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From: ETSI STC SMG2
To: ETSI STC SMG10

LS on "double ciphering" in GSM/GPRS Dual Transfer Mode

SMG2 is currently working on the specification of "GPRS dual transfer mode (DTM)" for Release 99. DTM is an alternative definition of the implementation of GPRS class A mode of operation, aiming to reduce the complexity in the mobile station when class A services are to be supported.

As part of the DTM feature, SMG2 has agreed that a DTM capable mobile station shall be capable of using the main DCCH of the CS connection to send packet information (both signalling and small quantities of user data). SMG2 would like to inform SMG10 that when sending LLC data on the main DCCH, the data is ciphered twice: once at the LLC layer by the GPRS mechanism and once at the layer 1 level with A5/1 (or A5/2).

It is the understanding of SMG2 that this "double ciphering" does not present a problem. However, SMG2 kindly asks for SMG10's view on this issue.

Attached: SMG2 778/00 ("DTM concept document")

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Title: **Dual transfer mode: concept document**

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Contents

1 Scope

This document is intended to be a description of the practical implementation of GSM-GPRS class A mobiles and a basis for discussion on the changes and additions to the current specifications.

This work is part of the Release 99 Work Item “BSS co-ordination of Radio Resource allocation for class A GPRS services - GSM Radio Access (R99)” for which M Mouly of Nortel Networks is rapporteur. This work item was supported by Nortel, Motorola, Vodafone and Lucent. It is due for completion at SMG #32.

This work is also required as part of Release 99 by the 3GPP specification 23.121 [9], section 4.1.

2 References

2.1 References

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.60: " Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 1".

[3] GSM 04.13: " Digital cellular telecommunications system (Phase 2+); Performance requirements on the mobile radio interface".

[4] GSM 04.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol".

[5] GSM 05.02: "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".

[6] GSM 05.08: "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".

[7] GSM 05.10: " Digital cellular telecommunications system (Phase 2+); Radio subsystem synchronization".

[8] 3GPP 23.060: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description; Stage 2".

[9] 3GPP 23.121: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Architectural Requirements for Release 1999".

[10] 3GPP 24.008: "3rd Generation Partnership Project; Universal Mobile Telecommunications System; Mobile radio interface layer 3 specification, Core Network Protocols - Stage 3".

2.2 Definitions

Dual transfer mode

It is only applicable for a mobile station that supports GRPS.

A mobile station in dual transfer mode is simultaneously[1] in dedicated mode and packet transfer mode, provided that the BSS co-ordinates its allocation of radio resources.

[1] The term “simultaneous” is used in this document with the same meaning as in 02.60. Different services or connections may happen *simultaneously* and be multiplexed at lower layers so that they e.g. different TDMA time slots in the same carrier.

A DTM mobile is a class A mobile. Hence all specifications/requirements for class A apply to this mobile unless specifically altered by this work item.

Class A

Across this document "class A" and "class B" is used as a short form of "class A mode of operation" and "class B mode of operation", respectively.

2.3 Abbreviations

CS: Circuit Switched

DTM: Dual Transfer Mode

PS: Packet Switched[2]

Other abbreviations used in this document are listed in GSM 01.04 [1].

3 Concept description

3.1 Introduction

3.1.1 Motivation

The current definition of GPRS class A mode of operation assumes a total independence between the CS and PS domains. Thus the direct implementation of the existent standards for class A would result in mobile stations that are required to operate in two different frequencies either in the same timeslot, in timeslots *n* and *n* + 3 or their adjacent ones. This complicates enormously the internal architecture of the ME, resulting in a very high development cost, which both operators and manufacturers would prefer to avoid.

Nevertheless, operators have expressed their need for this type of mobiles, since they want to offer services that demand the simultaneous existence of a CS connection and a PS session. This is particularly important during the coexistence of GSM/GPRS with UMTS, as these capabilities will exist in UMTS. However, UMTS coverage may not be available in some areas where there is GSM/GPRS coverage (e.g. deep inside buildings or when roaming to a 2G network). As coverage is a vital service, in order for an operator to be able to sell "UMTS class A services" it is necessary to be able to imitate class A services in areas of only GSM coverage. On the other hand, the provision of class A services with 2G technology is also essential for operators without UMTS coverage.

3.1.2 Concept basis

A constant aim throughout this document is to reuse the existing functionality when possible, in order to minimise the impact on current implementations. In general, the changes proposed have little impact on the core network elements (i.e. MSC and SGSN) and 24.008 [10].

The solution outlined in this document overcomes the restrictions mentioned above and makes possible to have simultaneous CS and PS active connections. This is achieved by sending PS data (signalling and user data)

- on the timeslot use by the CS connection
- on timeslot(s) not used by the CS connection

The possible timeslot configurations are based on two restrictions:

- the number of timeslots allocated to the CS connection is limited to one
- the timeslots allocated in each direction are contiguous

[2] The acronym PS or the expression "packet switched" in this document is to be understood as GPRS or E-GPRS.

These restrictions are assumed at this stage. More flexible proposals are left for further study. In addition, for the definition of class A multislot sub-classes, the restrictions in TS GSM 05.02 [5] for multislot capabilities shall apply.

Figure 1~~Figure 1~~ shows an example of a multislot configuration (2 uplink, 3 downlink).

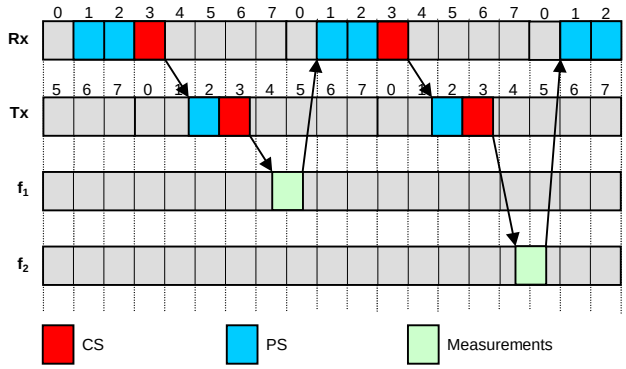

Figure 1 - Example of multislot configuration of a GPRS *simple* class A mobile station in dual transfer mode.

In a similar manner to UMTS, the A interface is modified so that the BSC knows the IMSI associated with each SCCP connection to the MSC. This means that the BSC is able to ensure that 'packet paging' messages can be delivered to mobiles which have a connection to the MSC. The same functionality can be reused to deliver MSC originated pages to mobiles in packet transfer mode while the network is in mode of operation II (i.e. no Gs interface).

Mobility management is basically the same as is specified in 23.060 [8] for class A mobiles but using the same techniques as UMTS for control of "in connection" routeing area and location area updates (e.g. System Information 6 message is extended to contain the Routing Area Code).

If GPRS signalling needs to be sent during a standalone voice call, then it is proposed that these LLC frames can be sent on the main DCCH (FACCH or SDCCH) with layer 2 SAPI 0. This requires a Protocol Discriminator in 24.007 for LLC (potentially one of the PDSS values could be reused for this purpose).

GSM Radio Resource signalling needs relatively little extra specification. This is because the HSCSD work already introduced the ability to have different Channel Modes on different timeslots, and the ability to queue a GPRS mobile on an (S)DCCH has provided many of the necessary RR messages for signalling GPRS information across dedicated RR connections.

Inter-BSC handover is planned to be controlled by A interface signalling. The Old BSS to New BSS information element is used to indicate to the target BSC that the mobile station is in DTM.

A more in-depth description of certain areas of this solution is carried out in the following sections.

3.2 Feature name

GSM TS 22.060 [2] v3.2.0 states:

> "*Three GPRS MS modes of operation are identified:*
>
> *NOTE 1: The term simultaneous (attach, traffic, etc.) is the requirement to simultaneously support GSM GPRS services and GSM circuit switched services including SMS.*
>
> *Class A: The MS is attached to both GPRS and other GSM services. The MS supports simultaneous attach, simultaneous activation, simultaneous monitor, simultaneous invocation and simultaneous traffic. The mobile user can make and/or receive calls on the two services simultaneously subject to the QoS requirements.*
>
> *A minimum of one time slot shall be available for each type of service (circuit switched and GPRS) when required*[3]*. […]*"

[3] NOTE: this does not seem to be compatible with the "Lm + PDCH/H" solution. Moreover, it does not make much sense in UMTS.

For paging, the behaviour of the mobile station is as in class B mode of operation: the PCH takes priority to PPCH, and both to CBCH.

The implementation described in this document also applies the restriction that the mobile station shall not be required to operate in two different frequencies in the same moment in time. However, GSM CS and GSM GPRS services will be still supported simultaneously. Thus, the feature here described is a subset of the GPRS class A capabilities.

The mentioned subset will be referred as DTM.

The specification of an *unrestricted* class A mode of operation that requires the mobile station to operate in different frequencies simultaneously shall not be forbidden.

3.3 Class A capabilities

3.3.1 Single timeslot operation

A mobile station in dual transfer mode has one timeslot allocated for the CS services. It is possible to reuse the same timeslot for the transmission of GPRS signalling and user data.

It is desirable to be able to use the same timeslot as the CS connection for GPRS data, due to

- the additional signalling messages to set up a TBF,
- the short length of most of the GPRS signalling message and some user data LLC frames and
- the impossibility of the network to allocate a TBF in some circumstances (e.g. congested cell, multislot capabilities not supported in the serving cell)

Figure 3~~Figure 2~~ shows two DTM capable mobile stations in a DTM capable, congested cell. If the mobile station supports single timeslot operation, it can maintain the packet session. If it does not support this feature, the packet session will probably be pre-empted.

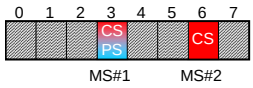

Figure 3~~2~~ - Example of two GPRS *simple* class A mobiles; only MS#1 supports single timeslot operation.

There are two solutions for single timeslot operation:

- the use of the main DCCH with layer 2 SAPI = 0
- the “Lm + PDCH/H” configuration

3.3.1.1 Main DCCH with SAPI 0

The main DCCH (with layer 2 SAPI 0) is currently used for GSM signalling. GPRS signalling and user data shall be able to use this resource.

When the mobile station requests uplink resources, RR shall indicate the establishment cause and it shall include a length indication of the amount of data to be transmitted. The network then may assign the main DCCH with SAPI 0 as the uplink resource to be used. The criteria for the decision of which type of resource to allocate are left free to the infrastructure manufacturer or the network operator.

“Spontaneous” transmission on the main DCCH with SAPI 0, i.e. its usage without network authorisation, is not allowed.

Following the assignment of a TBF with other DTM configuration, the main DCCH shall not be used in the direction of the existent TBF.

3.3.1.2 Lm + PDCH/H

An “Lm + PDCH/H” configuration implies the multiplexing of CS information and RLC/MAC blocks in the same timeslot of the TDMA frame. Which domain uses each half shall be flexible and indicated in the assignment command.

The PDCH/H is a resource dedicated to the mobile station in both directions. For instance, if an uplink TBF is established, the network may send a control message in any of the downlink blocks. No downlink data, however, shall be sent without a previous downlink assignment.

The existent RLC/MAC block format is used. In the downlink, the mobile station shall only pass to upper layers those blocks with the TFI indicated in the assignment message. In the uplink, the mobile station may transmit in any of the blocks of the PDCH/H, irrespective of the USF in the previous blocks in the dynamic allocation case or the allocation bitmap in the fixed allocation case, if that information was present in the (uplink) assignment message.

The PDCH/H can be used for both GPRS signalling and user data.

Apart from the different mapping onto physical resources, the PDCH/H has the same characteristics as a *dedicated* PDCH/F.

NOTE: the support of either HR or AMR is mandatory; the integration of AMR in the “Lm” part is left FFS.

NOTE: a PDCH/H can be assigned to a DTM capable mobile station in idle mode and packet transfer mode.

3.3.2 Multislot operation

In multislot operation the GPRS data is sent in a PDCH. The number of timeslots comprising the PDCH is decided by the network after taking into account the class A multislot capabilities supported by the mobile station.

The PDCH shall always be shared on the downlink direction. In the uplink direction, the PDCH can be either dedicated or shared with other GPRS users.

3.3.2.1 Shared PDCH

The uplink PDCH may be shared with other GPRS mobile stations. In this case the existent procedures in 04.60 [4] apply. A mobile station that supports the shared operation on the PDCH shall support the dedicated operation. Downlink PDCHs shall always be shared.

Figure 5~~Figure 3~~ shows a typical configuration with two GPRS simple class A mobiles in shared multislot operation.

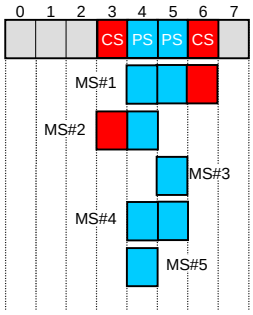

Figure 5~~3~~ - Example of multislot configuration with two GPRS *simple* class A mobiles stations (1 and 2) sharing their PDCHs with other GPRS users.

3.3.2.2 Dedicated uplink PDCH

An uplink PDCH can be assigned in dedicated operation, where the correspondent mobile station has always granted the right to transmit. The existent RLC/MAC block structure shall be kept. The procedures specified in 04.60 [4] shall apply with the exception that a mobile station that receives an assignment message describing a dedicated PDCH shall ignore the USF mechanism in the dynamic allocation case or the allocation bitmap in the fixed allocation case.

Despite the dedicated characteristics of the PDCH, the network shall allocate and use a valid USF or allocation bitmap, in order to prevent other mobiles that share the downlink PDCH from transmitting in a dedicated uplink PDCH.

Figure 7~~Figure 4~~ shows a typical configuration with two GPRS simple class A mobiles in dedicated multislot operation.

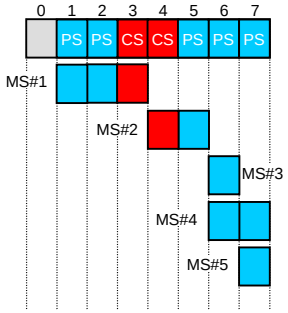

Figure 74 - Example of multislot configuration with two GPRS *simple* class A mobiles (1 and 2) using dedicated PDCHs.

3.3.3 Bearer capability

The decision of which of the class A capabilities shall be used shall be always made by the network after considering:

- the supported capabilities (by both the network and the mobile station)
- the type of data to be sent
- the length of the data and
- the requested QoS parameters

Table 1~~Table 1~~ shows the GPRS data supported by the different class A capabilities.

Bearer / GPRS data		Single timeslot operation		Multislot operation
		Main DCCH with SAPI 0	*Lm + PDCH/H*	
GPRS signalling		yes	yes	yes
User data	Short frames	yes	yes	yes
	Long frames	no	yes	yes

Table 1 - Support of GPRS data by the different class A capabilities.

NOTE: The use of the main DCCH with SAPI 0 has the following properties:

- It delays RR commands.
- It harms speech quality.
- It places load onto the A-bis LAPD signalling links.
- It has a maximum length of about 246 bytes.

Hence the BSS implementation may choose to make the longest ‘short frame’ equal to the size of the largest GMM message, e.g. less than 61 bytes.

3.3.4 Indication of the class A capabilities supported by the MS

3.3.4.1 Definition of MS class A sub-classes

Different mobile stations may support different class A capabilities and thus they need to be communicated to the network so that they can be taken them into account for the allocation of radio resources. The class A multislot capabilities are independent from the currently defined 05.02 multislot capabilities.

The following three sub-classes are proposed:

- Sub-class 1: the mobile station supports single timeslot operation.

- Sub-class 5: the mobile station supports class A multislot operation; the restrictions of multislot class 5 apply (cf. 05.02 [5]).
- Sub-class 9: the mobile station supports class A multislot operation; the restrictions of multislot class 9 apply (cf. 05.02 [5]).

Other sub-classes can be defined in the future if strictly required.

In order to reduce the number of possibilities and the length of the coding, incremental support shall be used; that is, a mobile station that supports a certain capabilities shall support the capabilities of the less restrictive sub-classes. E.g. a mobile station supporting sub-class 9 capabilities shall support sub-classes 1 and 5.

3.3.4.2 Options

The support of the following two capabilities has to be indicated independently from the sub-class:

- Uplink MAC procedure: shared or dedicated PDCH. This option is only valid for sub-classes 5 and 9. The PDCH/H of sub-class 1 is not shared in Release 99. Other sub-classes defined in the future shall share the PDCHs.
- E-GPRS: supported or not.

Incremental support is also applicable for the options:

- a mobile station supporting shared PDCHs shall support dedicated PDCHs.
- a mobile station supporting E-GPRS shall support GMSK-GPRS.

3.3.4.3 Indication of the capabilities

The current working assumption is that the mobile station class A sub-classes will be indicated in the Classmark 3 message. The absence of this information shall indicate that the mobile station does not support simple class A (i.e. either it supports *unrestricted* class A or it cannot operate in mode of operation A at all).

NOTE: They can be coded in four bits, as follows:

Bits 2 and 3 indicate the sub-class.

Bit 1 indicates the support of shared uplink PDCHs.

Bit 0 indicated the support of E-GPRS (and maybe the presence of a field with EDGE related information that can be included in future releases)

Bit	3 2 1 0	
	0 0 x x	Sub-class 1
	0 1 x x	Sub-class 5
	1 0 x x	Sub-class 9
	1 1 x x	Extended capabilities
	x x 0 x	Only dedicated PDCHs are supported
	x x 1 x	Dedicated and shared PDCHs are supported
	x x x 0	EGPRS not supported
	x x x 1	EGPRS supported

The “extended capabilities” code indicates the presence of another field for the coding of other (less frequent) sub-classes defined in the future. The indication of whether the PDCH is dedicated or shared only applies for sub-classes 5 and 9 and not for single timeslot operation or other classes defined in the future.

3.3.5 Compatibility issues

The mobile station shall indicate in its classmark whether it is DTM capable or not. The network shall not allocate resources for DTM operation unless the mobile is DTM capable. The resources allocated by the network shall meet the requirements imposed by the classmark.

The network indicates on the BCCH (and the SACCH and PACCH, for DTM capable mobile stations in dedicated and packet transfer mode, respectively) whether or not the cell supports DTM. A cell level indication is needed because adjacent BTSs may be in the same RA and LA but may be parented by different BSCs (from different vendors or different releases). The SACCH indication is needed to enable/suppress the transmission of packet resource requests when the mobile is in dedicated mode and cannot read the BCCH data. A mobile station shall not attempt to enter the DTM unless DTM is supported in the cell.

The network shall allocate resources taking into account the capabilities commonly supported with the mobile station. In order to avoid situations where both the mobile station and the network are DTM capable but no class A capabilities are shared, a *core set* of capabilities has been defined and shall be supported by the mobile station, consisting in the capabilities defined for DTM sub-class 1:

- the main DCCH with SAPI 0 for GPRS signalling, possibly with some length restriction controlled by the network.
- the Lm + PDCH/H configuration.

3.4 Layer 1

Some modifications or extra requirements are needed affecting layer 1 areas. The identified issues are:

- Timing advance
- Measurement reporting
- Power control

These issues are dealt with in the following sub-clauses.

3.4.1 Timing advance

A mobile station in DTM shall disable the timing advance features for the GPRS side:

- the mobile station shall inhibit the transmission of timing advance access bursts
- the mobile station shall ignore the reception of GPRS timing advance messages, if any

The reporting period and the SACHH message block shall be the same as though the mobile station was in dedicated mode and packet idle mode.

3.4.2 Measurement reporting

The mobile station shall continue to send measurement reports for the circuit switched part, but GPRS measurement reports shall not be sent. The mobile station shall be able to send extended measurement reports when commanded by the network.

NOTE: The impact on interference measurements is left FFS.

3.4.3 Power control in multislot operation

The difference of C/I requirements and the possibility of using different coding schemes in both domains may result in a difference in the power used in adjacent timeslots. This difference in power needs further consideration, which it is done in the following sub-clauses.

3.4.3.1 Uplink multislot power control

On the network side, there is no restriction for the difference of power received in adjacent timeslots.

On the mobile station side, the power control in different timeslots shall be independent and with no restriction for the difference of power transmitted in adjacent timeslots.

The parameters α and γ shall be included in the assignment message.

NOTE: in single timeslot operation, the power control is performed on the SACCH. This may change in the future if 8-PSK is introduced.

3.4.3.2 Downlink multislot power control

On the network side, there is no restriction for the difference of power received in transmitted timeslots.

As in normal GPRS power control and in addition to the cells present in SI5, the mobile station shall also perform measurements of the serving cell if the FH sequence does not include the BCCH carrier.

To ensure that no additional constraint compared to the current GPRS downlink power control specification be required on the implementation of the MS receiver, special care should be taken regarding the following points:

- the BTS output power variation between all blocks addressed to a particular MS within a TDMA frame shall never exceed 10 dB in DTM multislot configurations. Moreover, the power difference between contiguous CS and PS time slots shall be in the same range of 10 dB.
- the BTS output power on the timeslot immediately preceding each burst of a block addressed to one MS, and belonging to the same multislot allocation, shall not exceed the output power of that block by more than 10 dB in the current GPRS specification. This constraint is valid for both downlink power control modes A and B, and has been specified to avoid the receiver blinding. Such a blinding could last on the following time slot, and this would result on a degradation of the PS link. This constraint is still valid in case of a CS time slot contiguous to a PS time slot and placed after this PS burst. Indeed, even if the PS burst is not addressed to the MS, the power used for that burst shall not exceed by more than 10 dB the power of the CS burst.

To ensure this, some co-ordination is needed between the BTS, the BSC and the PCU so that these restrictions are met by the BTS.

3.5 Signalling procedures

3.5.1 Establishment

The existent establishment procedures for class A mode of operation rely on the capability of the mobile station to be able to operate in different frequencies in the same timeslot, e.g. to listen to the (P)BCCH while in dedicated mode. New procedures need to be added to the specifications to allow mobile stations without such capabilities to be able to enter the dual transfer mode.

The new cases are marked with ✓ in Table 3~~Table 2~~ and explained in detail in this section.

			Requested			
			CS	**PS**		
				MO	**MT**	
					Ready state	**Standby state**
Active	**Nothing**		Normal establishment			
	CS		Engaged	✓	✓	✓
	PS	**MO**	✓	Same TBF	Normal: PACCH	Not applicable
		MT		Normal: PACCH	Same TBF	

Table 3~~2~~ - Summary of establishment cases

3.5.1.1 Provision of the IMSI to the BSC

To enable the described implementation of the GPRS class A mode of operation, the BSS and the PCU are required to perform the co-ordination of the allocation of radio resources for both domains. That co-ordination is performed with the IMSI as it is described in the following sections.

The IMSI shall be provided to the BSC during:

1. call establishment
2. session establishment and
3. external handover.

3.5.1.1.1 Call establishment

The BSC triggers the establishment of the SCCP connection with the MSC. The MSC shall provide the IMSI to the BSC in a new message: Common ID message. This message can be sent either on the SCCP Connection Confirm message or immediately after, once the connection is already established.

3.5.1.1.2 Session establishment

3.5.1.1.2.1 Downlink session establishment

Both in the READY and the STANDBY states, the IMSI and the TLLI (or P-TMSI) are sent from the SGSN in the DL-UNITDATA and the PS PAGING BSSGP PDUs.

3.5.1.1.2.2 Uplink session establishment

As soon as the PCU learns the TLLI of the mobile station, it shall check that both the TLLI and the IMSI are known. If any of the is missing, the PCU shall send an RA-CAPABILITY-UPDATE message to the SGSN with the new TLLI. The SGSN shall answer with an RA-CAPABILITY-UPDATE-ACK message.

If the TLLI and the IMSI were known by the SGSN, they are sent in the RA-CAPABILITY-UPDATE-ACK message and then stored by the BSS/PCU.

If the TLLI and the IMSI were known by the SGSN (e.g. inter-SGSN cell change), the SGSN should receive an uplink LLC PDU containing a ROUTEING AREA UPDATE REQUEST message with the old RAI. This allows the SGSN to request the PDP and MM contexts (containing the IMSI) from the old SGSN. Once the GMM context is received, an RA-CAPABILITY message shall be sent to the PCU containing both the IMSI and the TLLI.

This procedure is shown in Figure 9~~Figure 5~~.

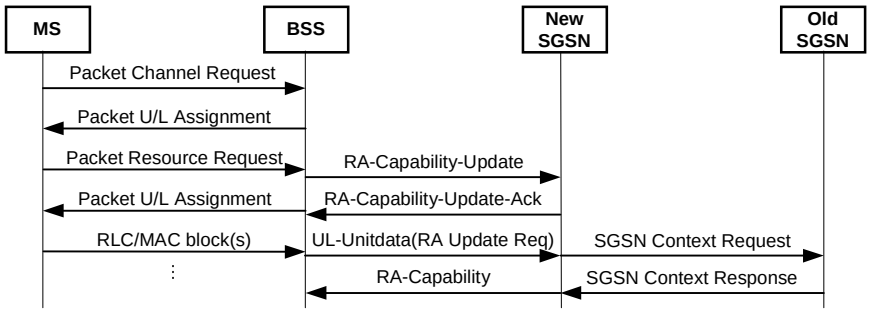

Figure 9~~5~~ - Provision of the IMSI to the BSS during an inter-SGSN cell change (two phase access on the PCCCH).

3.5.1.1.3 External handover

The IMSI is included in the Handover Request message from the MSC to the target BSC.

3.5.1.2 In-band parameters

When the mobile station is in dedicated mode, packet transfer mode or both, some information may need to be passed to the mobile station so that it can enter or maintain the dual transfer mode. Most of that information consists of parameters that are broadcast in the (P)BCCH, but that cannot be read by the mobile station. Some new parameters are added.

Table 5~~Table 3~~ lists those parameters and indicates whether they have to be sent while in dedicated mode, packet transfer mode or both. When the mobile station is in dedicated mode, the parameters are sent on the SACCH. When the mobile station is in idle mode and packet transfer mode, they are sent on the PACCH.

NOTE: for simplicity, a single new message (e.g. SI 13bis) may be defined with all the parameters, irrespective of the mode of the mobile station.

BCCH	SACCH	PACCH	Parameter	Description
✓	✓		NMO : bit	Network Mode of operation. The mobile station needs to be able to differentiate between Modes I and II/III to perform the appropriate type of attach
	✓		RAC : bit(8)	Routeing Area Code. It is needed to enable the MS to detect changes of routeing area when in dedicated mode

Table 5~~3~~ - List of broadcast parameters to be passed in-band to the mobile station.

3.5.1.3 PS establishment while in dedicated mode and packet idle mode

3.5.1.3.1 Principles

A new message is defined to enable the mobile station to request to enter the dual transfer mode: the **DTM Request** message. In Release 99, this message only includes information related to the requested packet resources while in dedicated mode. It may be used in future releases to request CS resources while in packet transfer mode.

Three DTM assignment messages are defined:

- the **DTM Assignment Command** message: this message shall describe both the CS and packet resources when a reallocation of the CS resource is needed, e.g. when a multislot configuration cannot be accommodated, when an "Lm + PDCH/H" configuration is to be used.
- the **Packet Assignment Command** message: this message describes the allocated packet resources when no reallocation of the CS resource is necessary, e.g. on an adjacent timeslot.
- the **Main DCCH Assignment Command** message: this message describes the packet resources for single timeslot operation using the main DCCH.

When there is reallocation of the CS timeslot:

- if the mobile station successfully establishes the new CS connection, it shall send an **Assignment Complete** message on the new main DCCH.
- if the mobile station fails to establish the new CS connection, it shall go back to the old timeslot, send an **Assignment Failure** message on the (old) main DCCH and continue the CS operation. The mobile station shall assume that the old PS resources were released and attempt its re-establishment.

If the network wants to move the mobile station to another cell, it shall send a **Handover Command** message on the main DCCH. The handover procedure is detailed in sub-clause 3.5.3.

3.5.1.3.2 MO session

If the serving cell of the CS connection indicates that supports DTM, the mobile station may request the establishment of a PS session by sending a DTM Request message on the main DCCH.

The network may answer the request with one of the three defined DTM assignment messages, sent on the main DCCH.If the network cannot allocate the packet resources, it shall answer with a **DTM Reject** message on the main DCCH. The DTM Reject message shall indicate:

- if the mobile is allowed to reattempt the packet establishment in the same cell (possibly after a waiting time) or
- if it is commanded to wait until the CS connection is cleared or a successful handover takes place.

NOTE: the use of the GPRS Suspend procedure in conjunction with the indefinite waiting command is left FFS.

Figure 11~~Figure 6~~ shows the successful case of the allocation of an uplink TBF When the reallocation of the CS timeslot is needed. The mobile station informs the network about the correct seizure of the new CS resource by sending an Assignment Complete message on the main DCCH of the new resource.

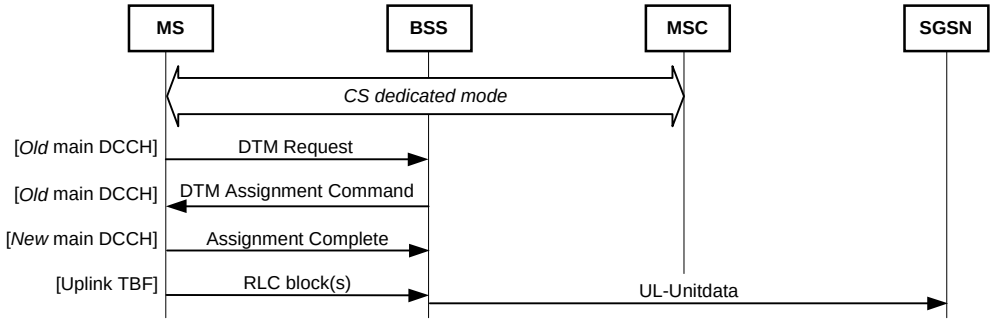

Figure 11~~6~~ - Establishment of a MO PS session while in dedicated mode with reallocation of the CS resource; successful case.

Figure 13~~Figure 7~~ shows the failure case. If there is an error when establishing the main signalling link in the new timeslot, the mobile station shall send an Assignment Failure message on the old main DCCH and then re-attempt the establishment of the packet session.

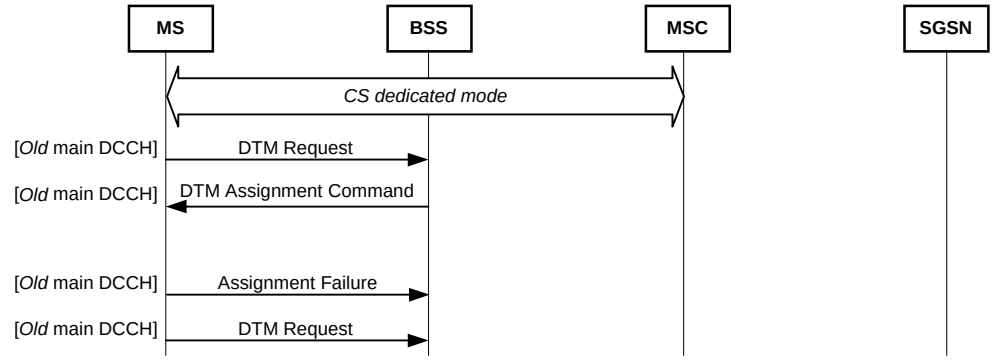

Figure 13~~7~~ - Establishment of a MO PS session while in dedicated mode with reallocation of the CS resource; failure case.

In Figure 15~~Figure 8~~, the packet resource is mapped onto adjacent timeslot(s) and thus the Packet Assignment Command message is used. There is no release/re-establishment of the main signalling link, successful and failure messages are not needed. The successful and failure cases for the establishment of the TBF are determined as in normal GPRS (see 04.60 [4]).

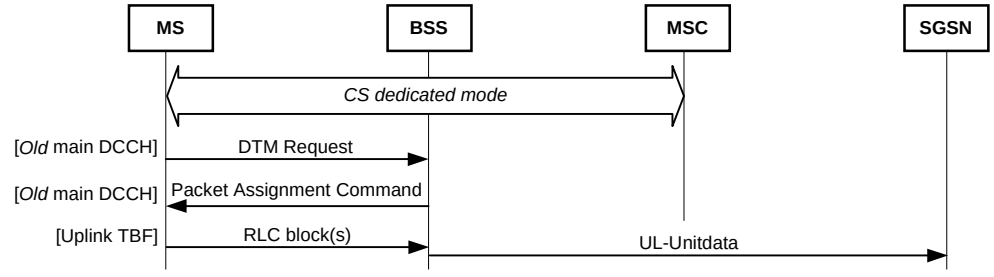

Figure 15~~8~~ - Establishment of a MO PS session in multislot configuration while in dedicated mode; successful case.

Figure 17~~Figure 9~~ shows the case of the main DCCH being assigned as the uplink resource.

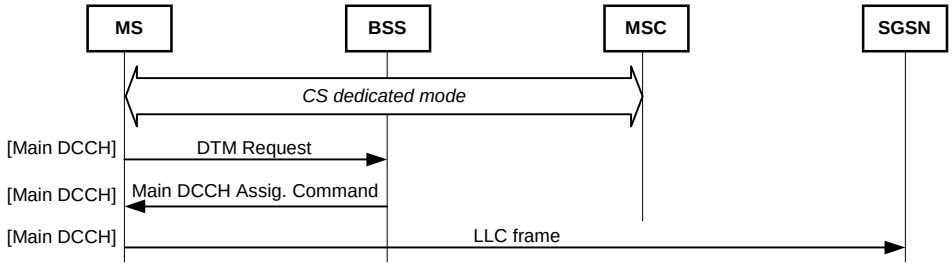

Figure 17~~9~~ - Assignment of the main DCCH as a packet resource while in dedicated mode; successful case.

3.5.1.3.3 MT session

3.5.1.3.3.1 Ready state

If the mobile station is in the Ready state, the SGSN may send an LLC frame to the BSS parenting the mobile station's serving cell. The downlink LLC PDU shall include the IMSI. As the IMSI of the mobile station was previously stored, the BSS is able to identify that the mobile station to which the data is sent is in dedicated mode. The BSS shall use the main signalling link to send the downlink assignment command instead of the (P)CCCH. Note that a mobile station in dedicated mode does not listen to the (P)CCCH unless it is "unrestricted class A" capable.

The assignment is done with one of the DTM assignment messages, sent on the main DCCH.

Figure 19~~Figure 10~~ shows the successful case, when a downlink TBF is assigned without reallocation of the CS resource.

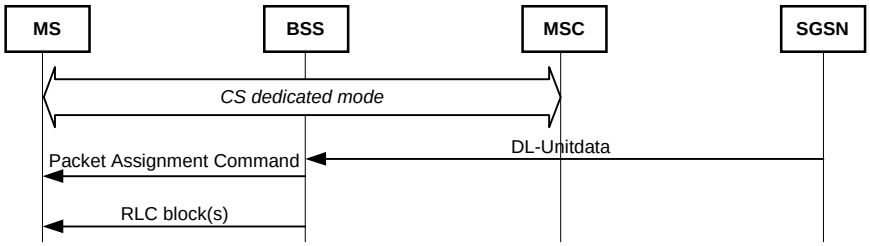

Figure 19~~10~~ - Example of a successful establishment of a PS MT session while in dedicated mode, packet idle mode and Ready state.

3.5.1.3.3.2 Standby state

If the mobile station is in the Stand-by state and the SGSN has something to send, it shall send a page to the BSS(s) parenting the RA where the mobile station is, in order to find out the actual serving cell/BVCI. As the mobile station has an established signalling connection with the BSS, the BSS shall not page the mobile station. Instead, the BSS shall inform the mobile station that it is being paged for packet services. This is done by sending the Packet Notification message on the main DCCH. The mobile station shall answer the notification with a Cell Update procedure. For that purpose, the GMM layer shall request the establishment of uplink resources, which, as the mobile station is in dedicated mode, shall be done as described in sub-clause 3.5.1.3.1.

Once the uplink resources are established, the mobile station sends a dummy LLC frame on the uplink TBF to act as a "Packet Paging Response" and the mobile station moves to the GMM Ready state. The SGSN understands the LLC frame as a valid page response and starts sending the downlink information. In order to forward this information to the mobile station, the BSS shall send a second assignment message as soon as it receives the data from the SGSN.

The procedure is shown in Figure 21~~Figure 11~~.

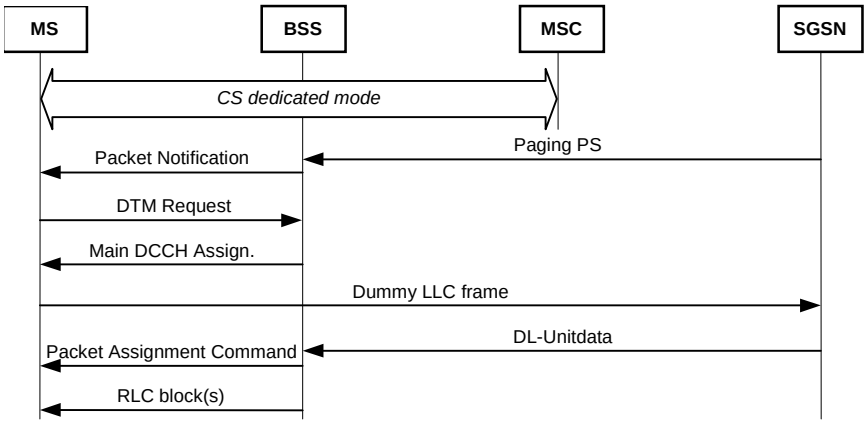

Figure 2111- Example of a successful establishment of a PS MT session while in dedicated mode, packet transfer mode and Standby state**.**

3.5.1.4 CS establishment while in packet transfer mode

When in packet transfer mode, either the mobile station or the network may initiate a CS connection establishment. In both cases, the packet session is temporarily abandoned and the establishment of the CS connection is initiated.

When the establishment of the CS connection is initiated by the network, the CS paging message may come directly from the MSC or via the SGSN if the Gs interface is present. The BSS shall be able to verify in both cases if the paged mobile station is in packet transfer mode and shall send the CS page on the PACCH.

This paging co-ordination can be reused for GPRS mobile stations in mode of operation B, so that the mobile station does not need to listen to the PCH. This capability shall be indicated with one bit in the BCCH and PACCH and constitutes a new Network Mode of operation: NMO II-bis (Gs interface not present, but the network performs paging co-ordination).

Once on the DCCH, the mobile station shall request the re-establishment of the packet resources by sending a DTM Request message indicating whether the abandoned resource was uplink, downlink or both. The DTM Request message with “downlink re-establishment” as the establishment cause shall not be considered as a request attempt but as an indication to help the network with the re-establishment of the downlink packet resource. Hence, the mobile station shall not check if there is an answer to that “indication”. The procedure to re-establish an abandoned uplink TBF shall be identical to the MO session request (see 3.5.1.3.2).

Figure 23~~Figure 12~~ shows this procedure graphically.

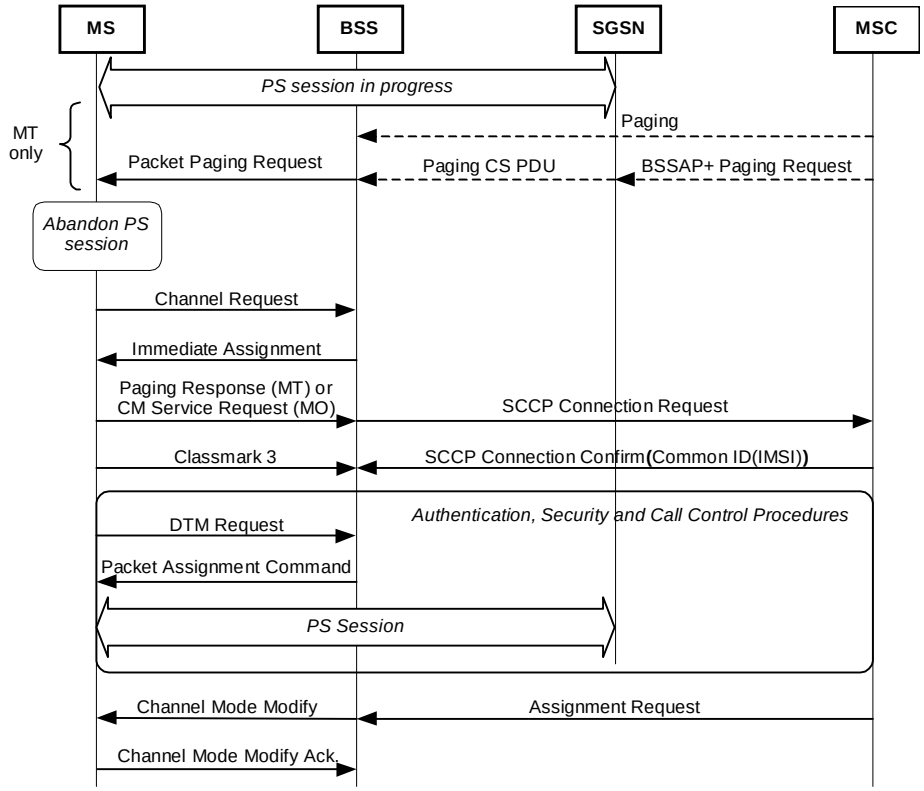

Figure 2312 - Successful establishment of a CS connection while in packet transfer mode**.**

The definition of a new procedure in 04.60 [4] would simplify this process, allowing the establishment of the CS connection without the abandonment of the packet session(s). This procedure is shown in Figure 25~~Figure 13~~. Once the CS connection is established (in signalling mode) the rest of CC and security procedures take place. This procedure shall not be mandatory for Release 99.

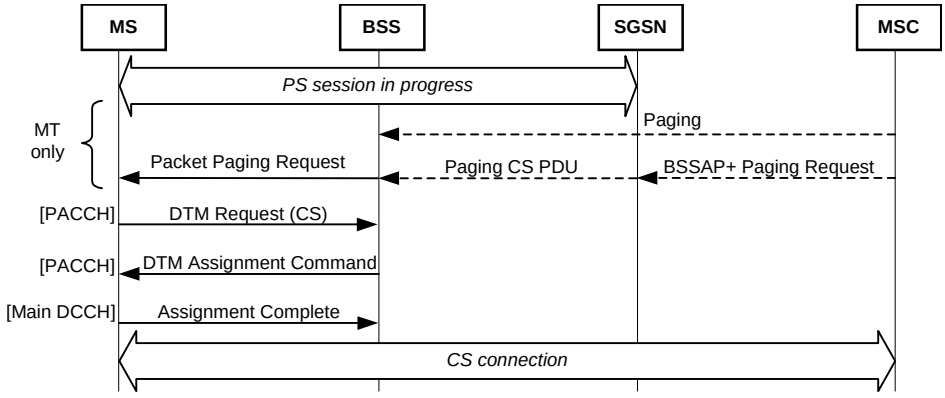

Figure 2513 - Successful establishment of a CS connection while in packet transfer mode without interruption of the packet session**.**

3.5.1.5 PS establishment while in dual transfer mode

Once the mobile station is in dual transfer mode with packet resources allocated in one direction only, the establishment of a packet session in the other direction shall be done when possible with the existent mechanisms (see 04.60 [4]). The new procedures here described shall be only used when the existent procedures can be applied, e.g. to allocate the main DCCH.

3.5.2 Release

3.5.2.1 Release of packet resources

The release of a TBF when it is mapped onto a PDCH shall follow the current procedures in 04.60 [4]. The use of the main DCCH as a packet resource is stopped when the signalling connection is cleared (during a handover or assignment procedure) or at the reception of a DTM assignment message allocating other packet resources.

3.5.2.2 Release of CS resources

In the case of the release of the CS connection while in dual transfer mode, the mobile station shall abandon the packet resource and a new one shall be established. Before the latter occurs, the mobile station may need to read all the relevant information contained in the SI messages that was not sent in the SACCH while in DTM.

NOTE: Alternatively, when the BSC receives the Clear Command on the A interface, it can indicate to the PCU that the CS connection is going to be cleared. The PCU may then send the mobile station the parameters needed for a *faster* re-establishment of the packet session.

3.5.3 Handover

Another group of procedures that are affected by the definition a new GPRS class A mode of operation are those related to the change of the serving cell when the mobile station is in dual transfer mode. The term *handover* in this document refers to the network initiated change of serving cell for both domains, unless explicit reference to the CS domain is made.

The handover and the cell change of the CS and PS domains respectively need to be performed at the same time.

As 05.08 [6] states, the serving cell for a class A mobile station while it is in dedicated mode “is determined by the network according to the handover procedures”, irrespective of the Network Control measuring report mode (NC).

The Handover Command message:

- shall continue to describe the CS timeslot
- shall indicate whether the target cell belongs to the same routeing area or to a different one; (for this purpose, the serving BSS shall include the RAI of the serving cell in the Old BSS to New BSS Information IE
- if the mobile station is in DTM, it may indicate whether the mobile is allowed to request packet resources in the target cell

NOTE: another suggested possibility is to create a new message (e.g. DTM Update message) that is sent to the mobile station on the main DCCH immediately after the handover and containing all the necessary information.

The RAI needs to be included in the SI 6 message sent to a DTM capable mobile station that is not in DTM so that it can detect a change of the RA when it is not indicated in the Handover Command message.

When accessing the new cell in a non-synchronised handover, the mobile sends Handover Access bursts on the CS timeslot but sends nothing —in the case of multislot operation— on the PS timeslot(s).

Handover failure cases are determined only from the CS timeslot. In the event of a handover failure, the mobile station shall return to the CS resource in the old cell and send a Handover Failure message on the main DCCH. The mobile station shall assume that the packet resources were released during the handover and it shall try to re-establish them.

Once the main DCCH is established in the cell, the mobile station may start the packet request procedure, as described in sub-clause 3.5.1.3.1.

3.5.3.1 Internal handover

The network may send a Handover Command message requesting the mobile station to switch to a different cell parented by the same BSC. Prior to that, the BSC shall activate the channels in the target cell. At the receipt of the

Handover Command message the mobile station shall abandon the packet session and initiate the access on the target cell, obeying the handover time requirements of GSM 05.10 [7] section 6 and GSM 04.13 [3] section 5.2.6.

The re-establishment of the CS connection shall continue as a CS only handover. When concluded, the BSC shall release the channels in the old cell.

The Handover Command message to a mobile station in DTM shall contain information about whether or not the new cell is in the same RA as the old cell (e.g. same RA, different RA, information unavailable). If that information is not available, the mobile station shall wait to the reception of the relevant information on the SACCH (e.g. RAI of the serving cell in SI6 message). Once the mobile station has the necessary information, it shall request an uplink TBF for the cell update or RA update procedure.

The Handover Command message to a mobile station in DTM shall contain information about whether or not the new cell supports DTM (i.e. whether or not the mobile station is allowed to attempt to re-establish a(n uplink) packet session).

If the mobile station also needs to (re-)establish a(n uplink) packet session in the new cell, the GMM signalling procedure shall take precedence and shall be performed first. Once the update procedure is performed, the (re-)establishment of the packet session may continue.

Figure 27~~Figure 14~~ shows the exchange of messages in a successful internal handover.

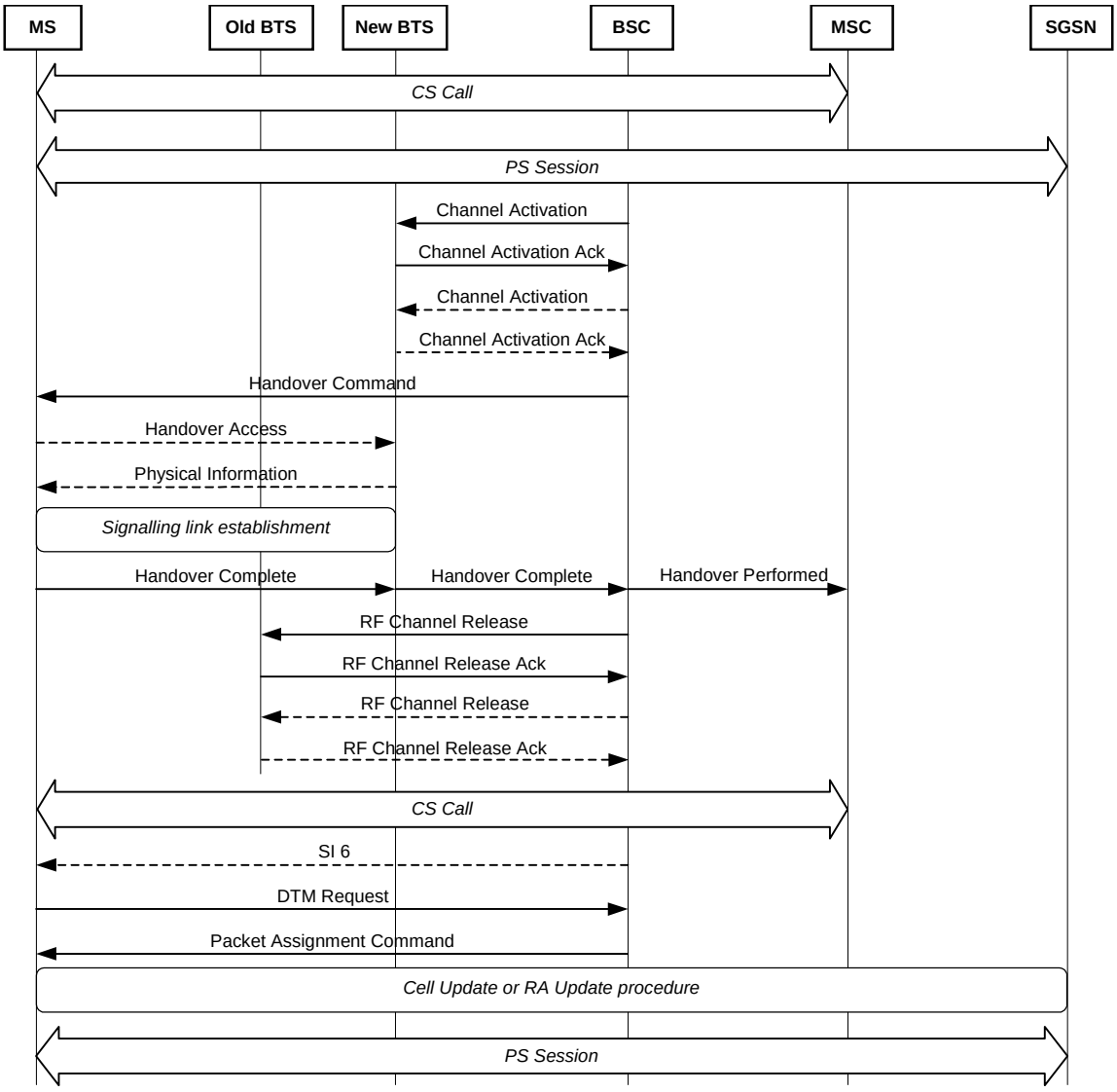

Figure 27~~14~~ - Successful internal, dual handover procedure.

3.5.3.2 External handover

In the case of an external handover, the target BSS:

- shall be provided with the IMSI of the mobile station (see 3.5.1.1)
- shall be provided with information about the nature of the packet resources in the serving cell, so that the CS resource is compatible with the packet resources that are going to be requested in the new cell (e.g. transceiver supporting AMR or EDGE, timeslot with a free, adjacent one). This information is also conveyed in the Old BSS to New BSS Information IE)
- should be provided with the RAI of the serving cell (in the Old BSS to New BSS Information IE).
  NOTE: If the MSC uses the Cell Global Identity in the Handover Request message to identify the serving and target cells, only the RAC is needed.

No changes are foreseen for an inter-MSC handover. Current implementations are expected to be able to carry the extended Old BSS to New BSS Information IE without modifications to 09.08.

No changes are foreseen for an inter-SGSN handover. The mobile shall perform a Routing Area Update procedure in the new cell. This may be as a result of the SI 6 contents (RAC is now added) or caused by information contained in the Handover Command message.

3.5.4 Location management

The behaviour of a mobile station in idle mode shall be the same as when operating in class B, except that a GPRS simple class A mobile in idle mode can perform the RA update procedure in a DCCH. When the mobile station is in dedicated mode, the change of serving cell may trigger location procedures that require both domains of the mobile station to become active.

Table 7~~Table 4~~ contains a summary of the procedures to be carried out by a GPRS mobile station operating in Class A when crossing a boundary.

Mode / Boundary			CS idle		CS dedicated	
			PS stand-by	PS ready	PS stand-by	PS ready
Cell; same RA			Nothing	Cell Update	Nothing	Cell Update
RA; same LA			RA Update			
LA	Mode[4]	I	Combined RA/LA update		RA update. When the CS connection ends in a LA different than the original, a combined RA/LA update is performed	
		II, III	Independent RA and LA updates		RA update. When the CS connection ends in a LA different than the original an LA update is performed.	

Table 7~~4~~ - Location update procedures for a GPRS mobile station operating in class A.

The request from GMM to perform a location management procedure will trigger the request of packet resources, as described above (see 3.5.1). The contents of the request message (e.g. DTM Request) should help the BSS decide the resources to be allocated.

RA update and LA update procedures shall be supported in the main DCCH with SAPI 0. The cell update procedure should be supported in single timeslot operation, especially in the case of sending a dummy, short LLC frame as a 'paging response'. This helps reduce the congestion caused by GPRS signalling on GPRS TCHs that naturally exists in cells on the border of a RA or RA/LA without noticeably affecting the QoS of the CS connection.

The following sub-clauses clarify how the mobile station performs the location/routeing area update procedures while in dedicated mode. As previously indicated, the request of the establishment of dual transfer mode may trigger a change of the RR resources in the cell or a change of the serving cell. To simplify the diagrams below, possible assignment or handover procedures are ignored.

[4] Network Operation Modes.

The following diagrams will consider the *worst* case (packet idle mode) as it requires the establishment of uplink and — for RA Update— downlink TBFs. If an uplink TBF already exists, the initial steps leading to the uplink TBF establishment are not necessary. If a downlink TBF already exists, the uplink TBF can also be established as currently by sending the Channel Request Description information element in the Packet Downlink Ack/Nack message on the PACCH.

3.5.4.1 Cell update

Figure 29~~Figure 15~~ and Figure 31~~Figure 16~~ show the exchange of messages involved in a Cell Update procedure when the mobile station is in dedicated mode, packet idle mode and Ready state. The mobile station shall request uplink resources, indicating "Cell Update". Typically, the BSS will command the MS to perform the Cell Update procedure in single timeslot operation (Figure 29~~Figure 15~~), although it may allocate an uplink TBF on a different time slot (Figure 31~~Figure 16~~). In the latter case, a change of the radio resources as was described in the previous sections may happen before the MS sends the LLC frame on the TBF.

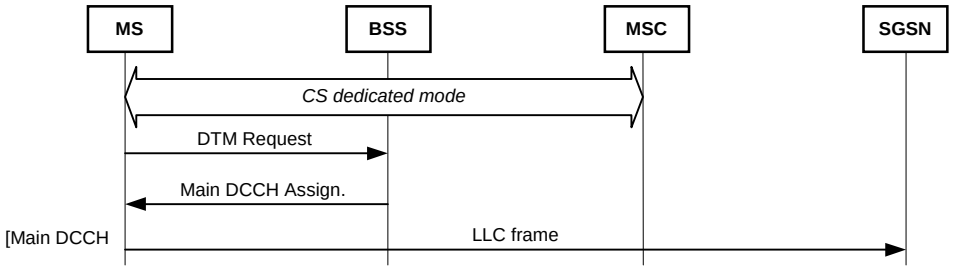

Figure 29~~15~~ - Cell Update procedure in dedicated mode, packet idle mode and Ready state; performed in single timeslot operation.

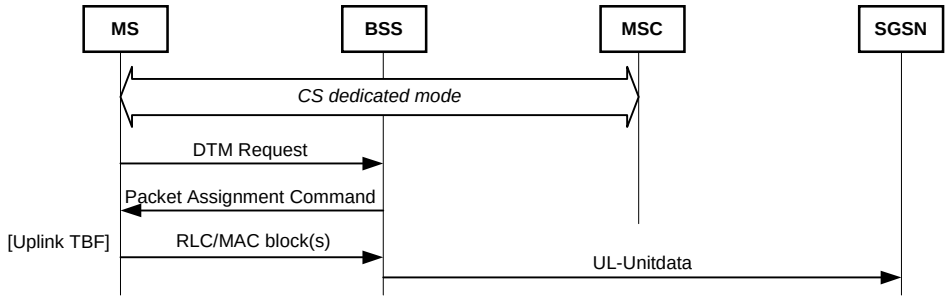

Figure 31~~16~~ - Cell Update procedure in dedicated mode, packet idle mode and Ready state; performed in multislot operation.

3.5.4.2 Routeing Area update

Figure 33~~Figure 17~~ and Figure 35~~Figure 18~~ show the message flow during the Routeing Area Update procedure under the same conditions (the MS in CS dedicated mode, packet idle mode and Ready state) and when no P-TMSI reallocation takes place. Figure 33~~Figure 17~~ assumes that the BSC opts for the main DCCH as the channel to be used, whereas two TBFs are used in Figure 35~~Figure 18~~. In this case, the uplink TBF is created to send the Routeing Area Update Request. The Routeing Area Update Accept from the SGSN needs the previous establishment of a downlink TBF.

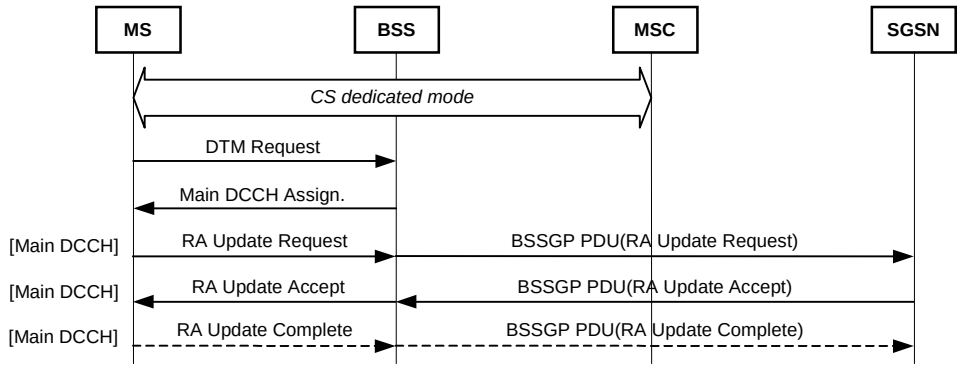

Figure 33~~17~~ - Routeing Area Update procedure in dedicated mode, packet idle mode and Ready state; performed on the main DCCH.

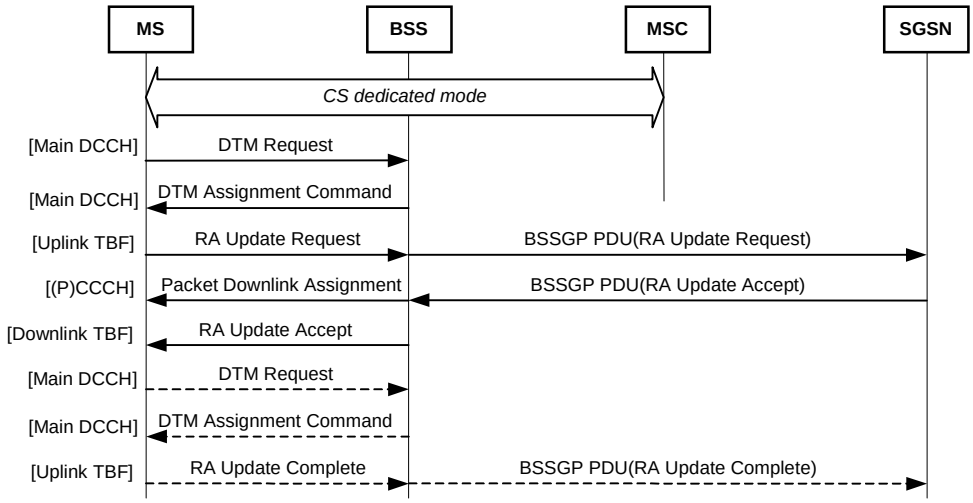

Figure 35~~18~~ - Routeing Area Update procedure in dedicated mode, packet idle mode and Ready state; performed on TBFs.

3.5.4.3 Location update

Figure 11 shows the exchange of messages when changing **one** Location Area boundary **once**. It is identical to the Routeing Area Update procedure except for the final group of messages. As the CS domain is not updated in the MSC while the MS is in a CS connection, a Location Area Update procedure is initiated when the CS connection ends to align the MM contexts in the MSC and the SGSN. This procedure is a Combined RA/LA Update procedure when the network is in mode I or a Location Area Update for modes II and III.

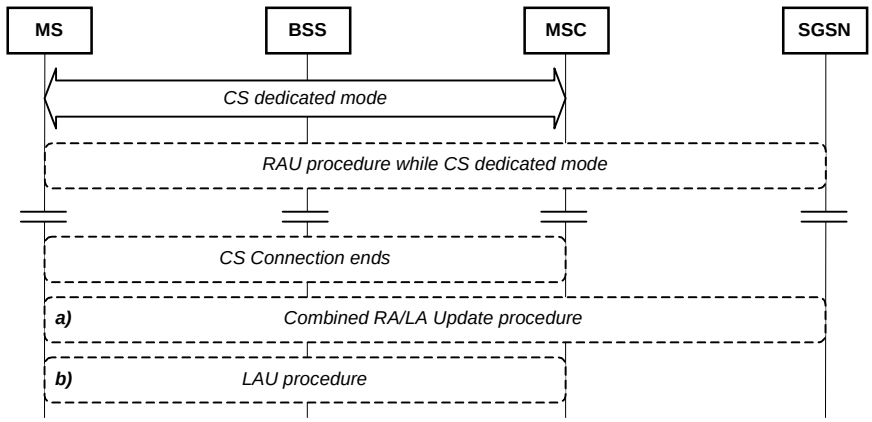

Figure 37~~19~~ - LA Update and RA Update procedures in CS dedicated mode, packet idle mode and Ready state; **a)** for Network Mode of Operation I; **b)** for Network Mode of Operation II and III.

3.6 DTM operation

Once the mobile stations enters the DTM, the existent RLC/MAC procedures apply, with the exception of the case of a dedicated uplink PDCH (including the PDHC/H of a "Lm + PDHC/H" configuration): in that case, the mobile station is always granted the transmission of uplink RLC/MAC blocks, which keep the current format; thus, the mobile station will ignore the USF mechanism or the allocation bitmap for dynamic or fixed allocation, respectively.

Other exceptions to the existent RLC/MAC procedures are:

- The mobile station shall not accept a packet assignment command (addressed to it on the PACCH) that changes the frequency definition of the PDCH. Such change shall be done by means of a DTM Assignment Command message on the main DCCH (changing both TCH and PDCH configurations). A modification of the timeslot allocation may occur by means of a Packet Assignment Command message. Any violation of the frequency restrictions or the multislot class of the mobile station (taking both TCH and PDCH resources into account) shall be treated as an abnormal case and the TBF(s) shall then be aborted.

NOTE: the PCU should know that the mobile station is in dual transfer mode and therefore format the messages correctly.

- When all TBFs have been released (or aborted), the mobile station returns to (CS) dedicated mode and packet idle mode.

- When the mobile station is in dual transfer mode, it shall ignore a Packet Cell Change Order or a RR-Cell Change Order message and shall remain in dual transfer mode.

NOTE: the PCU should know that the mobile station is in dual transfer mode and therefore not send these messages.

- A mobile station in dual transfer mode shall use normal acknowledgements and not access bursts, irrespective of the value if the CONTROL_ACK_TYPE field in the (P)BCCH. Access bursts are not needed since the mobile station is already in dedicated mode.

The mobile station remains in DTM until the CS connection or all the TBFs are released.

3.7 GPRS attach procedure while in dedicated mode and packet idle mode

In this procedure, the mobile station sends a GPRS Attach Request message to the SGSN. The sequence of messages is very similar to the Routeing Area Update procedure, described in sub-clause 3.5.4.2 and shown in Figure 33~~Figure 17~~ and Figure 35~~Figure 18~~. The presence of the Gs interface (i.e. network mode of operation I or II/III) needs to be indicated in the SACCH (e.g. SI 6) so that the MS knows what attach type needs to be performed.

3.8 Security

The current procedures apply.

NOTE: LLC frames sent on the main DCCH are therefore ciphered twice, but that is not felt as a security problem. In "Lm + PDCH/H" and other multislot configurations, current GPRS ciphering is kept.

3.9 Header and Data Compression

Because this is done at SNDCP layer, there is assumed to be no impact.

4 Issues for further study

No.	Description	Companies	Status
1	Multislot configurations where the CS connection is using more than one timeslot		Closed
2	Multislot configurations where the timeslots allocated to the PS session are not contiguous		Closed
3	Name of the feature		Closed
4	Details of the “Lm + PDCH/H” solution for single timeslot	All	Closed
5	List of advantages and disadvantages of the different proposals for single timeslot operation	All	Closed
6	Support of multislot operation and single timeslot operation in different directions		Closed
7	Core set of mandatory capabilities for mobile station and network		Closed
8	Measurement reporting	Ericsson / Motorola	Progressing
9	Provision of the IMSI to the BSS in an external handover	Vodafone	Closed
10	Downlink power control	Alcatel	Closed
11	Release of dedicated packet resources		Closed
12	Release of packet resources in single timeslot operation		Closed
13	Pre-emption of the packet session		Closed
14	Security issues	Vodafone	Progressing
15	Parameters in (P)SI messages that need to be sent in the SACCH/PACCH	Ericsson	Progressing
16	Alternative way to inform the MS of the behaviour on the PS domain after a handover (e.g. new message on the main DCCH indicating change of RA, permission to send DTM Request message…)	Ericsson	Progressing
17	QoS parameters in Release 99	J F Minet	Progressing
18	Mechanism to send acknowledgements during a downlink *dedicated* PDCH		Closed
19	Compatibility with AMR	Nortel	Progressing
20	Simulations on the behaviour of the MS in DTM	Motorola	Closed
21	Impact in testing (e.g. define “1+1” and “2+2” test loops)		Open

5 Change Requests

TS	Clause	Change	Editor	Status
01.04		Vocabulary		No editor
02.06		Mandatory capabilities		No editor
03.22		Check alignment		No editor
03.40		Alignment		No editor
03.64		Stage 2 description	Nokia / Vodafone	Being drafted
04.03		Alignment		No editor
04.04		Alignment		No editor
04.06	5.4.3	Deletion of LLC frames queued on the main DCCH in the handover and assignment procedures		No editor
04.11		Alignment		No editor
04.14		New test loops?		No editor
04.18		Definition of new messages and information elements	Vodafone	Drafted
04.18		Enable GPRS signalling on main DCCH with SAPI 0		No editor
04.18	10.5.2.35a	Inclusion of GPRS/DTM parameters in SI6		No editor
04.18	3.4.22	Description of DTM procedures in dedicated mode	Vodafone	Drafted
04.18	3.4.4	Modification to the handover procedure		No editor
04.18	9.1.43a	Inclusion of DTM cell capabilities in SI13	Vodafone	Being drafted
04.60		Definition of dedicated MAC mode	Ericsson / Vodafone	Being drafted
04.60		Assignment of a PDCH/H		No editor
04.60		Alignment	Ericsson	Being studied
04.60	11.2.25	Inclusion of DTM cell capabilities in PSI13	Vodafone	Needed?
04.64		Alignment. Check LLC number operation and re-sequencing for the use of the main DCCH		No editor
04.65		Alignment		No editor
05.01	2, 4, 7	Check references Define PDCH/H		No editor
05.02	3.2, 3.2.4, 6.3.2, 6.4.1, 7	Channel mappings for PDCH/H and permitted combinations	Motorola	Being drafted
05.02	B.4	Definition of DTM multislot capabilities	Motorola	Being drafted
05.03		Channel coding for PDCH/H		No editor
05.05		Check references Dedicated uplink PDCH (needed?)		No editor
05.08		Check measurement requirements: a DTM MS needs to measure the BCCH of the serving cell for GPRS power control		No editor
05.08	10.1.4.1, 10.2.3.2, 10.5.1	Measurement reporting	Motorola	Being drafted
05.08	10.2	Power control	Motorola	Being drafted
05.08	10.2.3.2.1	Timing advance	Motorola	Being drafted
05.10		Performance requirements	Nokia / Mitsubishi	Being studied
05.10	6.5.1, 6.5.2	Power control	Motorola	Being drafted
05.10	6.5.2	Timing advance	Motorola	Being drafted
08.02		Alignment		No editor
08.08		Provision of the IMSI to the BSC during call establishment	Vodafone	Drafted
08.08		Provision of the IMSI to the BSC during session establishment	Motorola / Vodafone	Progressing
08.08		Provision of the IMSI to the BSC during external handover	Vodafone	Drafted
08.08	3.2.2.58, 3.2.3, 3.2.3.6	Inclusion of DTM information in Old BSS to new BSS info.	Vodafone	Drafted
08.18		Alignment and improvements for use of the main DCCH		No editor
08.58		Channel (de)activation procedures and types		No editor
09.08		Check inter-MSC handover		No editor
22.060		Changes to paging procedures		No editor
22.060		In DTM the MS does not receive the CBCH		No editor
22.060		Remove “minimum of one timeslot” from the definition of class A mode of operation		No editor
23.060		New paging/notification procedures	Vodafone	Agreed by

TS	Clause	Change	Editor	Status
				SMG12 / S2
24.007		New Protocol Discriminator to route BSC → PCU (Reuse PDSS 2 code point)		No editor
24.007		New pictures / model		No editor
24.007		Protocol Discriminator for LLC messages		No editor
24.008		Modifications to the location update and GPRS attach procedures	Motorola	Being studied
24.008		Modification of GMM Radio Capabilities	Motorola	Being drafted
24.008	10.5.1.7	Inclusion of MS class A capabilities in Classmark 3	Motorola	Being drafted
		Other issues	**Editor**	**Status**
		Security issues	Vodafone	LS to SMG10 drafted
		Alignment with Release 99 QoS		No editor
		In-band parameters for DTM MSs while in dedicated mode and/or packet transfer mode	Ericsson	Being studied
		LS to SMG10 informing of the double ciphering of LLC frames sent on the main DCCH	Vodafone	Drafted
		LS to SMG7 notifying the status of the work item and requesting changes to (test loops) in 04.14	Vodafone	Drafted

6 Possible improvements for future releases

No.	Description
1	Support of EDGE
2	New 04.60 procedure for the establishment of a CS connection without interruption of the packet services
3	Support of multislot operation comprising single timeslot operation and additional PDCH(s) in the same direction
4	Multislot configurations where the CS connection is using more than one timeslot
5	Multislot configurations where the timeslots allocated to the PS session are not contiguous
6	Support of multislot operation and single timeslot operation in different directions

7 History

Date	Version	Event
22-26 Nov 1999	1.0.0	Presentation and discussions in WP 'B' and WP 'A' of SMG2 #33 (Sophia-Antipolis, France)
17 Dec 1999	1.1.0	Updated description document sent to SMG2 / SMG2WPA lists (Aalborg, Denmark)
10-14 Jan 2000	1.2.0	Presentation and discussions in WPB and WPA of SMG2 #34
16-17 Feb 2000	1.3.0	Description document discussed in SMG2 ad-hoc meeting on GPRS class A (London, UK)
3 March 2000	2.0.0	New concept document issued
14th March 2000	2.1.0	New version issued
16th March 2000	2.2.0	New version issued to align with the discussions in the first day of the SMG2 ad-hoc meeting on GPRS class A (London, UK)
23rd March 2000	2.3.0	New version issued after the ad hoc meeting in London (15-17/3/2000)
3rd April 2000	2.4.0	New version issued at SMG2 #35 (3-7/4/2000)