUs are discarded.

For every SDU received from a higher layer, timer monitoring of the transmission time of the SDU is started. If the transmission time exceeds a predefined value for a SDU in acknowledged mode RLC, this SDU is discarded in the transmitter and a Move Receiving Window (MRW) command is sent to the receiver so that AMD PDUs carrying that SDU are discarded in the receiver and the receiver window is updated accordingly. Note that when the concatenation function is active, PDUs carrying segments of other SDUs that have not timed out shall not be discarded.

The MRW command is defined as a super-field in the RLC STATUS PDU (see section **Error! Reference source not found.**), and piggy backed to status information of transmissions in the opposite direction. Therefore, SDU discard variants requiring peer-to-peer signalling are only possible for full duplex connections.
The MRW command is defined as a super-field in the RLC STATUS PDU (see section 9.2), and piggy backed to status information of transmissions in the opposite direction. If the MRW command has not been acknowledged by receiver, it will be retransmitted. Therefore, SDU discard variants requiring peer-to-peer signalling are only possible for full duplex connections.

11.6.2 Initiation

This procedure is initiated by the sender when the following conditions are fulfilled:

1) SDU discard with explicit signalling is used.

2) MaxDAT number of retransmissions is reached or Timer_Discard expires for a SDU in acknowledged mode RLC.

The sender shall discard all PUs that contain a segment of the associated SDU. If the concatenation function is active, PDUs carrying segments of other SDUs that have not timed out shall not be discarded. The sender shall transmit a STATUS PDU 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.

This STATUS PDU is sent even if the 'STATUS PDU prohibit' is used and the timer 'Timer_Status_Prohibit' is active.

The STATUS PDU has higher priority than data PDUs.

The sender shall start timer Timer_MRW. If a new MRW procedure is initiated whilst Timer_MRW is running then Timer_MRW shall be stopped.

11.6.2.1 Piggybacked STATUS PDU

It is possible to piggyback a STATUS PDU on an AMD PDU. If a PDU includes padding a piggybacked STATUS PDU can be inserted instead of the padding.

11.6.2.2 STATUS PDU contents to set

The size of the STATUS PDU shall be equal to one of the allowed PDU sizes. The information that needs to be transmitted can be split into several STATUS PDUs if one STATUS PDU does not accommodate all the information.

STATUS PDU shall include the MRW SUFI, other SUFI fields can be used additionally. MRW SUFI shall convey information about the discarded SDU(s) to the receiver.

Padding shall be inserted if the SUFI fields do not fill the entire STATUS PDU. If the PDU contains padding the last SUFI field shall be a No More Data super-field.

11.6.3 Reception of the STATUS PDU by the receiver

The receiver shall upon reception of the STATUS PDU/piggybacked STATUS PDU discard PUs and update the state variables VR(R), VR(H) and VR(MR) according to the received STATUS PDU/piggybacked STATUS PDU. The receiver shall initiate the transmission of a STATUS PDUindicating the revised value of VR(R).

11.6.4 Reception of STATUS PDU if VR(R) ≥ SN_MRW

The procedure is terminated in the sender when a STATUS PDU is received indicating a value of VR(R) ≥ SN_MRW. If this occurs Timer_MRW is stopped thereby terminating the procedure.

11.6.5 Expiration of timer Timer_MRW

If Timer_MRW expires before a STATUS PDU is received indicating a value of VR(R) greater or eqal to the MRW parameter then the STATUS(MRW) shall be retransmitted and Timer_MRW restarted.

11.6.4 Abnormal cases

11.6.4.1 Obsolete/corrupted MRW command

If the MRW command contains outdated information about the receiver window (receiver window already moved further than MRW command is indicating) the MRW command shall be discarded.

11.6.4.2 VT(MRW) equals MaxMRW

If the number of retransmission of a MRW command (i.e. VT(MRW)) reaches MaxMRW, an error indication shall be passed RRC and RESET procedure should be performed.

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Nice, France, 13-15 December 1999

***Document* (R2-99h56)**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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25.322	CR	004	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-RAN#6 *list expected approval meeting # here ↑*

for approval ❑ | for information ☐

strategic ☐ | non-strategic ☐ *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM ☐ ME ❑ UTRAN / Radio ❑ Core Network ☐

Source: TSG-RAN WG2 **Date:** 22-11-99

Subject: SDU Discard Functionality

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	☐
A	Corresponds to a correction in an earlier release	☐
B	Addition of feature	❑
C	Functional modification of feature	☐
D	Editorial modification	☐

Release:

Phase 2	☐
Release 96	☐
Release 97	☐
Release 98	☐
Release 99	❑
Release 00	☐

Reason for change: To prevent unnecessary loss of SDUs / incorrect formation of SDUs with SDU Discard functionality

Clauses affected: Addition of a new SUFI

Other specs affected:

Other 3G core specifications	☐	→ List of CRs: ***R2-99g52***
Other GSM core specifications	☐	→ List of CRs:
MS test specifications	☐	→ List of CRs:
BSS test specifications	☐	→ List of CRs:
O&M specifications	☐	→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

9.2.2.12 SUFI

Length: variable number of bits

The SUFI (Super-Field) includes three sub-fields: type information (type of super-field, e.g. list, bitmap, acknowledgement, etc), length information (providing the length of a variable length field within the following value field) and a value.

Figure 9-8 shows the structure of the super-field. The size of the type sub-field is non-zero but the size of the other sub-fields may be zero.

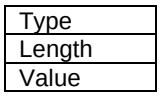


Figure 9-8: The Structure of a Super-Field

The length of the type field is 3 bits and it may have any of following values.

Bit	Description
000	No More Data (**NO_MORE**)
001	Window Size (**WINDOW**)
010	Acknowledgement (**ACK**)
011	List (**LIST**)
100	Bitmap (**BITMAP**)
101	Relative list (**RIist)**
110	Move Receiving Window **(MRW)**
111	Move Receiving Window and ignore first LI **(MRW_N_IFL)**

The length sub-field gives the length of the variable size part of the following value sub-field and the length of it depends on the super-field type.The value sub-field includes the value of the super-field, e.g. the bitmap in case of a BITMAP super-field, and the length is given by the length or the type sub-field.

9.2.2.12.7 The Move Receiving Window super-field

The 'Move Receiving Window' super-field is used to request the RLC receiver to move its receiving window, as a result of a SDU discard in the RLC transmitter. The format is given in the figure below.

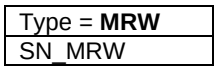


Figure 9-15: The MRW fields in a STATUS PDU

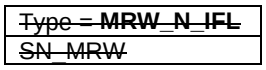
SN_MRW

Length: 12 bits

Requests the RLC receiver to discard all PUs with sequence number < SN_MRW, and to move the receiving window accordingly~~. It also indicates the first data byte in the PU with sequence number SN_MRW corresponds to the first byte of the SDU to be reassembled next .~~ . It also indicates the first data byte in the PU with sequence number SN_MRW corresponds to the first byte of the SDU to be reassembled next .

~~9.2.2.12.8 The Move Receiving Window aNd Ignore First LI (MRW_N_IFL) super-field~~

~~The 'Move Receiving Window and ignore first LI ' super-field is used to request the RLC receiver to move its receiving window, as a result of a SDU discard in the RLC transmitter. It also indicates to the receiver the presence of the trailing bytes of the discarded SDU in the PU with sequence number SN_MRW . The format is given in the figure below.~~



~~Figure 9-16: The MRW_N_IFL fields in a STATUS PDU~~

~~SN_MRW~~

~~Length: 12 bits~~

~~Requests the RLC receiver to discard all PUs with sequence number < SN_MRW, and to move the receiving window accordingly.In addition , the receiver has to discard the first LI and the corresponding data bytes in the PU with sequence number SN_MRW .~~

9.2.2.12.8 The Move Receiving Window aNd Ignore First LI (MRW_N_IFL) super-field

The 'Move Receiving Window and ignore first LI ' super-field is used to request the RLC receiver to move its receiving window, as a result of a SDU discard in the RLC transmitter. It also indicates to the receiver the presence of the trailing bytes of the discarded SDU in the PU with sequence number SN_MRW . The format is given in the figure below.

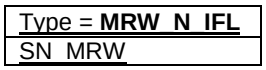


Figure 9-16: The MRW_N_IFL fields in a STATUS PDU

SN_MRW

Length: 12 bits

Requests the RLC receiver to discard all PUs with sequence number < SN_MRW, and to move the receiving window accordingly.In addition , the receiver has to discard the first LI and the corresponding data bytes in the PU with sequence number SN_MRW .

9.5 Timers

i) Timer_MRW

This timer is used as part of the Move Receiving Window protocol. It is used to trigger the retransmission of a STATUS PDU containing an MRW / MRW_N_IFL SUFI field. The timer is started when the STATUS PDU is first transmitted. Each time the timer expires the STATUS PDU is retransmitted and the timer is restarted. It shall be stopped when a STATUS PDU is received that indicates that VR(R) ≥ SN_MRW. It shall also be stopped if a new MRW procedure is triggered whilst it is running.

9.4 State variables

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

It is used to count the number of times a MRW command is transmitted. VT(MRW) is incremented with 1 each time a MRW command is transmitted. VT(MRW) is reset upon the reception of a STATUS PDU which suggests the acknowledgement of a MRW command in the receiver or the occurrence of discarding new SDU. The initial value of this variable is 0.When ever a new MRW procedure is initiated , this variable is initialised to zero .

9.6 Protocol Parameters

g) MaxMRW

It is the maximum value for the number of retransmissions of a MRW command. This parameter is an upper limit of counter VT(MRW). When the value of VT(MRW) comes to MaxMRW, error recovery procedure will be performed.

9.7.3 SDU discard function

9.7.3.1 Timer based discard, with explicit signalling

This alternative uses a timer based triggering of SDU discard (Timer_Discard). This makes the SDU discard function insensitive to variations in the channel rate and provides means for exact definition of maximum delay. However, the SDU loss rate of the connection is increased as SDUs are discarded.

For every SDU received from a higher layer, timer monitoring of the transmission time of the SDU is started. If the transmission time exceeds a predefined value for a SDU in acknowledged mode RLC, this SDU is discarded in the transmitter and a Move Receiving Window (MRW / MRW_N_IFL) command is sent to the receiver so that AMD PDUs carrying that SDU are discarded in the receiver and the receiver window is updated accordingly. Note that when the concatenation function is active, PDUs carrying segments of other SDUs that have not timed out shall not be discarded.

The MRW / MRW_N_IFL command is defined as a super-field in the RLC STATUS PDU, and piggy backed to status information of transmissions in the opposite direction. Therefore, SDU discard variants requiring peer-to-peer signalling are only possible for full duplex connections.
The MRW / MRW_N_IFL command is defined as a super-field in the RLC STATUS PDU (see section 9.2), and piggy backed to status information of transmissions in the opposite direction. If the MRW / MRW_N_IFL command has not been acknowledged by receiver, it will be retransmitted. Therefore, SDU discard variants requiring peer-to-peer signalling are only possible for full duplex connections.

11.6.2 Initiation

This procedure is initiated by the sender when the following conditions are fulfilled:

1) SDU discard with explicit signalling is used.

2) MaxDAT number of retransmissions is reached or Timer_Discard expires for a SDU in acknowledged mode RLC.

The sender shall discard all PUs that contain a segment of the associated SDU. If the concatenation function is active, PDUs carrying segments of other SDUs that have not timed out shall not be discarded. The sender shall transmit a STATUS PDU 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.

If the PU with sequence number SN_MRW contains LI indicating trailing data from the discarded SDU, the transmitter shall send SUFI MRW_N_IFL indicating to the receiver to discard the first LI and the corresponding data bytes. Otherwise the transmitter shall send SUFI MRW.

This STATUS PDU is sent even if the 'STATUS PDU prohibit' is used and the timer 'Timer_Status_Prohibit' is active.

The STATUS PDU has higher priority than data PDUs.

The sender shall start timer Timer_MRW. If a new MRW procedure is initiated whilst Timer_MRW is running then Timer_MRW shall be restarted and VT(MRW) should be reset.

11.6.2.1 Piggybacked STATUS PDU

It is possible to piggyback a STATUS PDU on an AMD PDU. If a PDU includes padding a piggybacked STATUS PDU can be inserted instead of the padding.

11.6.2.2 STATUS PDU contents to set

The size of the STATUS PDU shall be equal to one of the allowed PDU sizes. The information that needs to be transmitted can be split into several STATUS PDUs if one STATUS PDU does not accommodate all the information.

STATUS PDU shall include the MRW ~~SUFI~~/ MRW_N_IFL_SUFI, other SUFI fields can be used additionally. MRW / MRW_N_IFL SUFI shall convey information about the discarded SDU(s) to the receiver.

Padding shall be inserted if the SUFI fields do not fill the entire STATUS PDU. If the PDU contains padding the last SUFI field shall be a No More Data super-field.

11.6.3 Reception of the STATUS PDU by the receiver

The receiver shall upon reception of the STATUS PDU/piggybacked STATUS PDU discard PUs and update the state variables VR(R), VR(H) and VR(MR) according to the received STATUS PDU/piggybacked STATUS PDU. The receiver shall initiate the transmission of a STATUS PDU indicating the revised value of VR(R).

In case of receiving SUFI_MRW , the receiver shall start reassembling the next SDU from the first data byte of the PU with sequence number SN_MRW .

If the receiver receives SUFI MRW_N_IFL , it shall discard the first LI and start reassembling the next SDU .

11.6.4 Reception of STATUS PDU if VR(R) ≥ SN_MRW

The procedure is terminated in the sender when a STATUS PDU is received indicating a value of VR(R) ≥ SN_MRW. If this occurs Timer_MRW is stopped thereby terminating the procedure.

11.6.5 Expiration of timer Timer_MRW

If Timer_MRW expires before a STATUS PDU is received indicating a value of VR(R) greater or equal to the MRW parameter, then the STATUS(MRW) shall be retransmitted , VT(MRW) is incremented by one and Timer_MRW restarted.

11.6.4 Abnormal cases

11.6.4.1 Obsolete/corrupted MRW command

If the MRW command contains outdated information about the receiver window (receiver window already moved further than MRW command is indicating) ,the MRW command shall be discarded and a STATUS PDU containing SUFI ACK shall be tranmitted .

11.6.4.2 VT(MRW) equals MaxMRW

If the number of retransmission of a MRW command (i.e. VT(MRW)) reaches MaxMRW, an error indication shall be passed to RRC and RESET procedure should be performed.

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Document* *(R2-99k70)
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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25.322	**CR**	**005r2**	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-RAN#6 *list expected approval meeting # here ↑*

for approval ❑ for information ☐

strategic ☐ non-strategic ☐ *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM ☐ ME ❑ UTRAN / Radio ❑ Core Network ☐

Source: TSG-RAN WG2 **Date:** 3-12-99

Subject: Change in RLC control PDU format

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	☐
A	Corresponds to a correction in an earlier release	☐
B	Addition of feature	❑
C	Functional modification of feature	☐
D	Editorial modification	☐

Release:

Phase 2	☐
Release 96	☐
Release 97	☐
Release 98	☐
Release 99	❑
Release 00	☐

Reason for change: 1.To reduce the processing in Packing / Unpacking of RLC control PDU.
2.Creating more space for new SUFI types.

Clauses affected: Removal of PA bit from Control PDU

Other specs affected:

Other 3G core specifications	☐	→ List of CRs:
Other GSM core specifications	☐	→ List of CRs:
MS test specifications	☐	→ List of CRs:
BSS test specifications	☐	→ List of CRs:
O&M specifications	☐	→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

9.2.1.4 STATUS PDU

The STATUS PDU is used to report the status between two RLC AM entities. Both receiver and transmitter status information may be included in the same STATUS PDU.

The format of the STATUS PDU is given in figure 9-4 below.

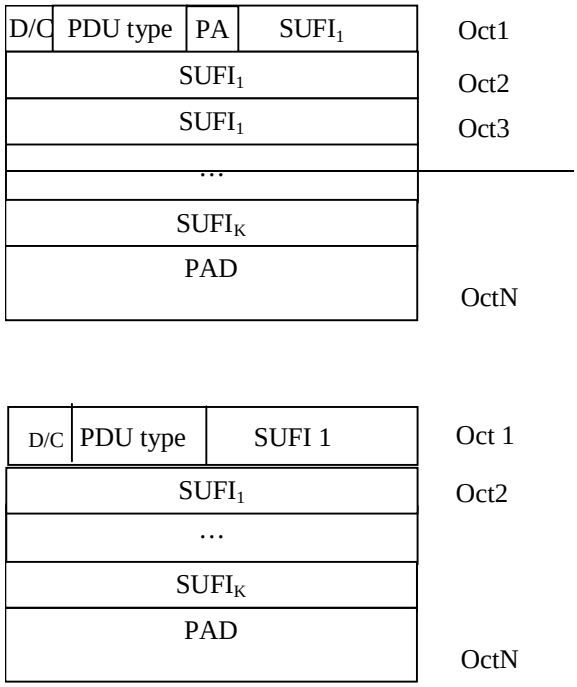

Figure 9-4: Status Information Control PDU (STATUS PDU)

Up to K different super-fields ($SUFI_1$-$SUFI_K$) can be included into one STATUS PDU. The size of a STATUS PDU is variable and upper bounded by the maximum RLC PDU size used by an RLC entity. Padding shall be included to exactly fit one of the PDU sizes used by the entity.

~~9.2.1.5 Piggybacked STATUS PDU~~

~~The format of the piggybacked STATUS PDU is the same as the ordinary STATUS PDU except that the D/C field and the PDU type field is omitted. This PDU can be used to piggyback STATUS PDU in a AMD PDU if the data does not fill the complete AMD PDU~~.

9.2.1.5 Piggybacked STATUS PDU

The format of the piggybacked ~~Control~~Status PDU is the same as the ordinary Control PDU except that the D/C field ~~and PDU_TYPE fields are~~is replaced by a reserved bit ~~field (R1~~). This PDU can be used to piggyback STATUS PDU in a AMD PDU if the data does not fill the complete AMD PDU. The PDU Type field is set to zero and all other values are invalid for this version of the protocol and the PDU is discarded.

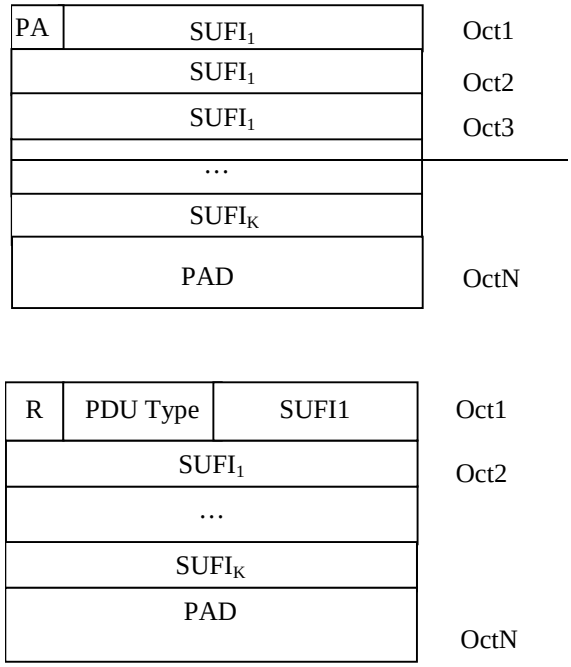

Figure 9-5: Piggybacked STATUS PDU

9.2.2 Parameters

~~9.2.2.11 Poll Answer (PA)~~

~~Length: 1bit~~

~~The PA (Poll Answer) field indicates whether the status report is the answer to a poll or not~~

~~Bit~~	~~Description~~
~~0~~	~~The status report is not the answer to a polling request~~
~~1~~	~~The status report is the answer to a polling request~~

9.2.2.12 SUFI

Length: variable number of bits

The SUFI (Super-Field) includes three sub-fields: type information (type of super-field, e.g. list, bitmap, acknowledgement, etc), length information (providing the length of a variable length field within the following value field) and a value.

Figure 9-8 shows the structure of the super-field. The size of the type sub-field is non-zero but the size of the other sub-fields may be zero.

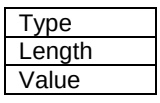

Figure 9-8: The Structure of a Super-Field

The length of the type field is 4~~3~~ bits and it may have any of following values.

Bit	Description
0000	No More Data (**NO_MORE**)
0001	Window Size (**WINDOW**)
0010	Acknowledgement (**ACK**)
0011	List (**LIST**)
0100	Bitmap (**BITMAP**)
0101	Relative list (**Rlist)**
0110	Move Receiving Window **(MRW)**
0111	~~Reserved~~ Move Receiving Window and Ignore First Li (MRW_N_IFL)
1000-1111	*Reserved for future super-field types. PDUs with this encoding are invalid for this version of the protocol.*

The length sub-field gives the length of the variable size part of the following value sub-field and the length of it depends on the super-field type.The value sub-field includes the value of the super-field, e.g. the bitmap in case of a BITMAP super-field, and the length is given by the length or the type sub-field.

9.2.2.13 Reserved (R~~1~~)

Length: 1 bit~~s~~

This ~~field~~bit is used to achieve octet alignment and for this purpose it is coded as 0~~000~~. Otherwise the PDU ~~functions of it are left for future releases. PDU, with values for this field , other than 0000, shall be~~is treated as ~~-~~invalid ~~PDU~~ and hence shall be discarded by this version of the protocol~~.~~

3GPP TSG-RAN Meeting #6
Nice, France, 13-15 December 1999

Document* *(R2-99k72)
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.322	CR	016r1	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*

(U)SIM		ME	X	UTRAN / Radio	X	Core Network	

Source: TSG-RAN WG2 **Date:** 1999-11-26

Subject: Introduction of RLC suspend state

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change:
A suspend/resume function is added to RLC for the following reason:

During the security mode control procedure, there is a need for RRC to suspend the RLC entity.

Clauses affected: 5, 8.1, 9.3.3, 9.7

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:


help.doc

<--------- double-click here for help and instructions on how to create a CR.

5 Functions

The following functions are supported by RLC. For a detailed description of the following functions see [3].

- Connection Control;
- Segmentation and reassembly;
- Header compression;
- Concatenation;
- Padding;
- Transfer of user data;
- Error correction;
- In-sequence delivery of higher layer PDUs;
- Duplicate Detection;
- Flow control;
- Sequence number check (Unacknowledged data transfer mode);
- Protocol error detection and recovery.
- Ciphering;

~~The following potential function(s) are regarded as further study items (FFS):~~

- Suspend/resume function;

8.1 Primitives between RLC and higher layers

The primitives between RLC and upper layers are shown in table 8-1.

Table 8-1 : Primitives between RLC and upper layers

Generic Name	Parameter			
	Req.	**Ind.**	**Resp.**	**Conf.**
RLC-AM-DATA	Data, ~~CFN~~CNF, MUI	Data	Not Defined	MUI
RLC-UM-DATA	Data,	Data	Not Defined	Not Defined
RLC-TR-DATA	Data	Data	Not Defined	Not Defined
CRLC-CONFIG	E/R, Ciphering Elements (UM/AM only)	Not Defined	Not Defined	Not Defined
CRLC-SUSPEND (UM/AM only)	N	Not Defined	Not Defined	VT(S)
CRLC-RESUME (UM/AM only)	No Parameter	Not Defined	Not Defined	Not Defined
CRLC-STATUS	Not Defined	EVC	Not Defined	Not Defined

Each Primitive is defined as follows:

RLC-AM-DATA-Req/Ind/Conf

- RLC-AM-DATA-Req is used by higher layers to request transmission of a higher layer PDU in acknowledged mode.
- RLC-AM-DATA-Ind is used by RLC to deliver to higher layers RLC SDUs, that have been transmitted in acknowledged mode.
- RLC-AM-DATA-Conf is used by RLC to confirm to higher layers the transmission of a RLC SDU.

RLC-UM-DATA-Req/Ind

- RLC-UM-DATA-Req is used by higher layers to request transmission of a higher layer PDU in unacknowledged mode.
- RLC-UM-DATA-Ind is used by RLC to deliver to higher layers RLC SDUs, that have been transmitted in unacknowledged mode.

RLC-TR-DATA-Req/Ind

- RLC-TR-DATA-Req is used by higher layers to request transmission of a higher layer PDU in transparent mode.
- RLC-TR-DATA-Ind is used by RLC to deliver to higher layers RLC SDUs, that have been transmitted in transparent mode.

CRLC-CONFIG-Req

This primitive is used by RRC to establish, release or reconfigure the RLC. Ciphering elements are included for UM and AM operation.

CRLC-SUSPEND-Req/Cnf

This primitive is used by RRC to suspend the RLC. The N parameter indicates that RLC shall not send a PDU with SN>=VT(S)+N, where N is an integer. RLC informs RRC of the VT(S) value in the confirm primitive.

CRLC-RESUME-Req

This primitive is used by RRC to resume RLC when RLC has been suspended.

CRLC-STATUS-Ind

It is used by the RLC to send status information to RRC.

Following parameters are used in the primitives:

1) The parameter Data is the RLC SDU that is mapped onto the Data field in RLC PDUs. The Data parameter may be divided over several RLC PDUs. In case of a RLC-AM-DATA or a RLC-UM-DATA primitive the length of the Data parameter shall be octet alligned.

2) The parameter Confirmation request (CNF) indicates whether the RLC needs to confirm the correct transmission of the RLC SDU.

3) The parameter Message Unit Identifier (MUI) is an identity of the RLC SDU, which is used to indicate which RLC SDU that is confirmed with the RLC-AM-DATA conf. primitive.

4) The parameter E/R indicates whether RLC should enter or exit the data transfer ready state.

5) The parameter Event Code (EVC) indicates the reason for the CRLC-STATUS-ind (i.e unrecoverable errors such as data link layer loss or recoverable status events such as reset, etc.).

6) The parameter ciphering elements are only applicable for UM and AM operation. These parameters are Ciphering Mode, Ciphering Key, Activation Time (SN to activate a new ciphering configuration) and Ciphering Sequence Number.

9.3.3 State model for acknowledged mode entities

Figure 9-18 illustrates the state model for the acknowledged mode RLC entity (both transmitting and receiving). An acknowledged mode entity can be in one of following states.

9.3.3.1 Null State

In the null state the RLC entity does not exist and therefore it is not possible to transfer any data through it.

Upon reception of an CRLC-CONFIG-Req from higher layer the RLC entity is created and acknowledged data transfer ready state is entered.

9.3.3.2 Acknowledged Data Transfer Ready State

In the acknowledged data transfer ready state, acknowledged mode data can be exchanged between the entities. Upon reception of a CRLC-CONFIG-Req from higher layer the RLC entity is terminated and the null state is entered.

Upon errors in the protocol, the RLC entity sends a RESET PDU to its peer and enters the reset pending state.

Upon reception of a RESET PDU, the RLC entity resets the protocol and responds to the peer entity with a RESET ACK PDU.

Upon reception of a RESET ACK PDU, the RLC takes no action.

9.3.3.3 *Reset* Pending State

In the reset pending state the entity waits for a response from its peer entity and no data can be exchanged between the entities. Upon reception of CRLC-CONFIG-Req from higher layer the RLC entity is terminated and the null state is entered.

Upon reception of a RESET ACK PDU, the RLC entity resets the protocol and enters the acknowledged data transfer ready state.

Upon reception of a RESET PDU, the RLC entity resets the protocol, send a RESET ACK PDU and enters the acknowledged data tranfer ready state.

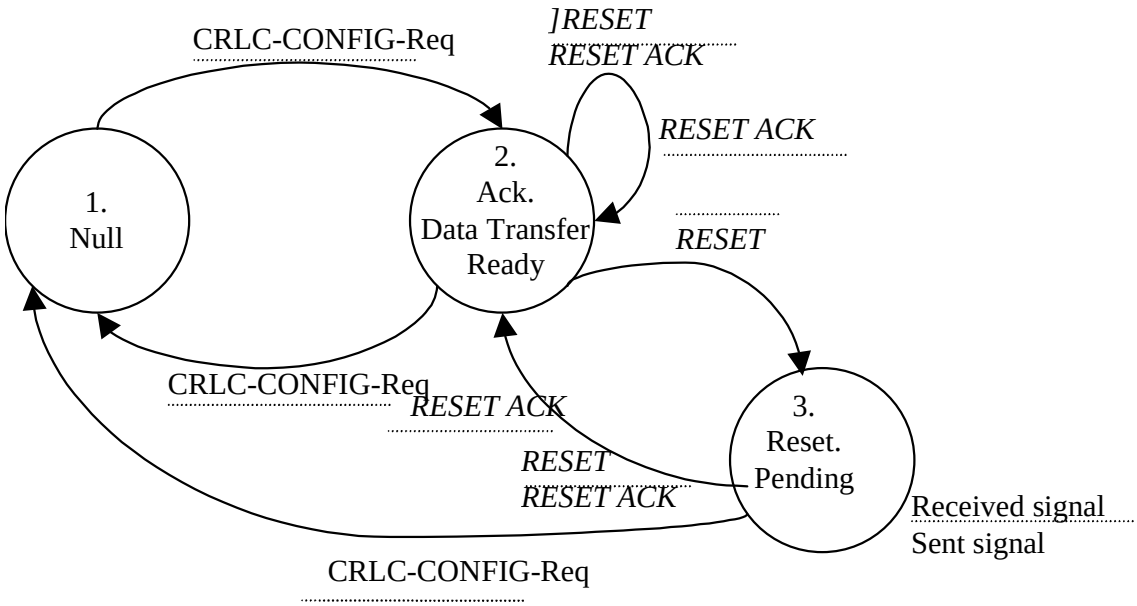

Figure 9-18: The state model for the acknoledged mode entities when reset is performed

9.3.3.4 Local Suspend State

Upon reception of CRLC-SUSPEND-Req from higher layer (RRC) the RLC entity is suspended and the Local Suspend state is entered. In the Local Suspend state RLC shall not send a RLC-PDUs with a SN>=VT(S)+N. Upon reception of CRLC-RESUME-Req from higher layer (RRC) the RLC entity is resumed and the Data Transfer Ready state is entered.

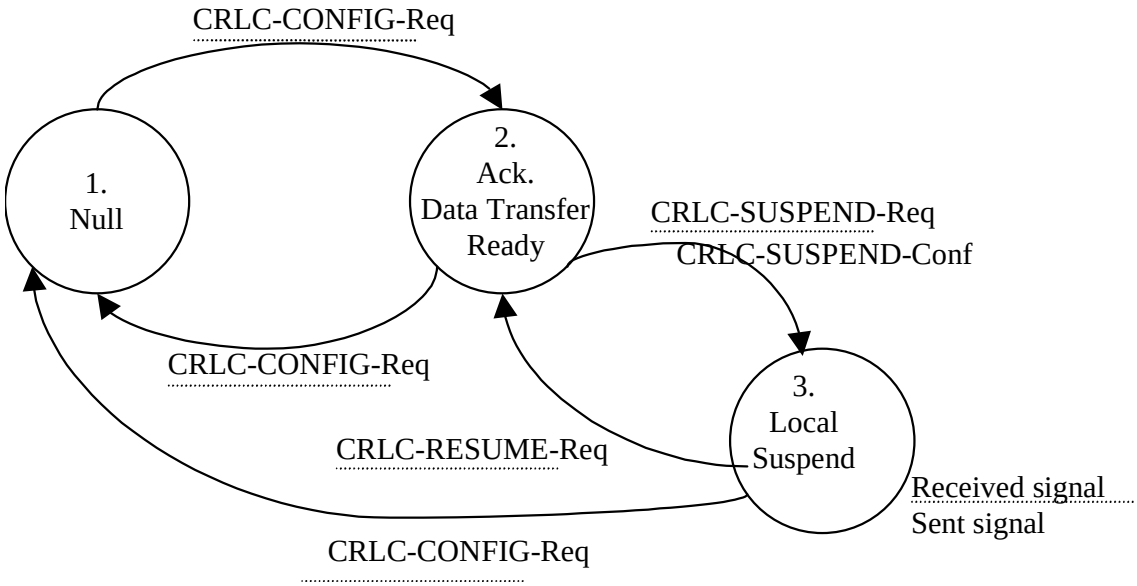

Figure 9-18-2: The state model for the acknowledged mode entities when local suspend is performed

9.7.6 Local Suspend function for acknowledged mode transfer

The higher layer (RRC) may suspend the RLC entity. The CRLC-SUSPEND-Req indicates this request. The RLC entity shall, when receiving this request, not send RLC PDUs with SN>=VT(S)+N (N is given by the CRLC_SUSPEND-Req primitive). The RLC entity shall acknowledge the CRLC-SUSPEND-Req ordering a suspend with a CRLC-SUSPEND-Conf with the current value of VT(S). The suspend state is left when a CRLC-RESUME-Req primitive indicating resume is received.