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GLOBAL SYSTEM FOR
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Digital cellular telecommunications system; Base Station System - Mobile-services Switching Centre (BSS - MSC) interface; Interface principles (GSM 08.02)

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Contents

Foreword

This Global System for Mobile communications Technical Specification (GTS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This GTS gives the interface principles Base Station System (BSS) to Mobile-services Switching Centre (MSC) interface within the digital cellular telecommunications system

The contents of this GTS are subject to continuing work within TC-SMG and may change following formal TC-SMG approval. Should TC-SMG modify the contents of this GTS it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 5.x.y

where:

- y the third digit is incremented when editorial only changes have been incorporated in the specification;

- x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

The specification from which this GTS has been derived was originally based on CEPT documentation, hence the presentation of this GTS may not be entirely in accordance with the ETSI rules.

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1 General

1.1 Scope

This Global System for Mobile communications Technical Specification (GTS) gives the principles on which the detailed interface specifications in the rest of the GSM 08.0X series of Technical Specifications are based.

The set of fixed equipment accessed from the MSC through one particular instance of the interface will be later referred to as a Base Station System (BSS). A BSS ensures the coverage of n cells, where n can be 1 or more.

The function of a BSS may be further subdivided into a control function, performed by one Base Station Controller (BSC) and a transceiving function, performed by "n" Base Transceiver Station equipments (BTS), one for each cell. However, the study of such a split is outside the scope of the 08.0x series of Technical Specifications, where the BSS will be considered as a whole.

The BSS-MSC interface defined in the GSM 08 series of Technical Specifications is designed to support a wide range of possible architectures on both sides. Characteristics like the physical location of the transcoders/rate adaptation inside the BSS (either integrated into the transceivers or very near to the MSC) or the use of traffic or signalling concentration at either side are left to the operators choice. Annex A to this Technical Specification contains guidance information concerning the use of remote mobile switching units, which for the purposes of this specification are considered as part of the MSC.

Direct connection between two BSSs is not supported by this interface.

This interface is based on the use of 1 or more 2 048 kbit/s digital transmission system interfaces. Each 2 048 kbit/s interface provides 31*64 kbit/s channels which can be used for traffic or signalling as the operator requires.

The signalling is layered, terminology similar to that in the OSI reference model is used in this series, however the layers referred to are not identical to the equivalently named layer in the OSI model.

This interface is defined at the boundary of the MSC and has a per channel bit rate of 64 kbit/s, but the net radio path traffic channel is at a rate of less than 16 kbit/s. A transcoder or rate adapter function is thus needed for the rate conversion. The interface is designed such that the transcoding or rate adaptation function may be geographically situated at either the MSC site or the BSS site, however the transcoder is considered to be part of the BSS.

The interface has been designed around the aims of GSM 08.01 allowing each component and the system as a whole to evolve.

1.2 Normative references

This GTS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this GTS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1] GSM 01.04 (ETR 350): "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 03.09: "Digital cellular telecommunications system (Phase 2+); Handover procedures".

[3] GSM 03.10: "Digital cellular telecommunications system (Phase 2+); GSM Public Land Mobile Network (PLMN) connection types".

[4] GSM 03.20 (ETS 300 929): "Digital cellular telecommunications system; Security related network functions".

[5] GSM 04.08 (ETS 300 940): "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[6] GSM 08.01: "Digital cellular telecommunications system; Base Station System - Mobile services Switching Centre (BSS - MSC) interface; General aspects".

[7] GSM 08.04: "Digital cellular telecommunications system; Base Station System - Mobile-services Switching Centre (BSS - MSC) interface; Layer 1 specification".

[8] GSM 08.06: "Digital cellular telecommunications system; Signalling transport mechanism specification for the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[9] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification".

[10] GSM 08.20: "Digital cellular telecommunications system; Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[11] GSM 08.51: "Digital cellular telecommunications system; Base Station Controller - Base Transceiver Station (BSC - BTS) interface; General aspects".

[12] GSM 08.52: "Digital cellular telecommunications system; Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Interface principles".

[13] GSM 08.54: "Digital cellular telecommunications system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 1 structure of physical circuits".

[14] GSM 08.56: "Digital cellular telecommunications system; Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 2 specification".

[15] GSM 08.58: "Digital cellular telecommunications system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

[16] GSM 08.60 (ETS 300 737): "Digital cellular telecommunications system (Phase 2+); Inband control of remote transcoders and rate adaptors for Enhanced Full Rate (EFR) and full rate traffic channels".

[17] GSM 08.61 (ETS 300 979): "Digital cellular telecommunications system; In-band control of remote transcoders and rate adaptors for half rate traffic channels".

[18] GSM 12.01 (ETS 300 612-2): "Digital cellular telecommunications system (Phase 2); Common aspects of GSM Network Management (NM)".

1.3 Definitions and abbreviations

Abbreviations used in this GTS are listed in GSM 01.04

2 Functional division between Base Station System (BSS) and MSC

Functional split

Item/Task	BSS	MSC,VLR,HLR
Terrestrial Channel Management		
channel allocation		X
blocking indication	X	
Radio channel management		
Radio channel configuration management	X	
frequency hopping management	X	
idle channel observation	X	
power control	X	
TCH management		
channel allocation (choice)	X	
link supervision	X	
channel release	X	X (Invoked by MSC)
BCCH/CCCH management		
scheduling of messages	X	
DCCH management		
link supervision	X	
channel release	X	X (Invoked
DCCH allocation	X	by MSC
Radio resource indication		
report status of idle channels	X	
Channel coding decoding		MSC defines
on the basis of call type	X	call type
Transcoding/rate adaptation	X	
Interworking Function (data calls)		X
Measurements		
reported from MS	X	
uplink	X	
traffic		X
Handover		
internal (within one cell){if provided}	X	MSC informed
internal (between cells) {if provided}	X	MSC informed
external recognition radio reason	X	
external recognition traffic reason	X	X
decision	X	X
execution		X
Mobility Management		
authentication		X
location updating		X
paging		X
DRX paging (scheduling)	X	

(continued)

Functional split (concluded)

Item/Task	BSS	MSC,VLR,HLR
Call control		X
User data encryption	X	Key and permitted algorithms from MSC
Signalling element encryption	X	Key and permitted algorithms from MSC

2.1 Terrestrial channel management

2.1.1 Terrestrial channel allocation

Terrestrial channel allocation will be handled in the following manner.

The MSC will consider the link to the BSS as a route on "n" channels. Within this route, certain of the channels need not be able to support all types of traffic (e.g. data calls or half rate coder calls). A circuit pool is a group of circuits supporting the same channel types. There may be several circuit pools per one BSS. The MSC shall therefore ensure that the terrestrial channel chosen is able to support the type of call involved, this information is held as data in the MSC.

The MSC shall choose the terrestrial channel to be used.

2.1.2 Blocking of terrestrial channels

Since the MSC chooses the terrestrial channel the BSS shall be able to remotely block the terrestrial channel and remove it from service. This is signalled across the BSS/MSC interface using the appropriate signalling exchange as defined in GSM 08.08.

Local blocking of terrestrial channels at the MSC may be supported by the MSC and will result in the concerned channels not being chosen, no information flows across the interface concerning this type of blocking.

2.2 Radio channel management

2.2.1 Channel configuration management

The channel configuration management will be controlled between BSS and maintenance centre, the MSC holding no direct data concerning the allocation of radio timeslots etc.

2.2.2 Radio TCH management

2.2.2.1 Radio channel allocation

The BSS shall choose the radio channel to be used on the appropriate cell, based on information received from the MSC, which defines the channel type, channel coding and all other parameters relevant to defining channel type. The chosen radio channel shall be connected to the terrestrial channel in order to support the call. This connection mechanism is not further defined in these Technical Specifications.

2.2.2.2 TCH radio link supervision

Radio link supervision of dedicated radio resources shall be the responsibility of the BSS. If communication with the mobile is lost then the BSS can request that the call be cleared.

2.2.2.3 Frequency hopping management

Frequency hopping management shall be performed by the BSS. That is the BSS shall store and transmit all hopping parameters for the cell(s) that it controls, the hopping shall be performed such that it is not visible on the BSS/MSC interface.

2.2.2.4 Idle channel observation

The quality of idle radio channels shall be measured by the BSS and a condensed form of the information passed back to the MSC.

2.2.2.5 TCH power control

All power control functions shall be performed between MS and BSS. No real time power control commands shall be sent across the BSS/MSC interface.

2.2.2.6 TCH channel release

The release of a dedicated resource is primarily controlled by the MSC. However for radio propagation reasons the BSS can request of the MSC that a call be released. The necessary protocols are defined in GSM 08.08.

2.2.3 BCCH CCCH management

All BCCH data shall be either stored at or derived locally by the BSS.

CCCH random accesses shall be controlled autonomously by the BSS, paging messages shall be received from the MSC via the BSS/MSC interface.

2.2.3.1 Scheduling of BCCH and CCCH messages

The scheduling for all BCCH and CCCH messages shall be performed by the BSS.

2.2.4 DCCH Management

2.2.4.1 DCCH link supervision

Radio link supervision of dedicated radio resources shall be the responsibility of the BSS. If communication with the mobile is lost then the BSS can request that the call be cleared.

2.2.4.2 DCCH channel release

The release of a dedicated resource is primarily controlled by the MSC. However for radio propagation reasons the BSS can request of the MSC that a call be released. The necessary protocols are defined in GSM 08.08.

2.2.4.3 DCCH power control

All power control functions shall be performed between MS and BSS. No real time power control commands shall be sent across the BSS/MSC interface.

2.2.4.4 Radio Channel Allocation

The BSS shall choose the DCCH to be used on the appropriate cell. This shall be performed initially after the random access to the CCCH has been made by the MS. The chosen DCCH may at a later stage in the call be connected to the terrestrial channel in order to support the service, this is controlled by the appropriate indications in an assignment message from the MSC.

2.3 Resource indication

The status of idle radio channels is reported to the MSC using the protocol described in GSM 08.08.

2.4 Channel coding decoding

The encoding decoding and interleaving shall be performed by the BSS. The type of channel coding and interleaving is derived from the information in the assignment message from the MSC.

2.5 Transcoding/rate adaptation

Rate adaptation or transcoding shall be performed by the BSS. The selection of the appropriate function shall be based on information received from the MSC.

2.6 Interworking function (data calls)

The interworking function required for data calls to other networks shall be performed on the MSC side of the MSC/BSS interface.

2.7 Measurement information

2.7.1 Measurement information reported from the MS

Measurement information reported from MSs with dedicated radio resources shall be processed by the BSS.

2.7.2 Uplink measurement information

The BSS shall process uplink information.

The results of the processing of the "Measurement information reported from the MS" and the "Uplink measurement information" may be transmitted to the MSC as described in GSM 08.08.

2.7.3 Traffic information

Traffic information concerning the traffic environment outside a BSS is not passed from MSC to BSS.

2.8 Handover

Handovers (both internal and external) can occur for one of several reasons e.g. radio propagation, traffic distribution, O and M activity, equipment failure.

2.8.1 Internal handover within one cell

Internal handover within one cell can be supported within a BSS. It is optional for an BSS to be able to perform autonomous internal handover.

The MSC will be informed when an autonomous internal handover has been completed (see GSM 08.08).

2.8.2 Internal handover between cells

Internal Handover between cells on the same BSS can be supported within an BSS. Multi cell BSSs would normally be expected to support internal inter cell handover, however it is optional that they do so.

The MSC will be informed when an autonomous internal handover has been completed (see GSM 08.08).

2.8.3 External handover

This type of handover includes inter MSC handover as discussed in GSM 03.09.

2.8.3.1 Recognition that a handover is required for a radio reason

The BSS shall be able to generate an indication that a handover is required to the MSC using the protocols defined in GSM 08.08.

No additional guidance is given in the GSM 08.0X series concerning the algorithm within the BSS that generates either an internal handover, or an indication to the MSC that an external handover is required.

2.8.3.2 Recognition that a handover is required for a traffic reason

The BSS shall be able to generate an indication to the MSC that a handover is required for traffic reason (e.g. directed retry) using the protocols defined in GSM 08.08.

Within a multi BSS area only the MSC has a perspective of the overall traffic loading. The MSC may therefore originate inter BSS traffic handovers due to traffic reasons.

2.8.3.3 Decision of Target Cell

The choice of the target cell in an external traffic handover shall be made by the MSC, based on information received from the BSS.

2.8.3.4 Execution

Having received an indication from an BSS that an external handover is required, the decision of when and whether an external handover should take place shall be made by the MSC.

2.9 Mobility management

All transactions concerning mobility management (as specified in GSM 04.08) shall take place transparently between the MS and MSC/VLR/HLR, using the protocols described in Technical Specifications GSM 08.08 and GSM 08.06. The only exception to this rule is that of paging which is scheduled by the BSS on the appropriate cell.

2.10 Call control

Call control will be the responsibility of the MSC/HLR/VLR.

2.11 Security features

Information on security aspects are found in GSM 03.20. The BSS/MSC interface supports all of the required interchange of encryption keys.

2.11.1 User data confidentiality

Encryption and decryption of user data (e.g. speech) takes place within the mobile station and within the BSS. In order to decrypt/encrypt user data the encryption device used for the call must be loaded with the relevant key and algorithm. The key and the permitted algorithms are supplied by the MSC.

2.11.2 User identity confidentiality

This feature is supported by using a TMSI rather than an IMSI, over the radio path. The translation between TMSI and IMSI is performed at the MSC and within the mobile. Both TMSI and IMSI are carried transparently by the BSS-MSC interface as far as possible.

2.11.3 Signalling information confidentiality

As for user data.

2.11.4 Authentication of users

Authentication is carried out at the mobile and at the MSC/VLR/HLR. The MSC to BSS interface is required to transport the necessary challenge and response messages.

3 Transcoder/rate adapter integration

The transcoder will be functionally integrated into the BSS. It is not considered to be a stand alone piece of equipment. The control of the transcoder will therefore take place directly via the BSS, an explicit control interface between BSS and transcoder will not be defined.

Dependent on the relative costs of transmission plant for a particular administration, there is an economic benefit, for larger cells and certain network topologies, in having the transcoder positioned at the MSC site. However, for smaller cells there may actually be a cost penalty due to special multiplexing.

When the transcoder is geographically sited at the MSC site, it shall still be considered part of the BSS, and as such is on the BSS side of the BSS-MSC interface.

4 Multiplexing of common and dedicated control channels

Common and dedicated control channels will be used for the same call on the radio path. These control channels will be multiplexed onto one or more common signalling channel(s) between the BSS and MSC. This multiplexing function will reside at the BSS.

It should be noted therefore that the data links across the air interface are terminated at the BSS.

All scheduling of messages via the air interface is controlled by the base station, flow control is therefore required from BSS to MSC to prevent overload of the transmission buffers, this is further detailed in Technical Specifications GSM 08.08 and GSM 08.06.

5 Classes of signalling messages

The signals between BSS and MSC are classified under three headings:

i) DTAP messages ——┐ BSSAP messages
ii) BSS management ——┘
iii) BSS O&M

Where DTAP BSSMAP and BSSAP are as defined in GSM 08.08.

Layer 3 call control messages will as far as possible pass transparently through the BSS. The discrimination between BSSMAP and DTAP messages is detailed in Technical Specification GSM 08.06.

6 Support of services and features other than speech

6.1 Data services

In order to ensure that the requirements of GSM 03.10 are met, the support of data services will entail the following 7 actions being taken:

i) the speech coder being deactivated in the mobile;

ii) a rate adaptation function being activated in the mobile;

iii) an appropriate channel coding being activated in the mobile radio subsystem;

iv) an appropriate channel coder being activated in the BSS;

v) a rate adaptation function being activated in the BSS;

vi) any echo control in the MSC being by-passed or disabled;

vii) an appropriate network interworking function being invoked.

The MSC to BSS interface will support all necessary signalling for this to be achieved.

6.2 Supplementary services

All signalling concerned with supplementary services is passed transparently through the BSS via the DTAP.

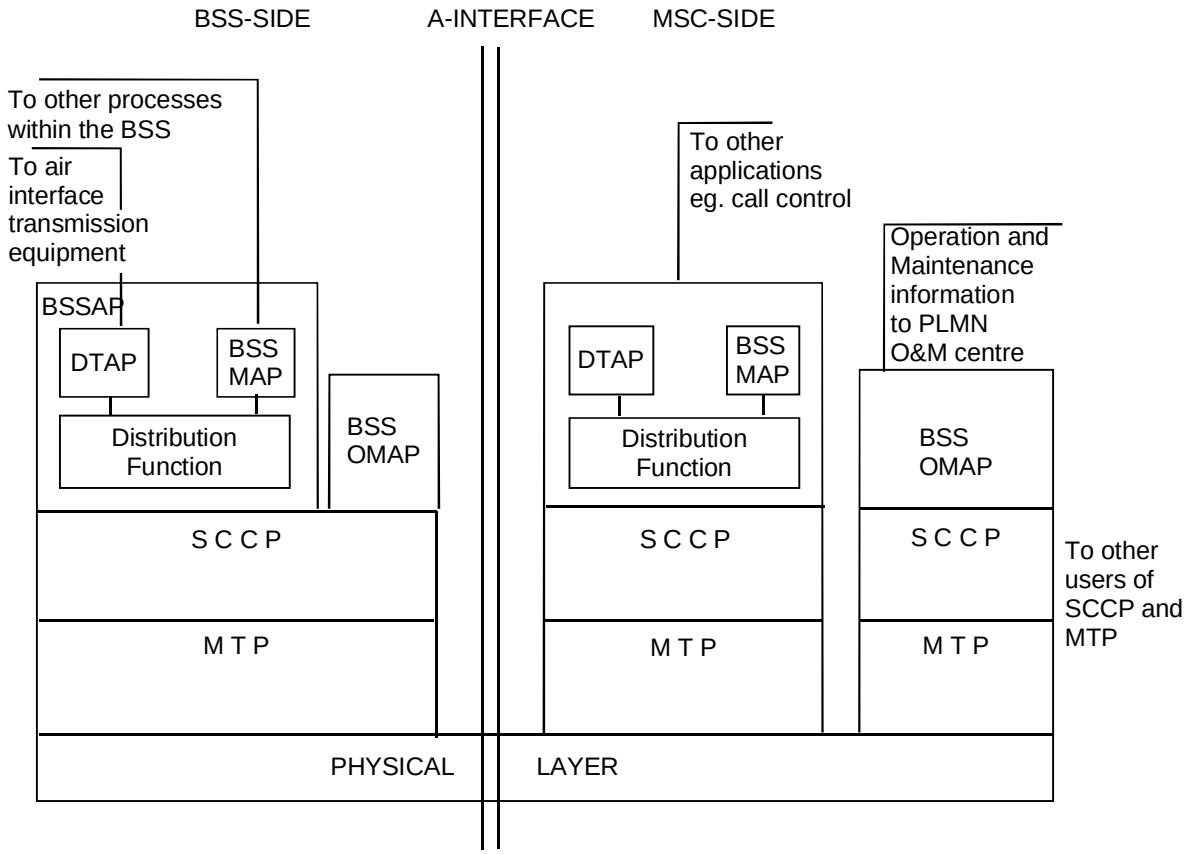
7 Interface structures

The definition of the MSC to BSS interface follows a layered approach. This is shown in figure 1.

In the case of a digital link being used between the BSS and MSC, the signalling will be carried in one of the 64kbits/s timeslots.

8 Operation and maintenance

Operation and maintenance information is required to flow between the BSS and O & M functions. The BSS to MSC interface provides for this type of information see GSM 12.01.



Terminology:
DTAP - Direct Transfer Application Part
BSSMAP - BSS Management Application Part
BSS OMAP - BSS Operation and Maintenance Application Part
SCCP - Signalling Connection and Control Part
MTP - Message Transfer Part
BSS - Base Station System
MSC - Mobile services Switching Centre

NOTE: X.25 can be used for transferring O and M information.

Figure 1: Signalling protocol reference model

Annex A (informative): Remote Mobile Switching Unit (RMSU)

A.1 Introduction

Between the MSC and some of the BSS sites served by this MSC , it may be advantageous to include a line concentrator, an RMSU. The main purpose of introducing this unit is to reduce the number of terrestrial circuits needed between BSS site and MSCs (signalling and traffic circuits). The benefits of introducing an RMSU will depend on:

- relative costs of the transmission plant for the particular administrations;
- the costs involved in operating the RMSU;
- the complexity of the RMSU, i.e. if it allows interworking with the ISDN or the PSTN for mobile originated calls.

In the GSM Technical Specifications the RMSU will be regarded as a remotely controlled part of the MSC, and therefore no detailed specification of the RMSU or the signalling functions needed between the RMSU and the MSC will be given.

A.2 Functions provided by the RMSU

Below is listed some examples of functions which may be provided by the RMSU:

- setting up and clearing of circuits to the BSS and the MSC (remotely controlled by the MSC);
- switching of the circuits between MSC and the various BSSs;
- blocking and unblocking of circuits;
- possibly interworking with the PSTN or ISDN for mobile originated calls, including information exchange with remote control from the MSC;
- Operation and maintenance functions of the RMSU.

A.3 General requirements

In order to be able to establish a BSS configuration without using an RMSU, and then later on introducing this unit, the interface between the BSSs and the RMSU should have the same characteristics as the interface between a BSS and an MSC.

The number of subscribers served by an RMSU will be large compared to the number of subscribers served by a single BSS. Therefore, if the RMSU or the signalling links between the RMSU and the MSC go down, this will have a serious impact on the mobile service in a large geographical area.

The implementation of the RMSU and the signalling between the RMSU and the MSC therefore has to be made in such a way that the overall reliability requirements specified for the MSC are fulfilled.

Some O and M facilities may be required in the RMSU, and the necessary signalling between the RMSU and the O and M functions has to be provided.

History

Document history	
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