TSG-RAN Meeting #18 ***RP-020735***
***New-Orleans, USA, 03* - 06 December 2002**

Title: **Agreed CR (Rel-5) to TS 25.321**

Source: **TSG-RAN WG2**

Agenda item: **7.2.5**

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version-	Version
R2-022703	Agreed	25.321	137	-	Rel-5	Generation of RLC Status Reports to coordinate with MAC-hs reset	B	5.2.0	5.3.0
R2-022706	Agreed	25.321	138	-	Rel-5	Re-ordering Mechanism	F	5.2.0	5.3.0
R2-022707	Agreed	25.321	139	-	Rel-5	Transport Block Size Signalling for 1.28Mcps TDD	F	5.2.0	5.3.0
R2-023207	Agreed	25.321	153	-	Rel-5	Limitation on number of PDUs per single TTI for 1.28 Mcps TDD	F	5.2.0	5.3.0
R2-023208	Agreed	25.321	154	-	Rel-5	The Number of mac-d pdu’s in a single mac-hs PDU for TDD	F	5.2.0	5.3.0

3GPP TSG-RAN2 Meeting #33
Sophia Antipolis, France, 12-15 November 2002

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CR-Form-v7

CHANGE REQUEST

⌘ **25.321** **CR** **137** ⌘ **rev** **-** ⌘ Current version: **5.2.0** ⌘

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

Title:	⌘	Generation of RLC Status Reports to coordinate with MAC-hs reset
Source:	⌘	InterDigital
Work item code:	⌘	HSDPA-L23
Date:	⌘	Sep 27, 2002
Category:	⌘	**B**
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:	⌘	For proper operations, generation of RLC Status Reports should follow flushing of the reordering buffers.
Summary of change:	⌘	Following the MAC-hs reset, the MAC indicates RLC to generate a status report for appropriate RLC status to be known by the UTRAN, where the MAC indicates the RLC through a primitive “Status_Report_REQ”.
Consequences if not approved:	⌘	Unnecessary delay in recovery of data lost in the source Node-B following handovers.

Clauses affected:	⌘	8.2.1, 8.2.2, 11.6.2.5

Other specs affected:	Y	N			
⌘	X		Other core specifications	⌘	25.322 CR 210, 25.308 CR 004.
		X	Test specifications		
		X	O&M Specifications		

Other comments:	⌘	

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

8.2.1 Primitives

The primitives between MAC layer and RLC layer are shown in table 8.2.1.1.

Table 8.2.1.1: Primitives between MAC layer and RLC layer

Generic Name	Parameter			
	Request	Indication	Response	Confirm
MAC-DATA	Data, BO, UE-ID type indicator, RLC Entity Info	Data, No_TB, TD (note), Error indication		
MAC-STATUS		No_PDU, PDU_Size, TX status, Status_Report_REQ	BO, RLC Entity Info	
NOTE: TDD only.				

MAC-DATA-Req/Ind:

- MAC-DATA-Req primitive is used to request that an upper layer PDU be sent using the procedures for the information transfer service;
- MAC-DATA-Ind primitive indicates the arrival of upper layer PDUs received within one transmission time interval by means of the information transfer service.

MAC-STATUS-Ind/Resp:

- MAC-STATUS-Ind primitive indicates to RLC for each logical channel the rate at which it may transfer data to MAC. Parameters are the number of PDUs that can be transferred in each transmission time interval and the PDU size; it is possible that MAC would use this primitive to indicate that it expects the current buffer occupancy of the addressed logical channel in order to provide for optimised TFC selection on transport channels with long transmission time interval. At the UE, MAC-STATUS-Ind primitive is also used to indicate from MAC to RLC that MAC has requested data transmission by PHY (i.e. PHY-DATA-REQ has been submitted, see Fig. 11.2.2.1), or that transmission of an RLC PDU on RACH or CPCH has failed due to exceeded preamble ramping cycle counter.
- MAC-STATUS-Resp primitive enables RLC to acknowledge a MAC-STATUS-Ind. It is possible that RLC would use this primitive to indicate that it has nothing to send or that it is in a suspended state or to indicate the current buffer occupancy to MAC.

8.2.2 Parameters

a) Data:

- it contains the RLC layer messages (RLC-PDU) to be transmitted, or the RLC layer messages that have been received by the MAC sub-layer.

b) Number of transmitted transport blocks (No_TB) :

- indicates the number of transport blocks transmitted by the peer entity within the transmission time interval, based on the TFI value.

c) Buffer Occupancy (BO):

- the parameter Buffer Occupancy (BO) indicates for each logical channel the amount of data in number of bytes that is available for transmission and retransmission in RLC layer. When MAC is connected to an AM RLC entity, control PDUs to be transmitted and RLC PDUs outside the RLC Tx window shall also be included in the BO. RLC PDUs that have been transmitted but not negatively acknowledged by the peer entity shall not be included in the BO.

d) RX Timing Deviation (TD), TDD only:

- it contains the RX Timing Deviation as measured by the physical layer for the physical resources carrying the data of the Message Unit. This parameter is optional and only for Indication. It is needed for the transfer of the RX Timing Deviation measurement of RACH transmissions carrying CCCH data to RRC.

e) Number of PDU (No_PDU):

- specifies the number of PDUs that the RLC is permitted to transfer to MAC within a transmission time interval.

f) PDU Size (PDU_Size):

- specifies the size of PDU that can be transferred to MAC within a transmission time interval.

g) UE-ID Type Indicator:

- indicates the UE-ID type to be included in MAC for a DCCH and DTCH when they are mapped onto a common transport channel (i.e. FACH, RACH, DSCH in FDD or CPCH). On the UE side UE-ID Type Indicator shall always be set to C-RNTI.

h) TX status:

- when set to value "transmission unsuccessful" this parameter indicates to RLC that transmission of an RLC PDU failed in the previous Transmission Time Interval, when set to value "transmission successful" this parameter indicates to RLC that the requested RLC PDU(s) has been submitted for transmission by the physical layer.

i) RLC Entity Info

- indicates to MAC the configuration parameters that are critical to TFC selection depending on its mode and the amount of data that could be transmitted at the next TTI. This primitive is meant to insure that MAC can perform TFC selection (see subclause 11.4).

j) Error indication

- When a MAC SDU is delivered to upper layer, an error indication is given for the SDU to upper layer if an error indication for the SDU has been received from lower layer.

k) Status_Report_REQ

- indicates to all AM RLC entities mapped on HS-DSCH to generate a status report when the MAC-hs resets.

11.6.2.5 MAC-hs Reset

If a reset of the MAC-hs entity is requested by upper layers, the UE shall:

- flush soft buffer for all configured HARQ processes;
- stop all active re-ordering release timer (T1) and set all timer T1 to their initial value;
- start TSN with value 0 for the next transmission on every configured HARQ process;
- initialise the values for transmit window (TRANSMIT_ WINDOW), receive window (RECEIVE_WINDOW) and the next expected TSN (Next_expected_TSN=0);
- disassemble all MAC-hs PDUs in the re-ordering buffer and deliver all MAC-d PDUs to the MAC-d entity;
- flush the re-ordering buffer

and then:

- indicate to all AM RLC entities mapped on HS-DSCH to generate a status report.

3GPP TSG-RAN WG2 Meeting #32
Xian, China, 23 – 27 September 2002

Tdoc ⌘R2-022706

CR-Form-v7

CHANGE REQUEST

⌘ **25.321** **CR** **138** ⌘ **rev** **-** ⌘ Current version: **5.2.0** ⌘

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

Title:	⌘	Proposed CR to TS25.321 on Re-ordering Mechanism
Source:	⌘	Motorola
Work item code:	⌘	HSDPA
Date:	⌘	23/09/2002
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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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:	⌘	1. In the RAN2#27 a change was incorporated in the specification that leads to a prohibition on the transmitter in the UTRAN to abort a MAC-hs PDU transmission and re-schedule it later. This mechanism however does not account for the possibility that the UE misses a HS-SCCH assignment and thereby the UE would then potentially prematurely discard it's soft buffer contents. In addition, by creating a hole in the re-ordering buffer intentionally this mechanism would force a retransmission at the RLC level negating the advantage from HARQ. It is therefore proposed to delete this. 2. Figure 9.1.4.1 does not include the VF parameter – inline with the description in 9.2.2. 3. Various editorial changes.
Summary of change:	⌘	1. Prohibition on UTRAN transmission of aborted PDUs is removed. 2. Figure 9.1.4.1 is updated. 3. Various editorial changes have been made.
Consequences if not approved:	⌘	

Clauses affected:	⌘	4.2.4.2, 9.1.4, 11.6.1.2, 11.6.2.3.1

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

Other comments: ⌘

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4.2.4.3 MAC-hs entity – UTRAN Side

There is one MAC-hs entity in the UTRAN for each cell that supports HS-DSCH transmission. The MAC-hs is responsible for handling the data transmitted on the HS-DSCH. Furthermore ~~it is its responsibility~~ it is responsible for the management of ~~to manage~~ the physical resources allocated to HSDPA. MAC-hs receives configuration parameters from the RRC layer via the MAC-Control SAP. There should ~~shall~~ be priority handling per MAC-d PDU in the MAC-hs. The MAC-hs is comprised of four different functional entities:

- Flow Control:
  This is the companion flow control function to the flow control function in the MAC-c/sh in case of configuration with MAC-c/hs and MAC-d in case of configuration without MAC-c/hs. Both entities together provide a controlled data flow between the MAC-c/sh and the MAC-hs (Configuration with MAC-c/sh) or the MAC-d and MAC-hs (Configuration without MAC-c/hs) taking the transmission capabilities of the air interface into account in a dynamic manner. This function is intended to limit layer 2 signalling latency and reduce discarded and retransmitted data as a result of HS-DSCH congestion. Flow control is provided independently by MAC-d flow for a given MAC-hs entity.

- Scheduling/Priority Handling:
  This function manages HS-DSCH resources between HARQ entities and data flows according to their priority. Based on status reports from associated uplink signalling either new transmission or retransmission is determined. Further it determines the Queue ID and TSN for each new MAC-hs PDU being serviced. A new transmission can be initiated instead of a pending retransmission at any time to support the priority handling.

- HARQ:
  One HARQ entity handles the hybrid ARQ functionality for one user. One HARQ entity is capable of supporting multiple instances (HARQ process) of stop and wait HARQ protocols. There shall be one HARQ process per HS-DSCH per TTI.

- TFRC selection:
  Selection of an appropriate transport format and resource for the data to be transmitted on HS-DSCH.

The associated signalling shown in the figure illustrates the exchange of information between layer 1 and layer 2 provided by primitives shown in [3].

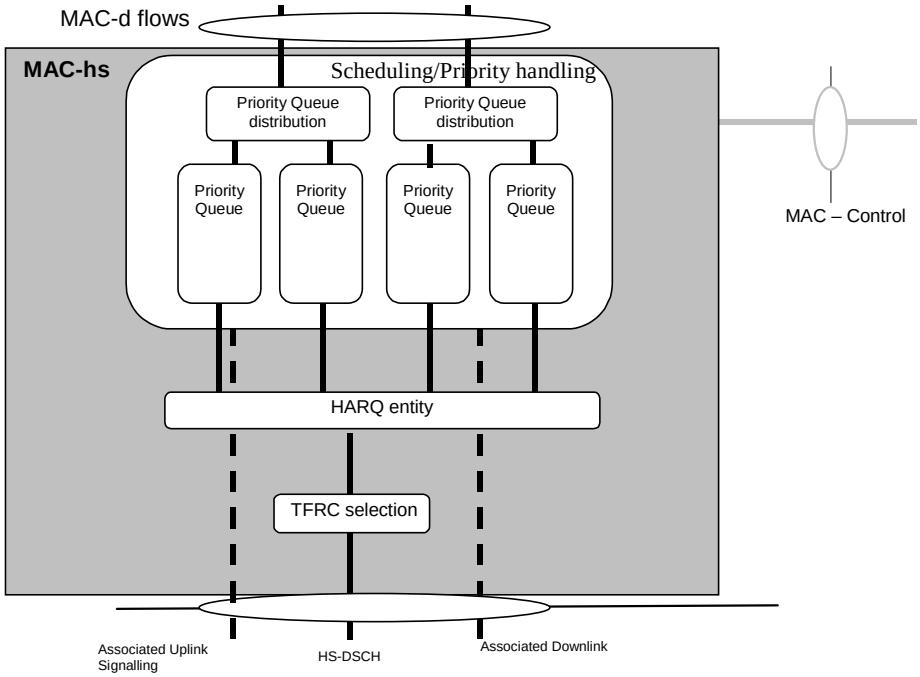

Figure 4.2.4.3.1: UTRAN side MAC architecture / MAC-hs details

9 Elements for peer-to-peer communication

9.1 Protocol data units

9.1.1 General

A MAC PDU is a bit string, with a length not necessarily a multiple of 8 bits. In the drawings in clause 9.1, bit strings are represented by tables in which the first bit is the leftmost one on the first line of the table, the last bit is the rightmost on the last line of the table, and more generally the bit string is to be read from left to right and then in the reading order of the lines.

Depending on the provided service, MAC SDUs are bit strings with any non-null length, or bit strings with an integer number of octets in length. An SDU is included into a MAC PDU from first bit onward.

In the UE for the uplink, all MAC PDUs delivered to the physical layer within one TTI are defined as Transport Block Set (TBS). It consists of one or several Transport Blocks, each containing one MAC PDU. The Transport Blocks, shall be transmitted in the order as delivered from RLC. When multiplexing of RLC PDUs from different logical channels is performed on MAC, the order of all Transport Blocks originating from the same logical channel shall be the same as the order of the sequence delivered from RLC. The order of the different logical channels in a TBS is set by the MAC protocol.

9.1.2 MAC PDU (non-HS-DSCH)

A MAC PDU consists of an optional MAC header and a MAC Service Data Unit (MAC SDU), see figure 9.1.2.1. Both the MAC header and the MAC SDU are of variable size.

The content and the size of the MAC header depends on the type of the logical channel, and in some cases none of the parameters in the MAC header are needed.

The size of the MAC-SDU depends on the size of the RLC-PDU, which is defined during the setup procedure.

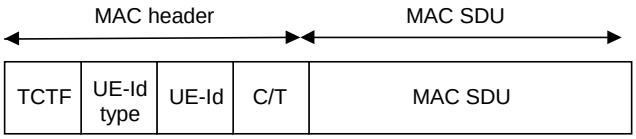

Figure 9.1.2.1: MAC PDU

9.1.3 MAC-d PDU (HS-DSCH)

For HS-DSCH the MAC-d PDU format equals the MAC PDU format for the non HS-DSCH case.

9.1.4 MAC PDU (HS-DSCH)

In case of HS-DSCH a MAC PDU consists of one MAC-hs header and one or more MAC-hs SDUs where each MAC-hs SDU equals a MAC-d PDU. A maximum of one MAC-hs PDU can be transmitted in a TTI per UE. The MAC-hs header is of variable size. The MAC-hs SDUs in one TTI belongs to the same reordering queue.

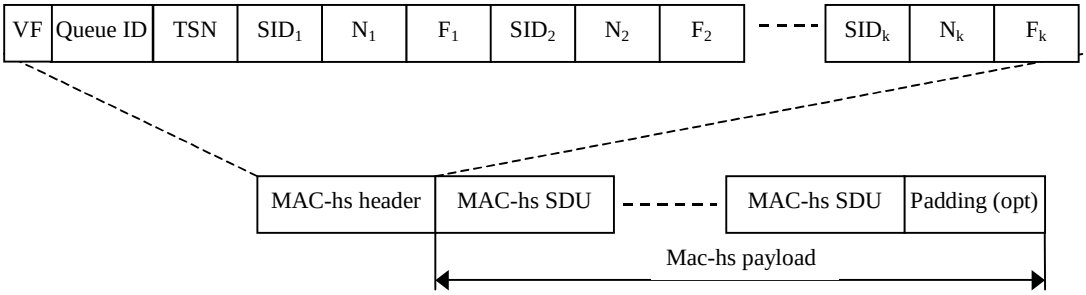

Figure 9.1.4.1: MAC-hs PDU

9.2.2 MAC PDU: Parameters of the MAC header (HS-DSCH)

- Version Flag (VF):
  The VF field is a one bit flag providing extension capabilities of the MAC-hs PDU format. The VF field shall be set to zero and the value one is reserved in this version of the protocol.

- Queue identifier (Queue ID):
  The Queue ID field provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues. The length of the Queue ID field is 3 bit.

- Transmission Sequence Number (TSN):
  The TSN field provides an identifier for the transmission sequence number on the HS-DSCH. The TSN field is used for reordering purposes to support in-sequence delivery to higher layers. The length of the TSN field is 6 bit.

- Size index identifier (SID):
  The SID fields identifies the size of a set of consecutive MAC-d PDUs. The MAC-d PDU size for a given SID is configured by higher layers and is independent for each Queue ID. The length of the SID field is 3 bit.

- Number of MAC-D PDUs (N):
  The number of consecutive MAC-d PDUs with equal size is identified with the N field. The length of the N field is 7 bits. In FDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 70. If more PDUs are received, the UE behaviour is unspecified.

- Flag (F):
  The F field is a flag indicating if more SID fields are present in the MAC-hs header or not. If the F field is set to "0" the F field is followed by a SID field. If the F field is set to "1" the F field is followed by a MAC-d PDU.

9.2.2.1 MAC header for DTCH and DCCH

a) DTCH or DCCH mapped to HS-DSCH:

   - The Queue ID field and TSN field are always included in the MAC-hs header. One SID field, N field and F field is included for each MAC-d PDU size included in the MAC-hs PDU. Padding is not explicitly indicated but is included in the end of the MAC-hs PDU if the total size of the MAC-hs payload is smaller than the transport block set size.

9.2.3 Signalling of Transport Block size for HS-DSCH

For HS-DSCH the transport block size is derived from the TFRI value signalled on the HS-SCCH. The mapping between the TFRI value and the transport block size for each mode is specified below:

9.2.3.1 Transport block size for FDD

For each combination of channelization code set and modulation scheme i = 0..31, a set of k_i = 0..63 transport block sizes $L(i, k_i)$ is given by:

If $i = 0$ and $k_i < 39$

$$L(i,k_i) = 137 + 12k_i$$
$$k_i = 0,...,38$$

else

$L(i,k_i) = \lfloor L_{\min} p^{k_{0,i}+k_i} \rfloor$
$p = 2085/2048$
$L_{\min} = 296$
$k_{0,i}$ = from Table 9.2.3.1
$k_i = 0,...,63$

end

The 'if' statement above is true only for a single channelization code using QPSK modulation. The index k_i of the transport block size $L(i, k_i)$ corresponds to the 6 bit transport block size index signaled on the HS-SCCH. The index i corresponds to the combination of channelization code set and modulation scheme as defined in Table 9.2.3.1.

Table 9.2.3.1: Values of $k_{0,i}$ for different numbers of channelization codes and modulation schemes

Combination i	Modulation scheme	Number of channelization codes	$k_{0,i}$
0	QPSK	1	1
1		2	40
2		3	63
3		4	79
4		5	92
5		6	102
6		7	111
7		8	118
8		9	125
9		10	131
10		11	136
11		12	141
12		13	145
13		14	150
14		15	153
15	16QAM	1	40
16		2	79
17		3	102
18		4	118
19		5	131
20		6	141
21		7	150
22		8	157
23		9	164
24		10	169
25		11	175
26		12	180
27		13	184
28		14	188
29		15	192

9.2.3.2 Transport block size for 3.84 Mcps TDD

Let k be the signalled TFRI value, then the corresponding HS-DSCH transport block size L_k is given by :

If k=1..510

$$L_k = \lfloor L_{\min} p^k \rfloor$$

$$p = \frac{8313}{8192}$$

$$L_{\min} = 57$$

If k = 511

L_k = 102000

If k=0, L_k indicates NULL and shall not be used to signal a transport block size in the TFRI.

9.2.3.3 Transport block size for 1.28 Mcps TDD

The mapping of transport block size, in bits, to TFRI value is dependent upon the UE's HS-DSCH capability class. The mapping between TFRI value, i, and the transport block size, L_i, is specified by the following:

L_0 = NULL i = 0,

$L_i = \left\lfloor 10^{a+(i-1)(b-a)/62} \right\rfloor$ i = 1, 2, …,63

where

i = the transport block index,
$a = \log_{10}(TBS_{min})$,
$b = \log_{10}(TBS_{max})$,

and

TBS_{min} = 240,
TBS_{max} = the maximum transport block size that is supported by the UE class, which has the value

7016 for 1.4 Mb/s,
10204 for 2.0 Mbps and
14056 for 2.8 Mb/s.

The NULL value (corresponding to index i = 0) is not signalled to the UE. It can be used by the UE in the Recommended Transport Block Size field of the CQI to signal that no available transport block size could have been used by the Node B to meet the specified target quality for the HS-DSCH.

11.6 Control of HS-DSCH transmission and reception

11.6.1 Network operation

The following are the functions of the various functional entities at the network in support of the HARQ protocol used on HS-DSCH.

11.6.1.1 Scheduler

The scheduler performs the following functions:

- Schedules all UEs within a cell;
- Services priority queues:

- The scheduler schedules MAC-hs SDUs based on information from upper layers. One UE may be associated with one or more MAC-d flows. Each MAC-d flow contains HS-DSCH MAC-d PDUs for one or more priority queues.

- Determines the HARQ Entity and the queue to be serviced;
- Sets the TSN for ~~the~~ new data blocks being transferred from the selected queue;
  - set the TSN to value 0 for the first MAC-hs PDU transmitted for ~~one HS-DSCH and~~ each Queue ID within an HS-DSCH;
  - increment the TSN with one for each transmitted MAC-hs PDU on ~~a HS-DSCH and~~ each Queue ID within an HS-DSCH.
- Indicates the Queue ID and TSN to the HARQ entity for each MAC-hs PDU to be transmitted;
- Schedules new transmissions and retransmissions:
  - Based on the status reports from HARQ Processes the scheduler determines if either a new transmission or a retransmission should be made. A new transmission can however be initiated on a HARQ process at any time. Based on a delay attribute provided by upper layers, the scheduler may decide to discard any 'out-of-date' MAC-hs SDU.
- Determines the redundancy version:
  - The scheduler determines a suitable redundancy version for each transmitted and retransmitted MAC-hs PDU and indicates the redundancy version to lower layer.

11.6.1.2 HARQ entity

- There is one HARQ entity per UE in UTRAN.
- The HARQ entity sets the Queue ID in transmitted MAC-hs PDUs to the value indicated by the UTRAN scheduler.
- The HARQ entity sets the transmission sequence number (TSN) in transmitted MAC-hs PDUs to the value indicated by the UTRAN scheduler.
- The HARQ entity sets the HARQ process identifier in transmitted MAC-hs PDUs. UTRAN should:
  - determine a suitable HARQ process to service the MAC-hs PDU and set the HARQ process identifier accordingly.

11.6.1.3 HARQ process

- The HARQ process sets the New data indicator in transmitted MAC-hs PDUs. UTRAN should:
  - set the New Data Indicator to the value "0" for the first MAC-hs PDU transmitted by a HARQ process;
  - not increment the New Data Indicator for subsequent transmissions of a MAC-hs PDU;
  - increment the New Data Indicator with one for each transmitted MAC-hs PDU containing new data.
- The HARQ process processes received status messages. UTRAN should:
  - deliver received status messages to the scheduler.

11.6.2 UE operation

The UE operation in support of the HARQ protocol used on HS-DSCH is split among the following four functional units with their associated functions.

11.6.2.1 HARQ Entity

- There is one HARQ entity at the UE which processes the HARQ process identifiers in received MAC-hs PDUs on HS-DSCH.
- Each received MAC-hs PDU shall be allocated to the HARQ process indicated by the HARQ process identifier of the MAC-hs PDU.

11.6.2.2 HARQ process

A number of parallel HARQ processes is used in the UE to support the HARQ protocol. The number of HARQ processes is configured by upper layers.

The HARQ process processes the New Data Indicator indicated by lower layers for each received MAC-hs PDU.

The UE shall:

- if the New Data Indicator has been incremented compared to the value in the previous received transmission in this HARQ process or this is the first received transmission in the HARQ process:
  - replace the data currently in the soft buffer for this HARQ process with the received data.

NOTE: alternative solutions for the use of the New Data Indicator are FFS.

- if the New Data Indicator is identical to the value used in the previous received transmission in the HARQ process:
  - combine the received data with the data currently in the soft buffer for this HARQ process.
- if the data in the soft buffer has been successfully decoded and no error was detected:
  - deliver the decoded MAC-hs PDU to the reordering entity;
  - generate a positive acknowledgement (ACK) of the data in this HARQ process.
- else:
  - generate a negative acknowledgement (NAK) of the data in this HARQ process;
- schedule the generated positive or negative acknowledgement for transmission and the time of transmission relative to the reception of data in a HARQ process is configured by upper layer.

The HARQ process processes the Queue ID in the received MAC-hs PDUs. The UE shall:

- arrange the received MAC-hs PDUs in queues based on the Queue ID.

11.6.2.3 Reordering entity

11.6.2.3.1 Definitions

In the functions described in this section the following variable definitions apply:

- Next_expected_TSN:
  The next_expected_TSN is the Transmission sequence number (TSN) following the TSN of the last in-sequence MAC-hs PDU received. It shall be updated upon the receipt of the MAC-hs PDU with TSN equal to Next_expected_TSN. The initial value of Next_expected_TSN =0.
- Transmitter window (TRANSMIT_WINDOW):
  The transmitter window defines which MAC-hs PDUs that the transmitter can retransmit without causing an ambiguity of the TSN in the receiver. The size of the transmitter window equals TRANSMIT_WINDOW and the maximum value of TRANSMIT_WINDOW is 32. The initial transmitter window equals [0..31]. The configuration of TRANSMIT_WINDOW by higher layers is FFS.
- Receiver window (RECEIVE_WINDOW):
  The receiver window defines which MAC-hs PDUs that can be received in the receiver without causing an

advancement of the receiver window according to the procedure below. The size of the receiver window equals RECEIVE_WINDOW and the maximum value of RECEIVE_WINDOW is 32. The initial receiver window equals [0..31]. The configuration of RECEIVE_WINDOW by higher layers is FFS.

The Re-ordering release timer T1 controls the stall avoidance in the UE reordering buffer. The value of T1 is configured by upper layers.

If no timer T1 is active:

- the timer T1 shall be started when a MAC-hs PDU with TSN=SN is correctly received but can not be delivered to the disassembly function due to that the MAC-hs PDU with TSN equal to Next_expected_TSN is missing.

If a timer T1 is already active:

- no additional timer shall be started, i.e. only one timer T1 may be active at a given time.

The timer T1 shall be stopped if:

- the MAC-hs PDU for which the timer was started can be delivered to the disassembly function before the timer expires.

When the timer T1expires:

- all correctly received MAC-hs PDUs up to and including SN-1 shall be delivered to the disassembly function and they shall be removed from the reordering buffer and be considered as having been received;

- all correctly received MAC-hs PDUs up to the next missing MAC-hs PDU shall be delivered to the disassembly function.

When the timer T1 is stopped or expires, and there still exist some received MAC-hs PDUs that can not be delivered to higher layer:

- timer T1 is started for the MAC-hs PDU with highest TSN among those MAC-hs PDUs that can not be delivered.

Transmitter operation:

After the transmitter has transmitted a MAC-hs PDU with TSN=SN, any MAC-hs PDU with TSN ≤ SN – TRANSMIT_WINDOW should not be retransmitted to avoid sequence number ambiguity in the receiver. ~~A MAC-hs PDU that has been aborted by the transmitter after having been transmitted one or more times, should not be retransmitted after it has been aborted.~~

Receiver operation:

~~If the soft buffers in all the HARQ processes are empty (i.e. no data in the buffers exists that will be soft combined with later received data):~~

~~all correctly received MAC-hs PDUs shall be delivered to the disassembly function and be removed from the reordering buffer; and~~

~~these MAC-hs PDUs shall be considered as having been received in the following procedure.~~

- MAC-hs PDUs that have been discarded by the timer based mechanism shall be considered as having been received in the following procedure.

When a MAC-hs PDU with TSN = SN is received:

- If SN is within the receiver window and this MAC-hs PDU has not previously been received:
  - the MAC-hs PDU is placed in the reordering buffer at the place indicated by the TSN.
- If SN is within the receiver window, and this MAC-hs PDU has been previously received:
  - the MAC-hs PDU shall be discarded.
- If SN is outside the receiver window:

- the received MAC-hs PDU shall be placed above the highest received TSN in the reordering buffer, at the position indicated by SN;
- the receiver window shall be advanced so that SN forms the upper edge of the receiver window;
- any MAC-hs PDUs with TSN ≤ SN – RECEIVE_WINDOW, i.e. outside the receiver window after its position is updated, shall be removed from the reordering buffer and be delivered to the disassembly entity.

- All received MAC-hs PDUs with consecutive TSNs from next_expected_TSN up to the first not received MAC-hs PDU are delivered to the disassembly entity.
- next_expected_TSN shall be set to the TSN of this first not received MAC-hs PDU.

3GPP TSG-RAN WG2 Meeting #32
Xian, China, 23rd-27th September 2002

R2-022707

CR-Form-v7

CHANGE REQUEST

⌘ **25.321** **CR** **139** ⌘ **rev** ⌘ Current version: **5.2.0** ⌘

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

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

Title:	⌘	Transport Block Size Signalling for 1.28Mcps TDD
Source:	⌘	Siemens
Work item code:	⌘	HSDPA-L23
Date:	⌘	18/09/02
Category:	⌘	**F**
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:	⌘	To align the algorithm used to calculate HSDPA transport block sizes for 1.28 Mcps TDD with those that are specified for FDD and 3.84 Mcps TDD. The algorithm describing how transport block sizes map to TFRI values currently specified in TS25.321v5.2.0 has a different format to that which is used for FDD and 3.84 Mcps TDD. This change request replaces the algorithm with one having a format that is consistent with those of FDD and 3.84 Mcps TDD.
Summary of change:	⌘	A revised algorithm replaces that described in section 9.2.3.3.
Consequences if not approved:	⌘	The algorithm format for 1.28 Mcps TDD will be different to that which is used for FDD and 3.84 Mcps.

Clauses affected:	⌘	9.2.3.3

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

⌘

Other comments:	⌘	

How to create CRs using this form:

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

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

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

9.2.3 Signalling of Transport Block size for HS-DSCH

For HS-DSCH the transport block size is derived from the TFRI value signalled on the HS-SCCH. The mapping between the TFRI value and the transport block size for each mode is specified below:

9.2.3.1 Transport block size for FDD

For each combination of channelization code set and modulation scheme i = 0..31, a set of k_i = 0..63 transport block sizes $L(i, k_i)$ is given by:

If $i = 0$ and $k_i < 39$

$$L(i,k_i) = 137 + 12k_i$$
$$k_i = 0,...,38$$

else

$$L(i,k_i) = \left\lfloor L_{\min} p^{k_{0,i}+k_i} \right\rfloor$$
$$p = 2085/2048$$
$$L_{\min} = 296$$
$$k_{0,i} = \text{from Table 9.2.3.1}$$
$$k_i = 0,...,63$$

end

The 'if' statement above is true only for a single channelization code using QPSK modulation. The index k_i of the transport block size $L(i, k_i)$ corresponds to the 6 bit transport block size index signaled on the HS-SCCH. The index i corresponds to the combination of channelization code set and modulation scheme as defined in Table 9.2.3.1.

Table 9.2.3.1: Values of $k_{0,i}$ for different numbers of channelization codes and modulation schemes

Combination i	Modulation scheme	Number of channelization codes	$k_{0,i}$
0	QPSK	1	1
1		2	40
2		3	63
3		4	79
4		5	92
5		6	102
6		7	111
7		8	118
8		9	125
9		10	131
10		11	136
11		12	141
12		13	145
13		14	150
14		15	153
15	16QAM	1	40
16		2	79
17		3	102

18		4	118
19		5	131
20		6	141
21		7	150
22		8	157
23		9	164
24		10	169
25		11	175
26		12	180
27		13	184
28		14	188
29		15	192

9.2.3.2 Transport block size for 3.84 Mcps TDD

Let k be the signalled TFRI value, then the corresponding HS-DSCH transport block size L_k is given by :

If k=1..510

$$L_k = \lfloor L_{\min} p^k \rfloor$$

$$p = \frac{8313}{8192}$$

$$L_{\min} = 57$$

If k = 511

L_k = 102000

If k=0, L_k indicates NULL and shall not be used to signal a transport block size in the TFRI.

9.2.3.3 Transport block size for 1.28 Mcps TDD

The mapping of transport block size, in bits, to TFRI value is dependent upon the UE's HS-DSCH capability class. ~~The mapping between TFRI value, i, and the transport block size, L_i, is specified by the following:~~

~~L_0 = NULL i = 0,~~

~~$L_i = \left\lfloor 10^{a+(i-1)(b-a)/62} \right\rfloor$ i = 1, 2, …,63~~

~~where~~

~~i = the transport block index,~~
~~$a = \log_{10}(TBS_{min})$,~~
~~$b = \log_{10}(TBS_{max})$,~~

~~and~~

~~TBS_{min} = 240,~~
~~TBS_{max} = the maximum transport block size that is supported by the UE class, which has the value~~

~~7016 for 1.4 Mb/s,~~
~~10204 for 2.0 Mbps and~~
~~14056 for 2.8 Mb/s.~~

~~The NULL value (corresponding to index i = 0) is not signalled to the UE. It can be used by the UE in the Recommended Transport Block Size field of the CQI to signal that no available transport block size could have been used by the Node B to meet the specified target quality for the HS-DSCH.~~If k is the signalled TFRI value then the corresponding HS-DSCH transport block size L_k is given by:

If k = 1..62

$$L_k = \lfloor L_{\min} p^{k-1} \rfloor$$

where

$p = \frac{1340}{1269}$ for the 1.4 Mbps user class,

$p = \frac{1755}{1652}$ for the 2.0 Mbps user class,

$p = \frac{2345}{2196}$ for the 2.8 Mbps user class,

and

$L_{\min} = 240$

If k = 63 then,

L_k = 7016 for the 1.4Mbps user class,

10204 for the 2.0 Mbps user class,

14056 for the 2.8 Mbps user class.

If k=0, L_k indicates NULL and shall not be used to signal a transport block size in the TFRI.

3GPP TSG-RAN2 Meeting #33 **Tdoc ⌘R2-023207**
Sophia Antipolis, France, November 12 – 15, 2002

CR-Form-v7

CHANGE REQUEST

⌘ **25.321** **CR** **153** ⌘ **rev** **-** ⌘ Current version: **5.2.0** ⌘

*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: ⌘	Limitation on number of PDUs per single TTI for 1.28 Mcps TDD	
Source: ⌘	Siemens AG	
Work item code: ⌘	HSDPA-L23	***Date:*** ⌘ 14/10/2002
Category: ⌘	**F**	***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: ⌘	From a UE complexity point of view it is useful to provide a cap to the number of PDUs that could be received within a single TTI for 1.28 Mcps TDD. There is already such a limitation approved for FDD.
Summary of change: ⌘	Specified the maximum number of PDUs that can be expected in a single TTI for 1.28 Mcps TDD.
Consequences if not approved: ⌘	The maximum number of PDUs per single TTI remains unspecified for 1.28 Mcps TDD.

Clauses affected: ⌘	9.2.2			
Other specs affected: ⌘	**Y**	**N**		
		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	
Other comments: ⌘				

How to create CRs using this form:
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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

9.2.2 MAC PDU: Parameters of the MAC header (HS-DSCH)

- Version Flag (VF):
  The VF field is a one bit flag providing extension capabilities of the MAC-hs PDU format. The VF field shall be set to zero and the value one is reserved in this version of the protocol.

- Queue identifier (Queue ID):
  The Queue ID field provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues. The length of the Queue ID field is 3 bit.

- Transmission Sequence Number (TSN):
  The TSN field provides an identifier for the transmission sequence number on the HS-DSCH. The TSN field is used for reordering purposes to support in-sequence delivery to higher layers. The length of the TSN field is 6 bit.

- Size index identifier (SID):
  The SID fields identifies the size of a set of consecutive MAC-d PDUs. The MAC-d PDU size for a given SID is configured by higher layers and is independent for each Queue ID. The length of the SID field is 3 bit.

- Number of MAC-D PDUs (N):
  The number of consecutive MAC-d PDUs with equal size is identified with the N field. The length of the N field is 7 bits. In FDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 70. In 1.28 Mcps TDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 45. If more PDUs than the defined maximum number of PDUs for the corresponding mode are received, the UE behaviour is unspecified.

- Flag (F):
  The F field is a flag indicating if more SID fields are present in the MAC-hs header or not. If the F field is set to "0" the F field is followed by a SID field. If the F field is set to "1" the F field is followed by a MAC-d PDU.

3GPP TSG-RAN2 Meeting #33
Sophia Antipolis, France, 12th

Tdoc ⌘R2-023208

CR-Form-v7

CHANGE REQUEST

⌘ **25.321** **CR** **154** ⌘ **rev** **1** ⌘ Current version: **5.2.0** ⌘

*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:	⌘	The Number of mac-d pdu's in a single mac-hs PDU for TDD
Source:	⌘	IPWireless
Work item code:	⌘	HSDPA-L23
Date:	⌘	14/11/2002
Category:	⌘	**F**
Release:	⌘	

Use one of the following categories:
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A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
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D *(editorial modification)*
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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 current specification does not specify the maximum number of mac-d PDUs in a mac-hs PDU for 3.84Mcps TDD mode.
Summary of change:	⌘	The maximum number of 318 mac-d PDUs are specified in a single TTI.
Consequences if not approved:	⌘	The maximum number of PDUs per single TTI will remain unspecified for 3.84 Mcps TDD.

Clauses affected:	⌘	9.2.2			
		Y	**N**		
Other specs Affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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9.2.2 MAC PDU: Parameters of the MAC header (HS-DSCH)

- Version Flag (VF):
  The VF field is a one bit flag providing extension capabilities of the MAC-hs PDU format. The VF field shall be set to zero and the value one is reserved in this version of the protocol.

- Queue identifier (Queue ID):
  The Queue ID field provides identification of the reordering queue in the receiver, in order to support independent buffer handling of data belonging to different reordering queues. The length of the Queue ID field is 3 bit.

- Transmission Sequence Number (TSN):
  The TSN field provides an identifier for the transmission sequence number on the HS-DSCH. The TSN field is used for reordering purposes to support in-sequence delivery to higher layers. The length of the TSN field is 6 bit.

- Size index identifier (SID):
  The SID fields identifies the size of a set of consecutive MAC-d PDUs. The MAC-d PDU size for a given SID is configured by higher layers and is independent for each Queue ID. The length of the SID field is 3 bit.

- Number of MAC-D PDUs (N):
  The number of consecutive MAC-d PDUs with equal size is identified with the N field. The length of the N field is 7 bits. In FDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 70. In 3.84Mcps TDD mode, the maximum number of PDUs transmitted in a single TTI shall be assumed to be 318. If more PDUs are received, the UE behaviour is unspecified.

- Flag (F):
  The F field is a flag indicating if more SID fields are present in the MAC-hs header or not. If the F field is set to "0" the F field is followed by a SID field. If the F field is set to "1" the F field is followed by a MAC-d PDU.