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Digital cellular telecommunications system (Phase 2+) (GSM);
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Stage 2
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3GPP A GLOBAL INITIATIVE
GSM® GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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Introduction

Motivation

The definition of GPRS class A mode of operation in Release 97 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 GERAN technology is also essential for operators without UMTS coverage.

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 3G TS 24.008 [11].

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 in Release 99:

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

More flexible proposals are left for further study. In addition, for the definition of DTM multislot classes, the restrictions in 3G TS 45.002 [6] for multislot capabilities shall apply.

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

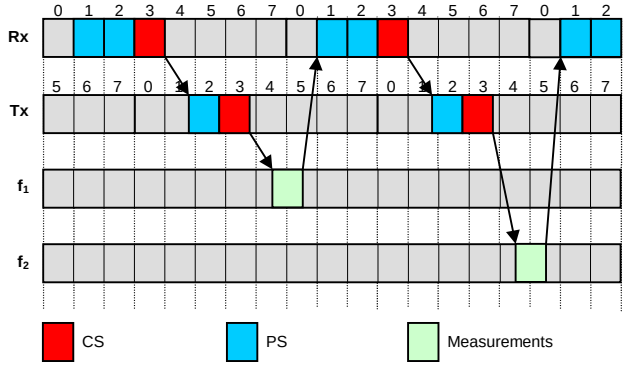

Figure 1: Example of multislot configuration of a GPRS *simple* class A mobile station in dual transfer mode.

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 mobile stations 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 3GPP TS 23.060 [9] for class A mobiles, but using the same techniques as UMTS for control of "in connection" cell, 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 uses a new Protocol Discriminator in 3GPP TS 24.007 for LLC: GTTP (GPRS Transparent Transport Protocol). The use of the main DCCH for GPRS signalling is subject to certain restrictions to reduce the harm to the speech quality.

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.

DTM Handover procedure is realized by utilizing in parallel the handover procedures that are defined in 3GPP TS43.129 [13] for the PS domain and in 3GPP TS 23.009 [14] for the CS domain.

Class A mode of operation

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.

1 Scope

The present document is 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.

In the following, GPRS refers to EGPRS, EGPRS2 and GPRS unless explicitly stated otherwise.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: " Vocabulary for 3GPP Specifications ".

[2] 3GPP TS 22.060: "General Packet Radio Service (GPRS); Service description; Stage 1".

[3] 3GPP TS 44.013: "Performance requirements on the mobile radio interface".

[4] 3GPP TS 44.018: "Mobile radio interface layer 3 specification, Radio Resource Control Protocol".

[5] 3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol".

[6] 3GPP TS 45.002: "Multiplexing and multiple access on the radio path".

[7] 3GPP TS 45.008: "Radio subsystem link control".

[8] 3GPP TS 45.010: "Radio subsystem synchronization".

[9] 3GPP TS 23.060: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description; Stage 2".

[10] 3GPP TS 23.121: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Architectural Requirements for Release 1999".

[11] 3GPP TS 24.007: "3rd Generation Partnership Project; Technical Specification Group Core Network; Mobile radio interface signalling layer 3; General aspects".

[12] 3GPP TS 24.008: "3rd Generation Partnership Project; Universal Mobile Telecommunications System; Mobile radio interface layer 3 specification, Core Network Protocols - Stage 3".

[13] 3GPP TS 43.129: "3rd Generation Partnership Project; Packet-switched handover for GERAN A/Gb mode; Stage 2".

[14] 3GPP TS 23.009: "3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Handover procedures; Stage 2".

[15] 3GPP TS 25.331: "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Radio Resource Control (RRC); Protocol Specification".