TSG-RAN Working Group 1 meeting #18 *TSGR1#18(01)0010*
Boston, U.S.A, January 15-18, 2000

Agenda Item: AH99

Source: Nokia

Title: Clarifications to UE capability in the first de-interleaving phase

Document for: Discussion and Approval

In the last WG1 meeting there was one contribution which looked at the impact of unlimited downlink rate matching repetition on UE capability memory dimensioning. Thus, current specification has no limitation on the rate of the repetition in rate matching. Consequently, this sets huge memory requirements for UE.

There are two parameters in 25.306 (v3.0.0) that handle the downlink datapath capacity. The parameters are "Maximum sum of number of bits of all transport blocks being received at an arbitrary time instant" and "Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH). Thus, the problem in the spec is that only the start and end point capabilities of the data pipe are defined and TTI is not considered properly.

The problem is as follows: Let's inform capabilities "maximum number of physical channel bits received in any 10 ms interval" = 19200 and "max sum of number of bits of all Transport blocks received in TTIs that end with the same arbitrary interval of length T<10ms" = 6400 to BS. This corresponds to 384 kbit/s class. If the user rate is 384 kbps the values above effectively limit the TTI to 10 ms. On the other hand, if network sets up a channel with physical channel speed 19200, TTI = 80 ms and user rate = 80 kbit/s i.e. on every 80 ms a transport block of 6400 bits is delivered to MAC. Based on the capabilities UE has told to BS it should be capable of doing this. However, this setup requires that UE has to store 8 * 19200 = 153600 bits to memory where the frames are stored. Hence, requiring 8 times more memory in UE which is a real complexity and cost issue for UE implementation. So the problem with the capabilites is that they limit only the start and end points of the data pipe. In the middle point of the pipe is the rate matching, which means that the middle part of the data pipe is not limited effectively as the example above shows. Just to emphasize, problem is not with the fast channels (if the user rate is high then the limitations of start and end point limit also the middle point) but with the slow user data rate channels, where the limitations on start and end points do not limit the buffer sizes of the middle point. Thus, the purpose of this CR is to clarify UE capability in the first de-interleaving phase by introducing a new FDD physical channel parameters in downlink i.e. "Maximum sum of number of bits of all transport channels that enter the first de-interleaving phase in any 10 ms interval" and to solve the problem in question.

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R1-01-0010

CR-Form-v3

CHANGE REQUEST

✍ **25.306** **CR** **CR-Num** ✍ rev **-** ✍ Current version: **3.0.0** ✍

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

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

Title: ✍	Clarifications to UE capability in the first de-interleaving phase	
Source: ✍	Nokia	
Work item code: ✍		***Date:*** ✍ 04, January, 2001
Category: ✍	**F**	***Release:*** ✍ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change: ✍	There are two parameters in 25.306 (v3.0.0) that handle the downlink datapath capacity. The parameters are "Maximum sum of number of bits of all transport blocks being received at an arbitrary time instant" and "Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH). The trap hole in the spec is that only the start and end point capabilities of the data pipe are defined and TTI is not considered properly. The middle point capabilty is not defined. Thus, the purpose of this document is to clarify UE capability in the first de-interleaving phase by introducing a new FDD Physical channel parameters in downlink i.e. "Maximum sum of number of bits of all transport channels that enter the first de-interleaving phase in any 10 ms interval".
Summary of change: ✍	To inroduce a new FDD physical channel parameter in 25.306 document in order to clarify UE capability in the first de-interleaving phase.
Consequences if not approved: ✍	Sets too heavy memory requirements for UE.

Clauses affected: ✍	4.5.3, 5.1, 5.2.2	
Other specs affected: ✍	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	✍
Other comments: ✍		

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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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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

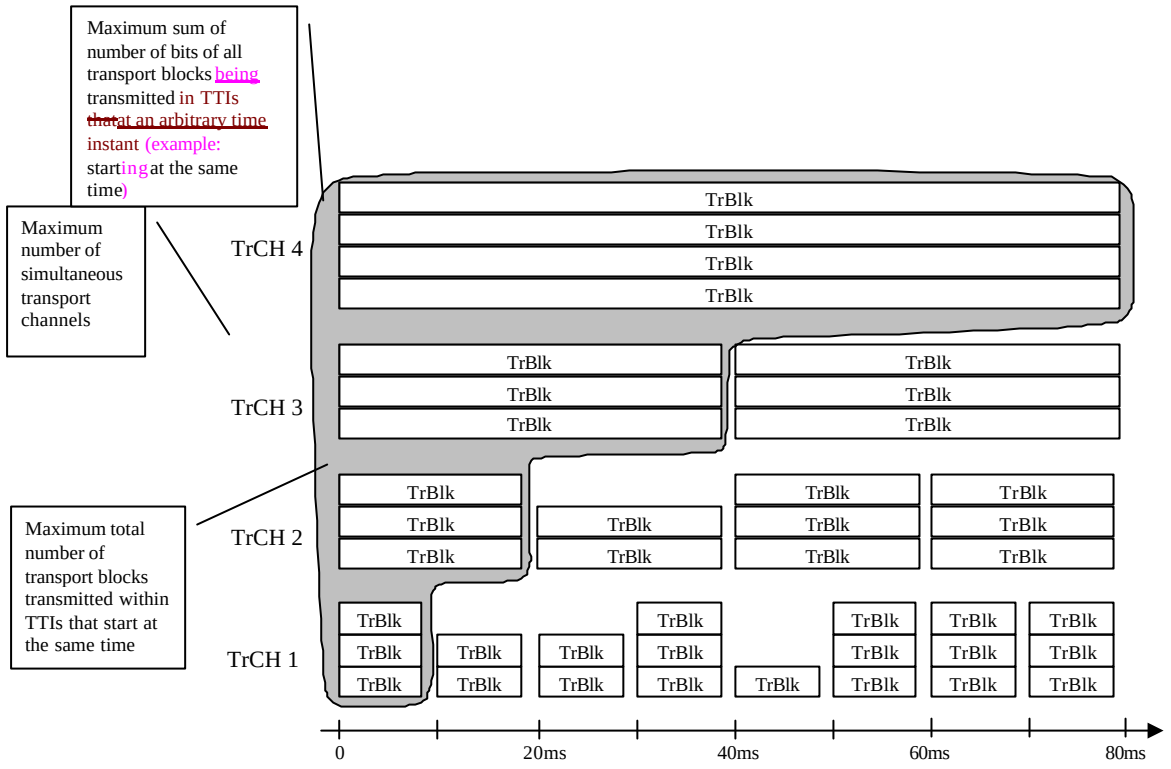

Figure 4.1: UE transport channel processing limitations in uplink

NOTE: When CPCH is supported, then simultaneous DPCCH & SCCPCH reception is needed.

4.5.3 FDD Physical channel parameters in downlink

Maximum number of DPCH/PDSCH codes to be simultaneously received

Defines the number of codes the UE is capable of receiving in parallel. For DPCH in soft/softer handover, each DPCH is only calculated once in this capability. The capability does not include codes used for S-CCPCH.

Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH)

Defines the number of physical channel bits the UE is capable of receiving. For DPCH in soft/softer handover, each DPCH is only calculated once in this capability.

The number of DPCH channel bits indicates the capability for normal, un-compressed mode.

The parameter also indicates the capability of the UE to support compressed mode by spreading factor reduction. For parameter values up to and including 9600 bits, the UE shall also be able to support compressed mode by SF reduction when operating in normal mode, at any value up to the reported capability. For parameter values greater than 9600 bits, the UE shall be able to support compressed mode by spreading factor reduction when operating, in normal mode, at any value up to half the reported capability or 9600bits, whichever is greater.

Maximum sum of number of bits of all transport channels that enter the first de-interleaving phase in any 10 ms interval

Defines the maximum sum of number of bits in the first de-interleaving phase that UE is capable of receiving.

Support for SF 512

Spreading factor 512 should not be mandatory for all UEs.

The corresponding configuration parameter is *Spreading factor* which is part of *Downlink DPCH info*.

Support of PDSCH

Support of PDSCH is only required for some RAB realizations, and is therefore a UE capability.

The corresponding configuration parameter is *Downlink transport channel type*, which is part of *RB mapping info*.

Simultaneous reception of SCCPCH and DPCH

Simultaneous reception of SCCPCH and DPCH, i.e. simultaneous reception of FACH and DCH is required for e.g. DRAC procedure, but it should not be mandatory for all UEs (e.g. speech only UEs).

There is no specific configuration parameter.

Simultaneous reception of SCCPCH, DPCH and PDSCH

Simultaneous reception of SCCPCH, DPCH and PDSCH, i.e. simultaneous reception of FACH, DCH and DSCH is required for e.g. simultaneous use of DSCH and the DRAC procedure, but it should not be mandatory for all UEs (e.g. speech only UEs). The PDSCH part of this capability is only relevant if the UE supports PDSCH, as covered by the capability "Support of PDSCH".

There is no specific configuration parameter.

Maximum number of simultaneous S-CCPCH radio links

Defines the maximum number of radio links on which the UE is capable of receiving S-CCPCH simultaneously.

5 Possible UE radio access capability parameter settings

5.1 Value ranges

Table 5.11: UE radio access capability parameter value ranges

		UE radio access capability parameter	Value range
PDCP parameters		Header compression algorithm supported	Yes/No
RLC parameters		Total RLC AM buffer size	2,10,50,100,150,500,1000 kBytes
		Maximum number of AM entities	3,4,5,6,8,16,32
PHY parameters	Transport channel parameters in downlink	Maximum sum of number of bits of all transport blocks being received at an arbitrary time instant	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all convolutionally coded transport blocks being received at an arbitrary time instant	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all turbo coded transport blocks being received at an arbitrary time instant	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum number of simultaneous transport channels	4, 8, 16, 32
		Maximum number of simultaneous CCTrCH	1, 2, 3, 4, 5, 6, 7, 8
		Maximum total number of transport blocks received within TTIs that end within the same 10 ms interval	4, 8, 16, 32, 48, 64, 96, 128, 256, 512
		Maximum number of TFC in the TFCS	16, 32, 48, 64, 96, 128, 256, 512, 1024
		Maximum number of TF	32, 64, 128, 256, 512, 1024
		Support for turbo decoding	Yes/No
	Transport channel parameters in uplink	Maximum sum of number of bits of all transport blocks being transmitted at an arbitrary time instant	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all convolutionally coded transport blocks being transmitted at an arbitrary time instant	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum sum of number of bits of all turbo coded transport blocks being transmitted at an arbitrary time instant	640, 1280, 2560, 3840, 5120, 6400, 7680, 8960, 10240, 20480, 40960, 81920, 163840
		Maximum number of simultaneous transport channels	2, 4, 8, 16, 32
		Maximum number of simultaneous CCTrCH of DCH type (TDD only)	1, 2, 3, 4, 5, 6, 7, 8
		Maximum total number of transport blocks transmitted within TTIs that start at the same time	2, 4, 8, 16, 32, 48, 64, 96, 128, 256, 512
		Maximum number of TFC in the TFCS	4, 8, 16, 32, 48, 64, 96, 128, 256, 512, 1024
		Maximum number of TF	32, 64, 128, 256, 512, 1024
		Support for turbo encoding	Yes/No
	FDD Physical channel parameters in downlink	Maximum number of DPCH/PDSCH codes to be simultaneously received	1, 2, 3, 4, 5, 6, 7, 8
		Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH)	600, 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 48000, 57600, 67200, 76800

		UE radio access capability parameter	Value range
		Maximum sum of number of bits of all transport channels that enter the first de-interleaving phase in any 10 ms interval	1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200, 153600, 230400, 460800
		Support for SF 512	Yes/No
		Support of PDSCH	Yes/No
		Simultaneous reception of SCCPCH and DPCH	Yes/No
		Simultaneous reception of SCCPCH, DPCH and PDSCH	Yes/No
		Maximum number of simultaneous S-CCPCH radio links	1 NOTE: Only the value 1 is part of R99
	FDD Physical channel parameters in uplink	Maximum number of DPDCH bits transmitted per 10 ms	600, 1200, 2400, 4800, 960, 19200, 28800, 38400, 48000, 57600
		Support of PCPCH	Yes/No
	TDD physical channel parameters in downlink	Maximum number of timeslots per frame	1..14
		Maximum number of physical channels per frame	1,2,3..,224
		Minimum SF	16, 1
		Support of PDSCH	Yes/No
		Maximum number of physical channels per timeslot	1..16
	TDD physical channel parameters in uplink	Maximum Number of timeslots per frame	1..14
		Maximum number of physical channels per timeslot	1, 2
		Minimum SF	16,8,4,2,1
		Support of PUSCH	Yes/No
RF parameters	FDD RF parameters	UE power class (25.101 subclause 6.2.1)	3, 4 NOTE: Only power classes 3 and 4 are part of R99
		Tx/Rx frequency separation (25.101 subclause 5.3) . NOTE: Not applicable if UE is not operating in frequency band a	190 MHz 174.8-205.2 MHz 134.8-245.2 MHz
RF parameters	TDD RF parameters	UE power class (25.102)	2,3 NOTE: Only power classes 2 and 3 are part of R99
		Radio frequency bands (25.102)	a), b), c), a+b), a+c), a+b+c)
		Chip rate capability (25.102)	3.84,1.28
Multi-mode related parameters		Support of UTRA FDD/TDD	FDD, TDD, FDD+TDD
Multi-RAT related parameters		Support of GSM	Yes/No (per GSM frequency band)
		Support of multi-carrier	Yes/No
LCS related parameters		Standalone location method(s) supported	Yes/No
		Network assisted GPS support	Network based / UE based / Both/ None
		GPS reference time capable	Yes/No
		Support for IPDL	Yes/No
		Support for OTDOA UE based method	Yes/No
Measurement related capabilities		Need for downlink compressed mode	Yes/No (per frequency band, UTRA mode and RAT)
		Need for uplink compressed mode	Yes/No (per frequency band, UTRA mode and RAT)

5.2.2 Combinations of UE Radio Access Parameters for DL

Table 5.2.2.1: UE radio access capability parameter combinations, DL parameters

Reference combination of UE Radio Access capability parameters in DL	32kbps class	64kbps class	128kbps class	384kbps class	768kbps class	2048kbps class
Transport channel parameters						
Maximum sum of number of bits of all transport blocks being received at an arbitrary time instant	640	3840	3840	6400	10240	20480
Maximum sum of number of bits of all convolutionally coded transport blocks being received at an arbitrary time instant	640	640	640	640	640	640
Maximum sum of number of bits of all turbo coded transport blocks being received at an arbitrary time instant	NA	3840	3840	6400	10240	20480
Maximum number of simultaneous transport channels	8	8	8	8	8	16
Maximum number of simultaneous CCTrCH (FDD)	1	2/1 NOTE 2	2/1 NOTE 2	2/1 NOTE 2	2	2
Maximum number of simultaneous CCTrCH (TDD)	2	3	3	3	4	4
Maximum total number of transport blocks received within TTIs that end at the same time	8	8	16	32	64	96
Maximum number of TFC in the TFCS	32	48	96	128	256	1024
Maximum number of TF	32	64	64	64	128	256
Support for turbo decoding	No	Yes	Yes	Yes	Yes	Yes
Physical channel parameters (FDD)						
Maximum number of DPCH/PDSCH codes to be simultaneously received	1	2/1 NOTE 2	2/1 NOTE 2	3	3	3
Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH).	1200	3600/2400 NOTE2	7200/4800 NOTE2	19200	28800	57600
Maximum sum of number of bits of all transport channels that enter the first de-interleaving phase in any interval	9600	28800/19200 NOTE2	28800/19200 NOTE2	19200	28800	57600
Support for SF 512	No	No	No	No	No	No
Support of PDSCH	No	Yes/No NOTE 1	Yes/No NOTE 1	No/Yes NOTE 1	Yes	Yes
Maximum number of simultaneous S-CCPCH radio links	1	1	1	1	1	1
Physical channel parameters (TDD)						
Maximum number of timeslots per frame	1	2	4	5	10	12
Maximum number of physical channels per frame	8	9	14	28	64	136
Minimum SF	16	16	16	1/16 NOTE 1	1/16 NOTE 1	1/16 NOTE 1
Support of PDSCH	Yes/No NOTE 1	Yes	Yes	Yes	Yes	Yes
Maximum number of physical channels per timeslot	8	9	9	9	9	13

NOTE 1: Options represent different combinations that should be supported with conformance tests.

NOTE 2: Options depend on the support of PDSCH. The highest value is required if PDSCH is supported.