3GPP TSG RAN#11 **RP-010173**

Palm Springs, USA

March 13-16, 2001

Agenda item: 6.11

Source: Golden Bridge Technology

Title: Justification for UE support for CPCH in Release 4

Document for: Discussion and Decision

Introduction

In December 99, RAN discussed CPCH as a required UE capability. RAN decided that CPCH was to be an optional feature for release 99 UEs primarily because the CPCH specifications were not complete and stable at that time. While the reasoning for such a RAN decision was appropriate at that time for Release 99, this reasoning is no longer valid now for Release 4. GBT and other operators and manufacturers feel that it is now appropriate to include Release 4 UE support for CPCH in TS25.306, UE Radio Access Capabilities Specification. Providing specified UE support for CPCH provides many system benefits and will insure the availability of CPCH-capable UEs for rollout of Release 4 systems using CPCH. This contribution includes a copy of CR009 for 25306 (RP-010xxx) which modifies the CPCH capability of certain UE classes to support CPCH. This CR was discussed in both RAN1 and RAN2 and is included here for decision.

Discussion

There are over 31 companies, both operators and equipment manufacturers, who are interested in implementing CPCH as a part of their suite of 3G services. TS 25.306 indicates there is no UE capability to support CPCH in any of the defined UE classes. This lack of UE support for CPCH is inconsistent with the principle used to determine UE support for other UE features and channels in TS25.306. This lack of UE support for CPCH is also inconsistent with the need to specify, produce and supply UEs with CPCH capability for the 3G marketplace.

Discussions in RAN1 and RAN2 have not revealed any technical reasons why the UE may not support CPCH. Certain UE manufacturers are reluctant to specify UE support for CPCH in TS25.306. There may be non-technical reasons for certain UE manufacturers to take this position. However, this position is not consistent with the RAN principle used to specify which UE capabilities will be required capabilities in TS25.306 for the various terminal classes. The 31 companies which support CPCH urge RAN to discuss this inconsistency and take the required corrective action for Release 4.

There are many reasons why it is now appropriate to specify that certain UE classes have the capability to support CPCH:

1. CPCH specifications are complete and stable, and certain UE classes should have the capability to support CPCH.

2. CPCH capability saves system resources and decreases interference by providing NRT services more efficiently, especially those services with bursty uplink traffic. A joint contribution by SBC and GBT (RP-010221) quantifies the gains associated with the use of CPCH for uni-directional and interactive services and applications.

3. The CPCH capacity gains and reduced infrastructure resource requirements translate into overall reduced infrastructure lifetime capital expenditures for 3G service providers and network operators. These CPCH cost savings are summarised in a joint contribution by Arthur D. Little and GBT (RP-010223).

4. The CPCH system benefits in items 2&3, above, can be achieved only if the vast majority of UEs within a system support CPCH. CPCH, like PDSCH and DRAC, will not provide measurable system gains if only 2-3% of the UEs in the system support CPCH. To be effective, CPCH must be widely supported by all the UEs in the system using bursty data services.

5. Cells serving CPCH-capable UEs can serve more UEs with the same spectrum, covering larger areas than cells not using CPCH. Larger cells with CPCH UEs will decrease the number of Node Bs required for system coverage, will reduce environmental impact and will lower system costs.

6. Widespread availability of CPCH-capable UEs and use of CPCH will reduce service costs for subscribers for messaging, internet, and file sharing applications.

7. System operators and infrastructure manufacturers choosing to exploit CPCH efficiencies require a ready source of supply of CPCH-capable UEs.

8. Operators in regions where local standards authorities are considering mandated use of CPCH require a ready source of supply of CPCH-capable UEs in order to rollout 3G services.

9. UE support for both CPCH and DSCH are needed to implement effective packet data services for 3G systems. The 3GPP packet data traffic models indicate PCPCH benefits for bursty, NRT data services (RP-010222). CPCH provides benefits over DCH for traffic models which cannot fully utilize the DCH constant bit rate (CBR) uplink circuit. In a similar way, PDSCH provides benefits over DCH for traffic models which cannot fully utilize the DCH CBR downlink circuit. Both PCPCH and PDSCH are proposed as effective channels for packet data services. Contribution RP-010222 titled “Traffic characteristics of various 3G non-real time services” lists the applications and services that can benefit from CPCH and DSCH. RAN should require both DSCH and CPCH as supported channels in all packet data UEs in order to obtain the intended system level efficiencies for 3G packet data services.

10. UE support for CPCH should be mandated only in those uplink UE terminal classes which will benefit from CPCH. The lowest data rate UE terminal class can either support voice or data, and if it is a voice-only terminal, it will not benefit from CPCH. For this reason, support for CPCH for the 32 kbps uplink class in the attached CR is optional. The co-sources of the attached CR have not identified any other UE class which will not include packet data services. Based on this understanding, it is technically sound and reasonable to require UE support for CPCH in all UE uplink classes except the lowest 32 kbps class.

11. UE support for CPCH will not require additional UE hardware. Analysis of the demodulation and signal processing functions required to support the CPCH when Channel Assignment (CA) is not active indicates that no additional UE hardware is needed. In some UE implementations, however, support of CPCH with CA active may require an n-ary (up to 16) signature correlator for AICH reception of the CA-ICH; this additional correlator would not otherwise be required. Since the attached CR splits support for PCPCH into its two modes of operation and defines support for CPCH to mean support for CPCH with CA not active, the proposed CR will not require additional UE hardware in any UE implementation.

12. UE support for CPCH does not include the reference phase ambiguity noted for SF=512 for DCH. The DL DPCCH for CPCH is defined differently from DCH in TS25.211. The frame boundaries of DL-DPCCH for CPCH and PCPICH are always offset by a multiple of 512 chips.

The attached CR adds the UE capability to support CPCH to certain UE classes for Release 4 systems.

Proposal

A. RAN should discuss the attached CR to modify the UE capability to support CPCH.

B. RAN should approve the CR to add UE support for CPCH to TS25.306 for Release 4.

3GPP TSG RAN Meeting #11
Palm Springs, USA, March 13-16, 2001

RP-010xxx

CR-Form-v3

CHANGE REQUEST

⌘ **TS25.306** **CR** **009** ⌘ rev **02** ⌘ 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:	⌘	Modified UE Capability for CPCH
Source:	⌘	Golden Bridge Technology, Cingular (formerly Bellsouth/SBC Mobility) (T1 operator), E-Plus (ETSI operator), SmarTone Mobil Communications (operator), Huawei Technologies Co (CWTS), Xiamen XOCECO Mobile Communication Co (CWTS), Golden Cellular Communication Co (CWTS), ZTE Corp (CWTS), Eastern Communication Co (CWTS), Moving Communication of Langchao Group (CWTS) Great Dragon Information Technology Corp (CWTS), Pu Tian Industrial Co (CWTS), Ning Bo Bird Co (CWTS), Beijing Golden Yuxing Electronic Technology Corp, Shanghai Video and Audio Electronics Co, Nanjing Panda International Communication System Co, Wave Com (ETSI), Telelogic (ETSI), Materna (ETSI), SBC Technology Resources (T1), Tality USA Corp (formerly Cadence Design Services) (T1), Rolm (ARIB), Seiko Epson (ARIB), OKI USA (T1), Asustek Computer, Telecommunications Research Associates

Work item code: ⌘	TEI4	***Date:*** ⌘	14 March 2001
Category: ⌘	**C**	***Release:*** ⌘	REL-4

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: ⌘

1. RAN#6 meeting (12/99) decision was to include CPCH as optional capability for Release 99 UEs primarily for schedule reasons related to late introduction of feature and incomplete specifications.
2. CPCH specifications are complete and stable and certain UE classes should have the capability to support CPCH.
3. CPCH capability saves system resources and decreases interference by providing NRT services more efficiently, especially those services with bursty uplink traffic.
4. Cells serving CPCH-capable UEs can serve more UEs with the same spectrum, covering larger areas than cells not using CPCH. Larger cells with CPCH UEs will decrease the number of Node Bs required for system coverage, will reduce environmental impact and will lower system costs.
5. Widespread availability of CPCH-capable UEs and use of CPCH will reduce service costs for subscribers for messaging, internet, and file sharing applications.
6. System operators choosing to exploit CPCH efficiencies require a ready source of supply of CPCH-capable UEs.
7. Infrastructure manufacturers choosing to offer CPCH capability require a ready source of supply of CPCH-capable UEs for operators to roll out CPCH service.
8. Operators in regions where local standards authorities are considering mandated use of CPCH require a ready source of supply of CPCH-capable UEs in order to rollout 3G services.

Summary of change: ⌘ UE capability to support CPCH is added to certain UE classes.

Consequences if not approved: ⌘ Operators and infrastructure suppliers for Rel-4 systems will not have ready source of supply of CPCH-capable UEs. This will delay rollout of 3G services in areas where CPCH may be mandated.

Clauses affected: ⌘ 5.1, 5.2.2, 5.2.3

Other specs affected: ⌘

- ☐ Other core specifications ⌘
- ☐ Test specifications
- ☐ O&M Specifications

Other comments: ⌘

5.1 Value ranges

Table 5.1: 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
		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

		UE radio access capability parameter	Value range
		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 with Channel Assignment (CA) not active	Yes/No
		Support of PCPCH with Channel Assignment (CA) active	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
Support for SF 512 NOTE 3	Yes/No NOTE 1	Yes/No NOTE 1	Yes/No NOTE 1	Yes/No NOTE 1	Yes/No NOTE 1	Yes/No NOTE 1
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.

NOTE 3: Support of SF 512 in DL is required to support PCPCH in UL.

5.2.3 Combinations of UE Radio Access Parameters for UL

Table 5.2.3.1: UE radio access capability parameter combinations, UL parameters

Reference combination of UE Radio Access capability parameters in UL	32kbps class	64kbps class	128kbps class	384kbps class	768kbps class
Transport channel parameters					
Maximum sum of number of bits of all transport blocks being transmitted at an arbitrary time instant	640	3840	3840	6400	10240
Maximum sum of number of bits of all convolutionally coded transport blocks being transmitted at an arbitrary time instant	640	640	640	640	640
Maximum sum of number of bits of all turbo coded transport blocks being transmitted at an arbitrary time instant	NA	3840	3840	6400	10240
Maximum number of simultaneous transport channels	4	8	8	8	8
Maximum number of simultaneous CCTrCH(TDD only)	1	2	2	2	2
Maximum total number of transport blocks transmitted within TTIs that start at the same time	4	8	8	16	32
Maximum number of TFC in the TFCS	16	32	48	64	128
Maximum number of TF	32	32	32	32	64
Support for turbo encoding	No	Yes	Yes	Yes	Yes
Physical channel parameters (FDD)					
Maximum number of DPDCH bits transmitted per 10 ms	1200	2400	4800	9600	19200
Simultaneous reception of SCCPCH and DPCH NOTE 2	No	No	Yes/No NOTE 1	Yes/No NOTE 1	Yes/No NOTE 1
Simultaneous reception of SCCPCH, DPCH and PDSCH NOTE 2	No	No	No	No	No
Support of PCPCH NOTE 3	Yes/No ~~No~~	Yes ~~No~~	Yes ~~No~~	Yes ~~No~~	Yes ~~No~~
Physical channel parameters (TDD)					
Maximum Number of timeslots per frame	1	2	3	7	9
Maximum number of physical channels per timeslot	1	1	1	1	2
Minimum SF	8	2	2	2	2
Support of PUSCH	Yes/No NOTE 1	Yes	Yes	Yes	Yes

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

NOTE 2: The downlink parameters 'Simultaneous reception of SCCPCH and DPCH' and 'Simultaneous reception of SCCPCH, DPCH and PDSCH' are included in the combinations for uplink as their requirements relate to the uplink data rate. Simultaneous reception of SCCPCH and DPCH is required for the DRAC procedure that is intended for controlling uplink transmissions. In release 99, this is limited to 1 SCCPCH.

NOTE 3: PCPCH may be implemented for the Channel Assignment (CA) active case or for the CA not acrtive case or for both cases. Support of PCPCH means that the UE supports PCPCH access for the CA not active case or for both cases.