TSG-RAN Meeting #21 ***RP-030478***
Frankfurt, Germany, 16-19 September 2003

Title: **The elimination of the EPC mechanism.**
CRs (R'99 and linked Rel-4/Rel-5) to TS 25.331 and TS 25.322.

Source: **TSG-RAN WG2**

Agenda item: **7.3.2**

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.331	2062	-	R99	Elimination of EPC mechanism	F	3.15.0	3.16.0	R2-032020	TEI
25.331	2063	-	Rel-4	Elimination of EPC mechanism	A	4.10.0	4.11.0	R2-032021	TEI
25.331	2064	-	Rel-5	Elimination of EPC mechanism	A	5.5.0	5.6.0	R2-032022	TEI
25.322	240	-	R99	Elimination of EPC mechanism	F	3.15.0	3.16.0	R2-032008	TEI
25.322	241	-	Rel-4	Elimination of EPC mechanism	A	4.9.0	4.10.0	R2-032009	TEI
25.322	242	-	Rel-5	Elimination of EPC mechanism	A	5.5.0	5.6.0	R2-032010	TEI

3GPP TSG-RAN2 Meeting #37
Budapest, Hungary, 25th August 2003

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CR-Form-v7

CHANGE REQUEST

⌘ **25.322** **CR** **240** ⌘ **rev** **-** ⌘ Current version: **3.f.0** ⌘

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

Title:	⌘	Elimination of EPC mechanism
Source:	⌘	RAN WG2
Work item code:	⌘	TEI
Date:	⌘	15/08/2003
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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The description of the EPC mechanism is found to be unclear. As it is not a strictly necessary mechanism, it was seen easier to eliminate it from the specifications.
Summary of change:	⌘	All references to the EPC mechanism were removed.
Consequences if not approved:	⌘	Networks will most likely never configure it as they would not know exactly how UEs would operate. UEs would still have to go through the burden of implementing it. Impact analysis: - There is no impact on T1 as no tests have yet been defined nor are foreseen in any of the GCF testing packages. - The impact is limited to the EPC mechanism. - There may be a problem if a network supporting the mechanism interacts with a UE that does not support it. However, given the lack of tests this is very unlikely.

Clauses affected:	⌘	3.2, 9.4, 9.5, 9.7.2, 9.7.4, 11.5.2.2, 11.5.2.3, 11.5.4.1			
Other specs affected:	⌘	**Y** / **N**	Other core specifications	⌘	TS 25.331
		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.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AM	Acknowledged Mode
AMD	Acknowledged Mode Data
ARQ	Automatic Repeat Request
BCCH	Broadcast Control CHannel
BCH	Broadcast CHannel
C-	Control-
CCCH	Common Control CHannel
CCH	Control CHannel
CCTrCH	Coded Composite Transport CHannel
CRC	Cyclic Redundancy Check
CTCH	Common Traffic CHannel
DCCH	Dedicated Control CHannel
DCH	Dedicated CHannel
DL	DownLink
DSCH	Downlink Shared CHannel
DTCH	Dedicated Traffic CHannel
FACH	Forward link Access CHannel
FDD	Frequency Division Duplex
~~EPC~~	~~Estimated PDU Counter~~
L1	Layer 1 (physical layer)
L2	Layer 2 (data link layer)
L3	Layer 3 (network layer)
LI	Length Indicator
LSB	Least Significant Bit
MAC	Medium Access Control
MRW	Move Receiving Window
MSB	Most Significant Bit
PCCH	Paging Control CHannel
PCH	Paging CHannel
PDU	Protocol Data Unit
PHY	PHYsical layer
PhyCH	Physical CHannels
RACH	Random Access CHannel
RLC	Radio Link Control
RRC	Radio Resource Control
SAP	Service Access Point
SDU	Service Data Unit
SHCCH	SHared channel Control CHannel
SN	Sequence Number
SUFI	SUper FIeld
TCH	Traffic CHannel
TDD	Time Division Duplex
TFI	Transport Format Indicator
TM	Transparent Mode
TMD	Transparent Mode Data
TTI	Transmission Time Interval
U-	User-
UE	User Equipment
UL	UpLink
UM	Unacknowledged Mode
UMD	Unacknowledged Mode Data
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network

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" $\geq$ VT(MS) unless VT(S) $\geq$ 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 the AMD PDU carrying the first segment of this SDU is scheduled to be transmitted for the first time. 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 "Length Indicator" indicating the end 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 a timer Timer_MRW expires. 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) Void~~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.~~

9.5 Timers

The timers defined in this subclause are normative. The timers shall be considered active from the time they are started until the time they either expire or are stopped.

a) Timer_Poll.

This timer shall only be used when so configured by upper layers. The value of the timer is signalled by upper layers. In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer. If x is the value of the state variable VT(S) after the poll was submitted to lower layer, the timer shall be stopped upon receiving:

- positive acknowledgements for all the AMD PDUs with "Sequence Number" up to and including x - 1; or
- a negative acknowledgement for the AMD PDU with "Sequence Number" = x - 1.

If the timer expires and no STATUS PDU fulfilling the criteria above has been received:

- the Receiver shall be polled once more;
- the timer shall be restarted; and
- the new value of VT(S) shall be saved.

If a new poll is sent when the timer is active, the timer shall be restarted at the time specified above, and the value of VT(S) shall be saved.

b) Timer_Poll_Prohibit.

This timer shall only be used when so configured by upper layers. It is used to prohibit transmission of polls within a certain period. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer.

From the time a poll is triggered until the timer expires, polling is prohibited. If another poll is triggered while polling is prohibited, its transmission shall be delayed until the timer expires (see subclause 9.7.1). Only one poll shall be transmitted when Timer_Poll_Prohibit expires even if several polls were triggered in the meantime. This timer shall not be affected by the reception of STATUS PDUs.

When Timer_Poll_Prohibit is not configured by upper layers, polling is never prohibited.

c) Void~~Timer_EPC~~.

~~This timer shall only be used when the EPC function is configured by upper layers. It is meant to account for the roundtrip delay, i.e. the time between the transmission of a status report and the reception of the first retransmitted AMD PDU. The initial value of the timer is signalled by upper layers.~~

~~In the UE, this timer shall be started when the successful or unsuccessful transmission of the first STATUS PDU of a status report is indicated by lower layer. In UTRAN it should be started when the first STATUS PDU of a status report is submitted to lower layer. Only after Timer_EPC expires shall VR(EP) be decremented as described in subclause 9.7.4.~~

d) Timer_Discard.

This timer shall be used when timer-based SDU discard is configured by upper layers. The value of the timer is signalled by upper layers. In the transmitter, a new timer is started upon reception of an SDU from upper layer.

In UM/TM, if a timer expires before the corresponding SDU is submitted to lower layer, "SDU discard without explicit signalling" specified in subclauses 11.2.4.3 and 11.1.4.2 shall be initiated. In AM, if a timer expires before the corresponding SDU is acknowledged, "SDU discard with explicit signalling" specified in subclause 11.6 shall be initiated.

e) Timer_Poll_Periodic.

This timer shall only be used when "timer based polling" is configured by upper layers. The value of the timer is signalled by upper layers. The timer shall be started when the RLC entity is created. When the timer expires, the RLC entity shall:

- restart the timer;
- if AMD PDUs are available for transmission or retransmission (not yet acknowledged):
    - trigger a poll.

f) Timer_Status_Prohibit.

This timer shall only be used when so configured by upper layers. It is meant to prohibit the Receiver from sending consecutive acknowledgement status reports. A status report is an acknowledgement status report if it contains any of the SUFIs LIST, BITMAP, RLIST or ACK. The value of the timer is signalled by upper layers.

In the UE, this timer shall be started when the successful or unsuccessful transmission of the last STATUS PDU of an acknowledgement status report is indicated by lower layer. In UTRAN it should be started when the last STATUS PDU of an acknowledgement status report is submitted to lower layer.

From the time an acknowledgement status report is triggered until the Timer_Status_Prohibit timer expires, acknowledgement is prohibited. If another such status report is triggered while acknowledgement is prohibited, its transmission shall be delayed until the timer expires (see subclause 9.7.2). The status report may be updated during this time. The transmission of SUFIs MRW, MRW_ACK, WINDOW or NO_MORE is not restricted.

When Timer_Status_Prohibit is not configured by upper layers, acknowledgment is not prohibited.

g) Timer_Status_Periodic.

This timer shall only be used when timer based status reporting is configured by upper layers.

This timer shall be started when the RLC entity is created. When the timer expires the transmission of a status report shall be triggered and the timer shall be restarted. This timer can be blocked by upper layers. The timer shall be restarted when upper layers indicate that it is no longer blocked.

h) Timer_RST.

This timer is meant to handle the loss of a RESET PDU by the peer entity, or the loss of a RESET ACK PDU from the peer entity. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of a RESET PDU is indicated by lower layer. In UTRAN it should be started when a RESET PDU is submitted to lower layer.

Timer_RST shall only be stopped upon reception of a RESET ACK PDU (with same RSN as RESET PDU), i.e. this timer shall not be stopped when an RLC reset initiated by the peer RLC entity occurs. If this timer expires, the RESET PDU shall be retransmitted.

i) Timer_MRW.

This timer is used to trigger the retransmission of a status report containing an MRW SUFI field. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of a STATUS PDU containing the MRW SUFI is indicated by lower layer. In UTRAN, it should be started when a STATUS PDU containing the MRW SUFI is submitted to lower layer.

Each time the timer expires the MRW SUFI is retransmitted and the timer is restarted. It shall be stopped when one of the termination criteria for the SDU discard with explicit signalling procedure is fulfilled (see subclause 11.6.4).

9.7.2 STATUS transmission for acknowledged mode

The Receiver 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 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) VoidThe EPC mechanism.

   The timer Timer_EPC is started according to subclause 9.5 e) 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) VoidThe 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.

When a status report is triggered the Receiver shall:

- if transmission of status reports is not prohibited by any of the functions "STATUS prohibit" or "EPC mechanism":
  - assemble and transmit the status report to the Sender, as specified in subclauses 11.5.2.2 and 11.5.2.3.
- otherwise (if the status report is prohibited by at least one of the functions "STATUS prohibit" or "EPC mechanism"):
  - if MRW, MRW_ACK or WINDOW SUFIs are required in the status report:
    - send a status report immediately excluding ACK, LIST, BITMAP, and RLIST SUFIs;
  - if ACK, LIST, BITMAP, or RLIST SUFIs are required in the status report:
    - delay sending these SUFIs until the prohibit function terminates.

Upon expiry of the timer Timer_Status_Prohibit or termination of the "EPC mechanism", the Receiver shall:

- if at least one status report was triggered during the time the transmission of a status reports was prohibited that could not be transmitted due to prohibition; and
- if transmission of a status reports is no longer prohibited by any of the functions "STATUS prohibit"~~ or "EPC mechanism"~~:
  - transmit one status report to the Sender, using the procedure described in subclause 11.5.2.3.

9.7.4 Void~~The Estimated PDU Counter for acknowledged mode~~

~~The Estimated PDU Counter (EPC) is only applicable for RLC entities operating in acknowledged mode. The EPC is a mechanism configured by upper layers used for scheduling the retransmission of status reports in the Receiver. With this mechanism, the Receiver will send a new status report in which it requests for AMD PDUs not yet received. The time between two subsequent status report retransmissions is not fixed, but it is controlled by both the timer Timer_EPC and the state variable VR(EP), which adapt this time to the round trip delay and the current bit rate, indicated in the TFI, in order to minimise the delay of the status report retransmission.~~

~~When a status report is triggered by some mechanisms and it is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer (in UE) to request for retransmitting one or more missing AMD PDUs, the variable VR(EP) is set equal to the number of requested AMD PDUs. At least one requested AMD PDU is needed to activate the EPC mechanism. The variable VR(EP) is a counter, which is decremented every transmission time interval with the estimated number of AMD PDUs that should have been received during that transmission time interval on the corresponding logical channel.~~

~~The timer Timer_EPC controls the maximum time that the variable VR(EP) needs to wait before it will start counting down. This timer starts immediately after a transmission of a retransmission request from the Receiver (when the first STATUS PDU of the status report is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer(in UE)). The initial value of the timer Timer_EPC is configured by upper layers. It typically depends on the roundtrip delay, which consists of the propagation delay, processing time in the transmitter and Receiver and the frame structure. This timer can also be implemented as a counter, which counts the number of 10 ms radio frames that could be expected to elapse before the first requested AMD PDU is received.~~

~~If not all of these requested AMD PDUs have been received correctly when VR(EP) is equal to zero, a new status report will be transmitted and the EPC mechanism will be reset accordingly. The timer Timer_EPC will be started once more when the first STATUS PDU of the status report is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer (in UE). If all of the requested AMD PDUs have been received correctly, the EPC mechanism ends.~~

11.5.2.2 STATUS PDU contents to set

On triggering of a status report, the Receiver shall:

- if ~~neither~~ the "STATUS prohibit" ~~nor "EPC mechanism" are~~is not active:
  - include negative acknowledgements for all AMD PDUs detected as missing;
  - include positive acknowledgements for all AMD PDUs received up to at least VR(R);
- if an MRW SUFI assembled as specified in subclause 11.6.2.2 had not been sent:
  - optionally include the MRW SUFI;
- if an MRW_ACK SUFI assembled as specified in subclause 11.6.2.2 is awaiting transmission:
  - optionally include the MRW_ACK SUFI;
- if the Sender's transmission window is to be updated:
  - optionally include the WINDOW SUFI;
- if all SUFIs can be accommodated in one STATUS PDU:
  - construct the status report using one STATUS PDU, using one of the allowed PDU sizes;
  - if the SUFIs included do not fill the entire STATUS PDU:

- terminate the STATUS PDU with the ACK or NO_MORE SUFI;
- use padding in the remainder of the STATUS PDU;

- otherwise (SUFIs included fill the entire STATUS PDU):
  - ACK or NO_MORE SUFIs need not be included in that STATUS PDU;

- otherwise (the status report is segmented):
  - construct STATUS PDUs including only complete SUFIs using one of the allowed PDU sizes. The set of STATUS PDUs shall accommodate all the SUFIs to form the complete status report. Indication of the same AMD PDU shall not be given in more than one STATUS PDU of a status report, but the ACK SUFI can be present in more than one STATUS PDU of a status report;
  - if any STATUS PDU constructed is not entirely filled with SUFIs:
    - terminate that STATUS PDU with the ACK or NO_MORE SUFI;
    - use padding in the remainder of that STATUS PDU.
  - otherwise (SUFIs included fill the entire STATUS PDU):
    - ACK or NO_MORE SUFIs should not be included in that STATUS PDU.

Which SUFI fields to use is implementation dependent. Bitmap SUFI is used to indicate both received and/or missing AMD PDUs. List SUFI and/or Relative List SUFI are used to indicate missing AMD PDUs only. Acknowledgement SUFI is used to indicate the received AMD PDUs. (For SUFI details see 9.2.2.11.) No information shall be given for AMD PDUs with "Sequence Number"≥VR(H), i.e. AMD PDUs that have not yet reached the Receiver.

11.5.2.3 Submission of STATUS PDUs to the lower layer

The Receiver shall:

- inform the lower layer of the STATUS PDUs scheduled for transmission;
- submit to the lower layer, the requested number of PDUs (STATUS PDUs, piggybacked AMD/STATUS PDUs and optionally AMD PDUs, see also subclause 11.3.2.2);
- if "Timer based STATUS transfer" is configured and the timer Timer_Status_Periodic has expired:
  - restart the timer Timer_Status_Periodic according to subclause 9.5 f);

~~- if the "EPC mechanism" is configured:~~

~~- start the timer Timer_EPC according to subclause 9.5 c), and set VR(EP) equal to the number of AMD PDUs requested to be retransmitted;~~

- if the STATUS PDU includes the MRW SUFI:
  - start the timer Timer_MRW according to subclause 9.5 i).

11.5.4 Abnormal cases

11.5.4.1 Void~~VR(EP) equals zero and the requested AMD PDUs have not been received~~

~~If the EPC mechanism is configured and VR(EP) equals zero and not all AMD PDUs requested for retransmission have been received, the Receiver shall:~~

~~- retransmit the status report. The retransmitted status report may contain new or different SUFI fields in order to indicate that some previously lost AMD PDUs have been received and that some additional AMD PDUs have been lost.~~

3GPP TSG-RAN2 Meeting #37
Budapest, Hungary, 25th August 2003

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CR-Form-v7

CHANGE REQUEST

⌘ **25.322** **CR** **241** ⌘ **rev** **-** ⌘ Current version: **4.9.0** ⌘

*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 [X] Radio Access Network [X] Core Network [ ]

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R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The description of the EPC mechanism is found to be unclear. As it is not a strictly necessary mechanism, it was seen easier to eliminate it from the specifications.
Summary of change:	⌘	All references to the EPC mechanism were removed.
Consequences if not approved:	⌘	Networks will most likely never configure it as they would not know exactly how UEs would operate. UEs would still have to go through the burden of implementing it.

Clauses affected:	⌘	3.2, 9.4, 9.5, 9.7.2, 9.7.4, 11.5.2.2, 11.5.2.3, 11.5.4.1			
Other specs affected:	⌘	Y / N		⌘	TS 25.331
		X /	Other core specifications		
		/ X	Test specifications		
		/ X	O&M Specifications		
Other comments:	⌘				

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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.
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.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AM	Acknowledged Mode
AMD	Acknowledged Mode Data
ARQ	Automatic Repeat Request
BCCH	Broadcast Control CHannel
BCH	Broadcast CHannel
C-	Control-
CCCH	Common Control CHannel
CCH	Control CHannel
CCTrCH	Coded Composite Transport CHannel
CRC	Cyclic Redundancy Check
CTCH	Common Traffic CHannel
DCCH	Dedicated Control CHannel
DCH	Dedicated CHannel
DL	DownLink
DSCH	Downlink Shared CHannel
DTCH	Dedicated Traffic CHannel
FACH	Forward link Access CHannel
FDD	Frequency Division Duplex
~~EPC~~	~~Estimated PDU Counter~~
L1	Layer 1 (physical layer)
L2	Layer 2 (data link layer)
L3	Layer 3 (network layer)
LI	Length Indicator
LSB	Least Significant Bit
MAC	Medium Access Control
MRW	Move Receiving Window
MSB	Most Significant Bit
PCCH	Paging Control CHannel
PCH	Paging CHannel
PDU	Protocol Data Unit
PHY	PHYsical layer
PhyCH	Physical CHannels
RACH	Random Access CHannel
RLC	Radio Link Control
RRC	Radio Resource Control
SAP	Service Access Point
SDU	Service Data Unit
SHCCH	SHared channel Control CHannel
SN	Sequence Number
SUFI	SUper FIeld
TCH	Traffic CHannel
TDD	Time Division Duplex
TFI	Transport Format Indicator
TM	Transparent Mode
TMD	Transparent Mode Data
TTI	Transmission Time Interval
U-	User-
UE	User Equipment
UL	UpLink
UM	Unacknowledged Mode
UMD	Unacknowledged Mode Data
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network

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" $\geq$ VT(MS) unless VT(S) $\geq$ 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 the AMD PDU carrying the first segment of this SDU is scheduled to be transmitted for the first time. 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 "Length Indicator" indicating the end 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 a timer Timer_MRW expires. 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) Void~~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.~~

9.5 Timers

The timers defined in this subclause are normative. The timers shall be considered active from the time they are started until the time they either expire or are stopped.

a) Timer_Poll.

This timer shall only be used when so configured by upper layers. The value of the timer is signalled by upper layers. In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer. If x is the value of the state variable VT(S) after the poll was submitted to lower layer, the timer shall be stopped upon receiving:

- positive acknowledgements for all the AMD PDUs with "Sequence Number" up to and including x - 1; or
- a negative acknowledgement for the AMD PDU with "Sequence Number" = x - 1.

If the timer expires and no STATUS PDU fulfilling the criteria above has been received:

- the Receiver shall be polled once more;
- the timer shall be restarted; and
- the new value of VT(S) shall be saved.

If a new poll is sent when the timer is active, the timer shall be restarted at the time specified above, and the value of VT(S) shall be saved.

b) Timer_Poll_Prohibit.

This timer shall only be used when so configured by upper layers. It is used to prohibit transmission of polls within a certain period. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer.

From the time a poll is triggered until the timer expires, polling is prohibited. If another poll is triggered while polling is prohibited, its transmission shall be delayed until the timer expires (see subclause 9.7.1). Only one poll shall be transmitted when Timer_Poll_Prohibit expires even if several polls were triggered in the meantime. This timer shall not be affected by the reception of STATUS PDUs.

When Timer_Poll_Prohibit is not configured by upper layers, polling is never prohibited.

c) Void~~Timer_EPC~~.

~~This timer shall only be used when the EPC function is configured by upper layers. It is meant to account for the roundtrip delay, i.e. the time between the transmission of a status report and the reception of the first retransmitted AMD PDU. The initial value of the timer is signalled by upper layers.~~

~~In the UE, this timer shall be started when the successful or unsuccessful transmission of the first STATUS PDU of a status report is indicated by lower layer. In UTRAN it should be started when the first STATUS PDU of a status report is submitted to lower layer. Only after Timer_EPC expires shall VR(EP) be decremented as described in subclause 9.7.4.~~

d) Timer_Discard.

This timer shall be used when timer-based SDU discard is configured by upper layers. The value of the timer is signalled by upper layers. In the transmitter, a new timer is started upon reception of an SDU from upper layer.

In UM/TM, if a timer expires before the corresponding SDU is submitted to lower layer, "SDU discard without explicit signalling" specified in subclauses 11.2.4.3 and 11.1.4.2 shall be initiated. In AM, if a timer expires before the corresponding SDU is acknowledged, "SDU discard with explicit signalling" specified in subclause 11.6 shall be initiated.

e) Timer_Poll_Periodic.

This timer shall only be used when "timer based polling" is configured by upper layers. The value of the timer is signalled by upper layers. The timer shall be started when the RLC entity is created. When the timer expires, the RLC entity shall:

- restart the timer;
- if AMD PDUs are available for transmission or retransmission (not yet acknowledged):
    - trigger a poll.

f) Timer_Status_Prohibit.

This timer shall only be used when so configured by upper layers. It is meant to prohibit the Receiver from sending consecutive acknowledgement status reports. A status report is an acknowledgement status report if it contains any of the SUFIs LIST, BITMAP, RLIST or ACK. The value of the timer is signalled by upper layers.

In the UE, this timer shall be started when the successful or unsuccessful transmission of the last STATUS PDU of an acknowledgement status report is indicated by lower layer. In UTRAN it should be started when the last STATUS PDU of an acknowledgement status report is submitted to lower layer.

From the time an acknowledgement status report is triggered until the Timer_Status_Prohibit timer expires, acknowledgement is prohibited. If another such status report is triggered while acknowledgement is prohibited, its transmission shall be delayed until the timer expires (see subclause 9.7.2). The status report may be updated during this time. The transmission of SUFIs MRW, MRW_ACK, WINDOW or NO_MORE is not restricted.

When Timer_Status_Prohibit is not configured by upper layers, acknowledgment is not prohibited.

g) Timer_Status_Periodic.

This timer shall only be used when timer based status reporting is configured by upper layers.

This timer shall be started when the RLC entity is created. When the timer expires the transmission of a status report shall be triggered and the timer shall be restarted. This timer can be blocked by upper layers. The timer shall be restarted when upper layers indicate that it is no longer blocked.

h) Timer_RST.

This timer is meant to handle the loss of a RESET PDU by the peer entity, or the loss of a RESET ACK PDU from the peer entity. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of a RESET PDU is indicated by lower layer. In UTRAN it should be started when a RESET PDU is submitted to lower layer.

Timer_RST shall only be stopped upon reception of a RESET ACK PDU (with same RSN as RESET PDU), i.e. this timer shall not be stopped when an RLC reset initiated by the peer RLC entity occurs. If this timer expires, the RESET PDU shall be retransmitted.

i) Timer_MRW.

This timer is used to trigger the retransmission of a status report containing an MRW SUFI field. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of a STATUS PDU containing the MRW SUFI is indicated by lower layer. In UTRAN, it should be started when a STATUS PDU containing the MRW SUFI is submitted to lower layer.

Each time the timer expires the MRW SUFI is retransmitted and the timer is restarted. It shall be stopped when one of the termination criteria for the SDU discard with explicit signalling procedure is fulfilled (see subclause 11.6.4).

9.7.2 STATUS transmission for acknowledged mode

The Receiver 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 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) VoidThe EPC mechanism.

   The timer Timer_EPC is started according to subclause 9.5 e) 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) VoidThe 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.

When a status report is triggered the Receiver shall:

- if transmission of status reports is not prohibited by any of the functions "STATUS prohibit" or "EPC mechanism":
  - assemble and transmit the status report to the Sender, as specified in subclauses 11.5.2.2 and 11.5.2.3.
- otherwise (if the status report is prohibited by at least one of the functions "STATUS prohibit" or "EPC mechanism"):
  - if MRW, MRW_ACK or WINDOW SUFIs are required in the status report:
    - send a status report immediately excluding ACK, LIST, BITMAP, and RLIST SUFIs;
  - if ACK, LIST, BITMAP, or RLIST SUFIs are required in the status report:
    - delay sending these SUFIs until the prohibit function terminates.

Upon expiry of the timer Timer_Status_Prohibit or termination of the "EPC mechanism", the Receiver shall:

- if at least one status report was triggered during the time the transmission of a status reports was prohibited that could not be transmitted due to prohibition; and
- if transmission of a status reports is no longer prohibited by any of the functions "STATUS prohibit"~~ or "EPC mechanism"~~:
  - transmit one status report to the Sender, using the procedure described in subclause 11.5.2.3.

9.7.4 Void~~The Estimated PDU Counter for acknowledged mode~~

~~The Estimated PDU Counter (EPC) is only applicable for RLC entities operating in acknowledged mode. The EPC is a mechanism configured by upper layers used for scheduling the retransmission of status reports in the Receiver. With this mechanism, the Receiver will send a new status report in which it requests for AMD PDUs not yet received. The time between two subsequent status report retransmissions is not fixed, but it is controlled by both the timer Timer_EPC and the state variable VR(EP), which adapt this time to the round trip delay and the current bit rate, indicated in the TFI, in order to minimise the delay of the status report retransmission.~~

~~When a status report is triggered by some mechanisms and it is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer (in UE) to request for retransmitting one or more missing AMD PDUs, the variable VR(EP) is set equal to the number of requested AMD PDUs. At least one requested AMD PDU is needed to activate the EPC mechanism. The variable VR(EP) is a counter, which is decremented every transmission time interval with the estimated number of AMD PDUs that should have been received during that transmission time interval on the corresponding logical channel.~~

~~The timer Timer_EPC controls the maximum time that the variable VR(EP) needs to wait before it will start counting down. This timer starts immediately after a transmission of a retransmission request from the Receiver (when the first STATUS PDU of the status report is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer(in UE)). The initial value of the timer Timer_EPC is configured by upper layers. It typically depends on the roundtrip delay, which consists of the propagation delay, processing time in the transmitter and Receiver and the frame structure. This timer can also be implemented as a counter, which counts the number of 10 ms radio frames that could be expected to elapse before the first requested AMD PDU is received.~~

~~If not all of these requested AMD PDUs have been received correctly when VR(EP) is equal to zero, a new status report will be transmitted and the EPC mechanism will be reset accordingly. The timer Timer_EPC will be started once more when the first STATUS PDU of the status report is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer (in UE). If all of the requested AMD PDUs have been received correctly, the EPC mechanism ends.~~

11.5.2.2 STATUS PDU contents to set

On triggering of a status report, the Receiver shall:

- if ~~neither~~ the "STATUS prohibit" ~~nor "EPC mechanism" are~~is not active:
  - include negative acknowledgements for all AMD PDUs detected as missing;
  - include positive acknowledgements for all AMD PDUs received up to at least VR(R);
- if an MRW SUFI assembled as specified in subclause 11.6.2.2 had not been sent:
  - optionally include the MRW SUFI;
- if an MRW_ACK SUFI assembled as specified in subclause 11.6.2.2 is awaiting transmission:
  - optionally include the MRW_ACK SUFI;
- if the Sender's transmission window is to be updated:
  - optionally include the WINDOW SUFI;
- if all SUFIs can be accommodated in one STATUS PDU:
  - construct the status report using one STATUS PDU, using one of the allowed PDU sizes;
  - if the SUFIs included do not fill the entire STATUS PDU:

- terminate the STATUS PDU with the ACK or NO_MORE SUFI;
- use padding in the remainder of the STATUS PDU;

- otherwise (SUFIs included fill the entire STATUS PDU):
  - ACK or NO_MORE SUFIs need not be included in that STATUS PDU;

- otherwise (the status report is segmented):
  - construct STATUS PDUs including only complete SUFIs using one of the allowed PDU sizes. The set of STATUS PDUs shall accommodate all the SUFIs to form the complete status report. Indication of the same AMD PDU shall not be given in more than one STATUS PDU of a status report, but the ACK SUFI can be present in more than one STATUS PDU of a status report;
  - if any STATUS PDU constructed is not entirely filled with SUFIs:
    - terminate that STATUS PDU with the ACK or NO_MORE SUFI;
    - use padding in the remainder of that STATUS PDU.
  - otherwise (SUFIs included fill the entire STATUS PDU):
    - ACK or NO_MORE SUFIs should not be included in that STATUS PDU.

Which SUFI fields to use is implementation dependent. Bitmap SUFI is used to indicate both received and/or missing AMD PDUs. List SUFI and/or Relative List SUFI are used to indicate missing AMD PDUs only. Acknowledgement SUFI is used to indicate the received AMD PDUs. (For SUFI details see 9.2.2.11.) No information shall be given for AMD PDUs with "Sequence Number"≥VR(H), i.e. AMD PDUs that have not yet reached the Receiver.

11.5.2.3 Submission of STATUS PDUs to the lower layer

The Receiver shall:

- inform the lower layer of the STATUS PDUs scheduled for transmission;
- submit to the lower layer, the requested number of PDUs (STATUS PDUs, piggybacked AMD/STATUS PDUs and optionally AMD PDUs, see also subclause 11.3.2.2);
- if "Timer based STATUS transfer" is configured and the timer Timer_Status_Periodic has expired:
  - restart the timer Timer_Status_Periodic according to subclause 9.5 f);

~~- if the "EPC mechanism" is configured:~~

~~- start the timer Timer_EPC according to subclause 9.5 c), and set VR(EP) equal to the number of AMD PDUs requested to be retransmitted;~~

- if the STATUS PDU includes the MRW SUFI:
  - start the timer Timer_MRW according to subclause 9.5 i).

11.5.4 Abnormal cases

11.5.4.1 Void~~VR(EP) equals zero and the requested AMD PDUs have not been received~~

~~If the EPC mechanism is configured and VR(EP) equals zero and not all AMD PDUs requested for retransmission have been received, the Receiver shall:~~

~~- retransmit the status report. The retransmitted status report may contain new or different SUFI fields in order to indicate that some previously lost AMD PDUs have been received and that some additional AMD PDUs have been lost.~~

3GPP TSG-RAN2 Meeting #37
Budapest, Hungary, 25th August 2003

Tdoc ⌘R2-0312010

CR-Form-v7

CHANGE REQUEST

⌘ **25.322** **CR** **242** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

*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 [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Elimination of EPC mechanism
Source:	⌘	RAN WG2
Work item code:	⌘	TEI
Date:	⌘	15/08/2003
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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The description of the EPC mechanism is found to be unclear. As it is not a strictly necessary mechanism, it was seen easier to eliminate it from the specifications.
Summary of change:	⌘	All references to the EPC mechanism were removed.
Consequences if not approved:	⌘	Networks will most likely never configure it as they would not know exactly how UEs would operate. UEs would still have to go through the burden of implementing it.

Clauses affected:	⌘	3.2, 9.4, 9.5, 9.7.2, 9.7.4, 11.5.2.2, 11.5.2.3, 11.5.4.1

Other specs affected:	Y	N			
⌘	X		Other core specifications	⌘	TS 25.331
		X	Test specifications		
		X	O&M Specifications		

Other comments:	⌘	

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FACH	Forward link Access CHannel
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L2	Layer 2 (data link layer)
L3	Layer 3 (network layer)
LI	Length Indicator
LSB	Least Significant Bit
MAC	Medium Access Control
MRW	Move Receiving Window
MSB	Most Significant Bit
PCCH	Paging Control CHannel
PCH	Paging CHannel
PDU	Protocol Data Unit
PHY	PHYsical layer
PhyCH	Physical CHannels
RACH	Random Access CHannel
RLC	Radio Link Control
RRC	Radio Resource Control
SAP	Service Access Point
SDU	Service Data Unit
SHCCH	SHared channel Control CHannel
SN	Sequence Number
SUFI	SUper FIeld
TCH	Traffic CHannel
TDD	Time Division Duplex
TFI	Transport Format Indicator
TM	Transparent Mode
TMD	Transparent Mode Data
TTI	Transmission Time Interval
U-	User-
UE	User Equipment
UL	UpLink
UM	Unacknowledged Mode
UMD	Unacknowledged Mode Data
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network

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" $\geq$ VT(MS) unless VT(S) $\geq$ 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 the AMD PDU carrying the first segment of this SDU is scheduled to be transmitted for the first time. 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 "Length Indicator" indicating the end 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 a timer Timer_MRW expires. 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) Void~~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.~~

9.5 Timers

The timers defined in this subclause are normative. The timers shall be considered active from the time they are started until the time they either expire or are stopped.

a) Timer_Poll.

This timer shall only be used when so configured by upper layers. The value of the timer is signalled by upper layers. In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer. If x is the value of the state variable VT(S) after the poll was submitted to lower layer, the timer shall be stopped upon receiving:

- positive acknowledgements for all the AMD PDUs with "Sequence Number" up to and including x - 1; or
- a negative acknowledgement for the AMD PDU with "Sequence Number" = x - 1.

If the timer expires and no STATUS PDU fulfilling the criteria above has been received:

- the Receiver shall be polled once more;
- the timer shall be restarted; and
- the new value of VT(S) shall be saved.

If a new poll is sent when the timer is active, the timer shall be restarted at the time specified above, and the value of VT(S) shall be saved.

b) Timer_Poll_Prohibit.

This timer shall only be used when so configured by upper layers. It is used to prohibit transmission of polls within a certain period. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of an AMD PDU containing a poll is indicated by lower layer. In UTRAN it should be started when an AMD PDU containing a poll is submitted to lower layer.

From the time a poll is triggered until the timer expires, polling is prohibited. If another poll is triggered while polling is prohibited, its transmission shall be delayed until the timer expires (see subclause 9.7.1). Only one poll shall be transmitted when Timer_Poll_Prohibit expires even if several polls were triggered in the meantime. This timer shall not be affected by the reception of STATUS PDUs.

When Timer_Poll_Prohibit is not configured by upper layers, polling is never prohibited.

c) Void~~Timer_EPC~~.

~~This timer shall only be used when the EPC function is configured by upper layers. It is meant to account for the roundtrip delay, i.e. the time between the transmission of a status report and the reception of the first retransmitted AMD PDU. The initial value of the timer is signalled by upper layers.~~

~~In the UE, this timer shall be started when the successful or unsuccessful transmission of the first STATUS PDU of a status report is indicated by lower layer. In UTRAN it should be started when the first STATUS PDU of a status report is submitted to lower layer. Only after Timer_EPC expires shall VR(EP) be decremented as described in subclause 9.7.4.~~

d) Timer_Discard.

This timer shall be used when timer-based SDU discard is configured by upper layers. The value of the timer is signalled by upper layers. In the transmitter, a new timer is started upon reception of an SDU from upper layer.

In UM/TM, if a timer expires before the corresponding SDU is submitted to lower layer, "SDU discard without explicit signalling" specified in subclauses 11.2.4.3 and 11.1.4.2 shall be initiated. In AM, if a timer expires before the corresponding SDU is acknowledged, "SDU discard with explicit signalling" specified in subclause 11.6 shall be initiated.

e) Timer_Poll_Periodic.

This timer shall only be used when "timer based polling" is configured by upper layers. The value of the timer is signalled by upper layers. The timer shall be started when the RLC entity is created. When the timer expires, the RLC entity shall:

- restart the timer;
- if AMD PDUs are available for transmission or retransmission (not yet acknowledged):
    - trigger a poll.

f) Timer_Status_Prohibit.

This timer shall only be used when so configured by upper layers. It is meant to prohibit the Receiver from sending consecutive acknowledgement status reports. A status report is an acknowledgement status report if it contains any of the SUFIs LIST, BITMAP, RLIST or ACK. The value of the timer is signalled by upper layers.

In the UE, this timer shall be started when the successful or unsuccessful transmission of the last STATUS PDU of an acknowledgement status report is indicated by lower layer. In UTRAN it should be started when the last STATUS PDU of an acknowledgement status report is submitted to lower layer.

From the time an acknowledgement status report is triggered until the Timer_Status_Prohibit timer expires, acknowledgement is prohibited. If another such status report is triggered while acknowledgement is prohibited, its transmission shall be delayed until the timer expires (see subclause 9.7.2). The status report may be updated during this time. The transmission of SUFIs MRW, MRW_ACK, WINDOW or NO_MORE is not restricted.

When Timer_Status_Prohibit is not configured by upper layers, acknowledgment is not prohibited.

g) Timer_Status_Periodic.

This timer shall only be used when timer based status reporting is configured by upper layers.

This timer shall be started when the RLC entity is created. When the timer expires the transmission of a status report shall be triggered and the timer shall be restarted. This timer can be blocked by upper layers. The timer shall be restarted when upper layers indicate that it is no longer blocked.

h) Timer_RST.

This timer is meant to handle the loss of a RESET PDU by the peer entity, or the loss of a RESET ACK PDU from the peer entity. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of a RESET PDU is indicated by lower layer. In UTRAN it should be started when a RESET PDU is submitted to lower layer.

Timer_RST shall only be stopped upon reception of a RESET ACK PDU (with same RSN as RESET PDU), i.e. this timer shall not be stopped when an RLC reset initiated by the peer RLC entity occurs. If this timer expires, the RESET PDU shall be retransmitted.

i) Timer_MRW.

This timer is used to trigger the retransmission of a status report containing an MRW SUFI field. The value of the timer is signalled by upper layers.

In the UE this timer shall be started when the successful or unsuccessful transmission of a STATUS PDU containing the MRW SUFI is indicated by lower layer. In UTRAN, it should be started when a STATUS PDU containing the MRW SUFI is submitted to lower layer.

Each time the timer expires the MRW SUFI is retransmitted and the timer is restarted. It shall be stopped when one of the termination criteria for the SDU discard with explicit signalling procedure is fulfilled (see subclause 11.6.4).

9.7.2 STATUS transmission for acknowledged mode

The Receiver 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 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) VoidThe EPC mechanism.

   The timer Timer_EPC is started according to subclause 9.5 e) 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) VoidThe 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.

When a status report is triggered the Receiver shall:

- if transmission of status reports is not prohibited by any of the functions "STATUS prohibit" or "EPC mechanism":
  - assemble and transmit the status report to the Sender, as specified in subclauses 11.5.2.2 and 11.5.2.3.
- otherwise (if the status report is prohibited by at least one of the functions "STATUS prohibit" or "EPC mechanism"):
  - if MRW, MRW_ACK or WINDOW SUFIs are required in the status report:
    - send a status report immediately excluding ACK, LIST, BITMAP, and RLIST SUFIs;
  - if ACK, LIST, BITMAP, or RLIST SUFIs are required in the status report:
    - delay sending these SUFIs until the prohibit function terminates.

Upon expiry of the timer Timer_Status_Prohibit or termination of the "EPC mechanism", the Receiver shall:

- if at least one status report was triggered during the time the transmission of a status reports was prohibited that could not be transmitted due to prohibition; and
- if transmission of a status reports is no longer prohibited by any of the functions "STATUS prohibit"~~ or "EPC mechanism"~~:
  - transmit one status report to the Sender, using the procedure described in subclause 11.5.2.3.

9.7.4 Void~~The Estimated PDU Counter for acknowledged mode~~

~~The Estimated PDU Counter (EPC) is only applicable for RLC entities operating in acknowledged mode. The EPC is a mechanism configured by upper layers used for scheduling the retransmission of status reports in the Receiver. With this mechanism, the Receiver will send a new status report in which it requests for AMD PDUs not yet received. The time between two subsequent status report retransmissions is not fixed, but it is controlled by both the timer Timer_EPC and the state variable VR(EP), which adapt this time to the round trip delay and the current bit rate, indicated in the TFI, in order to minimise the delay of the status report retransmission.~~

~~When a status report is triggered by some mechanisms and it is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer (in UE) to request for retransmitting one or more missing AMD PDUs, the variable VR(EP) is set equal to the number of requested AMD PDUs. At least one requested AMD PDU is needed to activate the EPC mechanism. The variable VR(EP) is a counter, which is decremented every transmission time interval with the estimated number of AMD PDUs that should have been received during that transmission time interval on the corresponding logical channel.~~

~~The timer Timer_EPC controls the maximum time that the variable VR(EP) needs to wait before it will start counting down. This timer starts immediately after a transmission of a retransmission request from the Receiver (when the first STATUS PDU of the status report is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer(in UE)). The initial value of the timer Timer_EPC is configured by upper layers. It typically depends on the roundtrip delay, which consists of the propagation delay, processing time in the transmitter and Receiver and the frame structure. This timer can also be implemented as a counter, which counts the number of 10 ms radio frames that could be expected to elapse before the first requested AMD PDU is received.~~

~~If not all of these requested AMD PDUs have been received correctly when VR(EP) is equal to zero, a new status report will be transmitted and the EPC mechanism will be reset accordingly. The timer Timer_EPC will be started once more when the first STATUS PDU of the status report is submitted to lower layer (in UTRAN) or the successful or unsuccessful transmission of it is indicated by lower layer (in UE). If all of the requested AMD PDUs have been received correctly, the EPC mechanism ends.~~

11.5.2.2 STATUS PDU contents to set

On triggering of a status report, the Receiver shall:

- if ~~neither~~ the "STATUS prohibit" ~~nor "EPC mechanism" are~~is not active:
  - include negative acknowledgements for all AMD PDUs detected as missing;
  - include positive acknowledgements for all AMD PDUs received up to at least VR(R);
- if an MRW SUFI assembled as specified in subclause 11.6.2.2 had not been sent:
  - optionally include the MRW SUFI;
- if an MRW_ACK SUFI assembled as specified in subclause 11.6.2.2 is awaiting transmission:
  - optionally include the MRW_ACK SUFI;
- if the Sender's transmission window is to be updated:
  - optionally include the WINDOW SUFI;
- if all SUFIs can be accommodated in one STATUS PDU:
  - construct the status report using one STATUS PDU, using one of the allowed PDU sizes;
  - if the SUFIs included do not fill the entire STATUS PDU:

- terminate the STATUS PDU with the ACK or NO_MORE SUFI;
- use padding in the remainder of the STATUS PDU;

- otherwise (SUFIs included fill the entire STATUS PDU):
  - ACK or NO_MORE SUFIs need not be included in that STATUS PDU;

- otherwise (the status report is segmented):
  - construct STATUS PDUs including only complete SUFIs using one of the allowed PDU sizes. The set of STATUS PDUs shall accommodate all the SUFIs to form the complete status report. Indication of the same AMD PDU shall not be given in more than one STATUS PDU of a status report, but the ACK SUFI can be present in more than one STATUS PDU of a status report;
  - if any STATUS PDU constructed is not entirely filled with SUFIs:
    - terminate that STATUS PDU with the ACK or NO_MORE SUFI;
    - use padding in the remainder of that STATUS PDU.
  - otherwise (SUFIs included fill the entire STATUS PDU):
    - ACK or NO_MORE SUFIs should not be included in that STATUS PDU.

Which SUFI fields to use is implementation dependent. Bitmap SUFI is used to indicate both received and/or missing AMD PDUs. List SUFI and/or Relative List SUFI are used to indicate missing AMD PDUs only. Acknowledgement SUFI is used to indicate the received AMD PDUs. (For SUFI details see 9.2.2.11.) No information shall be given for AMD PDUs with "Sequence Number"≥VR(H), i.e. AMD PDUs that have not yet reached the Receiver.

11.5.2.3 Submission of STATUS PDUs to the lower layer

The Receiver shall:

- inform the lower layer of the STATUS PDUs scheduled for transmission;
- submit to the lower layer, the requested number of PDUs (STATUS PDUs, piggybacked AMD/STATUS PDUs and optionally AMD PDUs, see also subclause 11.3.2.2);
- if "Timer based STATUS transfer" is configured and the timer Timer_Status_Periodic has expired:
  - restart the timer Timer_Status_Periodic according to subclause 9.5 f);

~~- if the "EPC mechanism" is configured:~~

~~- start the timer Timer_EPC according to subclause 9.5 c), and set VR(EP) equal to the number of AMD PDUs requested to be retransmitted;~~

- if the STATUS PDU includes the MRW SUFI:
  - start the timer Timer_MRW according to subclause 9.5 i).

11.5.4 Abnormal cases

11.5.4.1 Void~~VR(EP) equals zero and the requested AMD PDUs have not been received~~

~~If the EPC mechanism is configured and VR(EP) equals zero and not all AMD PDUs requested for retransmission have been received, the Receiver shall:~~

~~- retransmit the status report. The retransmitted status report may contain new or different SUFI fields in order to indicate that some previously lost AMD PDUs have been received and that some additional AMD PDUs have been lost.~~

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CR-Form-v7

CHANGE REQUEST

⌘ **25.331** **CR** **2062** ⌘ **rev** **-** ⌘ Current version: **3.f.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 [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Elimination of EPC mechanism
Source:	⌘	RAN WG2
Work item code:	⌘	TEI
Date:	⌘	25/08/2003
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)
Rel-6 (Release 6)

Reason for change:	⌘	The description of the EPC mechanism is found to be unclear. As it is not a strictly necessary mechanism, it was seen easier to eliminate it from the specifications.
Summary of change:	⌘	Removed the EPC related parameter from the tabular. Replaced the parameter with dummy in the ASN.1.
Consequences if not approved:	⌘	Networks will most likely never configure it as they would not know exactly how UEs would operate. UEs would still have to go through the burden of implementing it. Impact analysis: - There is no impact on T1 as no tests have yet been defined nor are foreseen in any of the GCF testing packages. - The impact is limited to the EPC mechanism. - There may be a problem if a network supporting the mechanism interacts with a UE that does not support it. However, given the lack of tests this is very unlikely.

Clauses affected:	⌘	10.3.4.1, 11.1

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	TS 25.322
			X	Test specifications		
			X	O&M Specifications		

Other comments: ⌘	

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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.

10.3.4.1 Downlink RLC STATUS info

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Timer_Status_Prohibit	OP		Integer(10..550 by step of 10, 550..1000 by step of 50)	Minimum time in ms between STATUS reports
~~Timer_EPC~~	~~OP~~		~~Integer(50, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 300, 400, 500, 700, 900)~~	~~Time in ms~~
Missing PDU Indicator	MP		Boolean	Value true indicates that UE should send a STATUS report for each missing PDU that is detected
Timer_STATUS_periodic	OP		Integer(100, 200, 300, 400, 500, 750, 1000, 2000)	Time in milliseconds

11.1 General message structure

[…]

```
DL-RLC-StatusInfo ::=               SEQUENCE {
    timerStatusProhibit                 TimerStatusProhibit                 OPTIONAL,
    -- dummy is not used in this version of the specification, it should not be sent
    -- and if received they should be ignored.
    dummy~~timerEPC~~                           TimerEPC                            OPTIONAL,
    missingPDU-Indicator                BOOLEAN,
    timerStatusPeriodic                 TimerStatusPeriodic                 OPTIONAL
}


[…]

TimerEPC ::=                        ENUMERATED {
                                        te50, te60, te70, te80, te90,
                                        te100, te120, te140, te160, te180,
                                        te200, te300, te400, te500, te700,
                                        te900 }
```

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CHANGE REQUEST

⌘ **25.331** **CR** **2063** ⌘ **rev** **-** ⌘ Current version: **4.9.0** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Elimination of EPC mechanism
Source:	⌘	RAN WG2
Work item code:	⌘	TEI
Date:	⌘	25/08/2003
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
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Rel-6 (Release 6)

Reason for change:	⌘	The description of the EPC mechanism is found to be unclear. As it is not a strictly necessary mechanism, it was seen easier to eliminate it from the specifications.
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Consequences if not approved:	⌘	Networks will most likely never configure it as they would not know exactly how UEs would operate. UEs would still have to go through the burden of implementing it.

Clauses affected:	⌘	10.3.4.1, 11.1			
Other specs affected:	⌘	**Y** / **N**	Other core specifications	⌘	TS 25.322
		X /	Other core specifications		
		/ **X**	Test specifications		
		/ **X**	O&M Specifications		
Other comments:	⌘				

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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.
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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.

10.3.4.1 Downlink RLC STATUS info

Information Element/Group name	Need	Multi	Type and reference	Semantics description
Timer_Status_Prohibit	OP		Integer(10..550 by step of 10, 550..1000 by step of 50)	Minimum time in ms between STATUS reports
~~Timer_EPC~~	~~OP~~		~~Integer(50, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 300, 400, 500, 700, 900)~~	~~Time in ms~~
Missing PDU Indicator	MP		Boolean	Value true indicates that UE should send a STATUS report for each missing PDU that is detected
Timer_STATUS_periodic	OP		Integer(100, 200, 300, 400, 500, 750, 1000, 2000)	Time in milliseconds

11.1 General message structure

[…]

```
DL-RLC-StatusInfo ::=               SEQUENCE {
    timerStatusProhibit                 TimerStatusProhibit                 OPTIONAL,
    -- dummy is not used in this version of the specification, it should not be sent
    -- and if received they should be ignored.
    dummy~~timerEPC~~                           TimerEPC                            OPTIONAL,
    missingPDU-Indicator                BOOLEAN,
    timerStatusPeriodic                 TimerStatusPeriodic                 OPTIONAL
}


[…]

TimerEPC ::=                        ENUMERATED {
                                        te50, te60, te70, te80, te90,
                                        te100, te120, te140, te160, te180,
                                        te200, te300, te400, te500, te700,
                                        te900 }
```

3GPP TSG-RAN2 Meeting #37
Budapest, Hungary, 25/08/2003

Tdoc ⌘R2-032022

CR-Form-v7

CHANGE REQUEST

⌘ **25.331** **CR** **2064** ⌘ **rev** **-** ⌘ Current version: **5.5.0** ⌘

*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 [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	Elimination of EPC mechanism
Source:	⌘	RAN WG2
Work item code:	⌘	TEI
Date:	⌘	25/08/2003
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)
Rel-6 (Release 6)

Reason for change:	⌘	The description of the EPC mechanism is found to be unclear. As it is not a strictly necessary mechanism, it was seen easier to eliminate it from the specifications.
Summary of change:	⌘	Removed the EPC related parameter from the tabular. Replaced the parameter with dummy in the ASN.1.
Consequences if not approved:	⌘	Networks will most likely never configure it as they would not know exactly how UEs would operate. UEs would still have to go through the burden of implementing it.

Clauses affected:	⌘	10.3.4.1, 11.1			
Other specs affected:	⌘	**Y** / **N**	Other core specifications	⌘	TS 25.322
		X /	Other core specifications		
		/ **X**	Test specifications		
		/ **X**	O&M Specifications		
Other comments:	⌘				

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```