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**Digital cellular telecommunications system (Phase 2+);  
General Packet Radio Service (GPRS);  
O&M in GPRS  
(GSM 10.18 version 0.4.0)**

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**GSM**®  
GLOBAL SYSTEM FOR  
MOBILE COMMUNICATIONS



*European Telecommunications Standards Institute*

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Reference

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## Foreword

To be drafted by the ETSI secretariat.

## Introduction

This TR is a working document for the SMG6 GPRS subgroup for collation of information regarding GPRS charging. It will be used to produce change requests(s) to the GSM 12 series (chiefly GSM 12.05). It is not expected that this document will be published. Further information about the time scales for GPRS work can be found in GSM 10.60.

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## 1. Scope

The GSM PLMN supports a wide range of voice and non-voice services in the same network. In order to enable operators the ability to provide a manageable service there is a need to provide management functions. This specification describes the management of GPRS, including the protocols and functionalities needed to support GPRS as defined in GSM 02.60 and 03.60 (packet based services).

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## 2. References

### 2.1 Normative references

This TR incorporates, by dated or 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 specification 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 01.61: "Digital cellular telecommunications system (Phase 2+); GPRS ciphering algorithm requirements".
- [3] GSM 02.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 1".
- [4] GSM 03.03 (ETS 300 927): "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".
- [5] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration procedures".

- [6] GSM 03.22 (ETS 300 930): "Digital cellular telecommunications system; Functions related to Mobile Station (MS) in idle mode and group receive mode".
- [7] GSM 03.40: "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS); Point-to-Point (PP)".
- [8] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 2".
- [9] GSM 03.61: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Point to Multipoint Multicast Service Description; Stage 2".
- [10] GSM 03.62: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Point to Multipoint Group Call Service Description; Stage 2".
- [11] GSM 03.64: "Digital cellular telecommunications system (Phase 2+); Overall description of the General Packet Radio Service (GPRS) Radio interface; Stage 2".
- [12] GSM 04.07 (ETS 300 939): "Digital cellular telecommunications system (Phase 2+); Mobile radio interface signalling layer 3; General aspects".
- [13] GSM 04.08 (ETS 300 940): "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".
- [14] GSM 04.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Logical Link Control (LLC)".
- [15] GSM 04.65: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Subnetwork Dependent Convergence Protocol (SNDCP)".
- [16] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre – Base Station System (MSC - BSS) interface: Layer 3 specification".
- [17] GSM 08.14: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) – Serving GPRS Support Node (SGSN) interface; Gb interface layer 1".
- [18] GSM 08.16: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) – Serving GPRS Support Node (SGSN) interface; Network Service".
- [19] GSM 08.18: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Base Station System (BSS) – Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".
- [20] 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."
- [21] GSM 03.60 (ETS 300 737): " Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service description; Stage 2."
- [21] GSM 09.02 (ETS 300 974): "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".
- [22] GSM 09.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".
- [23] GSM 09.61: "Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) supporting General Packet Radio Service (GPRS) and Packet Data Networks (PDN)".
- [24] CCITT Recommendations I.130: "General modelling methods – Method for the characterisation of telecommunication services supported by an ISDN and network capabilities of an ISDN".

- [25] CCITT Recommendation E.164: "Numbering plan for the ISDN era".
- [26] CCITT Recommendation Q.65: "Methodology – Stage 2 of the method for the characterization of services supported by an ISDN".
- [27] CCITT Recommendation Q.922: "Digital subscriber signalling system no. 1 (DSS 1) – Data link layer – ISDN data link layer specification for frame mode bearer services".
- [28] CCITT Recommendation Q.933: "Digital subscriber signalling system no. 1 (DSS 1) – Network layer – Signalling specification for frame mode basic call control".
- [29] CCITT Recommendation V.42 bis: "Data communication over the telephone network – Data compression procedures for data circuit-terminating equipment (DCE) using error correction procedures".
- [30] CCITT Recommendation X.3: "Packet assembly disassembly facility (PAD) in a public data network".
- [31] CCITT Recommendation X.25: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [32] CCITT Recommendation X.28: "DTE / DCE interface for a start-stop mode data terminal equipment accessing the packet assembly / disassembly facility (PAD) in a public data network situated in the same country".
- [33] CCITT Recommendation X.29: "Procedures for the exchange of control information and user data between a packet assembly / disassembly (PAD) facility and a packet mode DTE or another PAD".
- [34] CCITT Recommendation X.75: "Packet-switched signalling system between public networks providing data transmission services".
- [35] CCITT Recommendation X.121: "International Numbering Plan for Public Data Networks".
- [36] IETF RFC 768 (1980): "User Datagram Protocol" (STD 6).
- [37] IETF RFC 791 (1981): "Internet Protocol" (STD 5).
- [38] IETF RFC 792 (1981): "Internet Control Message Protocol" (STD 5).
- [39] IETF RFC 793 (1981): "Transmission Control Protocol" (STD 7).

## 2.2 Informative references

GSM 10.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS) Project scheduling and open issues;"

GSM 10.17 Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS)"

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## 3. Definitions abbreviations and symbols

### 3.1 Definitions

Refer to: GSM 02.60 [2].

In GSM 02.02 the bearer services are described. The general network configuration is described in GSM 03.02 and the GSM PLMN access reference configuration is defined in GSM 04.02. The various connection types used in the GSM PLMN are presented in GSM 03.10. Terminology used in this TR is presented in GSM 01.04. For support of data services between GSM PLMN and other networks see GSM 09-series of Specifications.

## 3.2 Abbreviations

For the purposes of this specification the following abbreviations apply:

BG	Border Gateway
BSS	Base Station Subsystem
BTS	Base Transceiver Station
CDR	Call Detail Record
CG	Charging Gateway
CMIP	Common Management Information Protocol
EIR	Equipment Identity Register
F/W	Firewall
DNS	Domain Name System Server
FFS	For Future Study
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GPRS BB	GPRS Backbone
GSN	GPRS Support Node
IP	Internet Protocol
MS	Mobile Station
NE	Network Element
NSS	Network and Switching Subsystem
NMC	Network Management Centre
OMC	Operations and Maintenance Centre
OSF	Operations System Function
OSF	Operations System Function
O&M	Operations & Maintenance
PDN	Packet Data Network
PDP	Packet Data Protocol, e.g., IP or X.25
PLMN	Public Land Mobile Network
PSPDN	Packet Switched Public Data Network
PTM-M	Point to Multipoint - Multicast
PTM-G	Point to Multipoint - Group Call
PTM SC	Point to Multipoint Service Center
SGSN	Serving GPRS Support Node
SNMP	Simple Network Management Protocol
SS7	Signalling System No. 7
TE	Terminal Equipment

## 3.3 Symbols

For the purposes of this specification the following Symbols apply:

A	Interface between a MS and a BTS of a BSS.
Gb	Interface between an SGSN and a BSC.
Gc	Interface between a GGSN and a HLR.
Gd	Interface between a SMS-GMSC and SGSN, and between SMS-IWMSC and SGSN
Gf	Interface between an SGSN and a EIR.
Gi	Reference point between GPRS and an external packet data network.
Gn	Interface between two GSNs within the same PLMN.
Gp	Interface between two GSNs in different PLMNs. The Gp interface allows support of GPRS network services across areas served by the co-operating GPRS PLMNs.
Gr	Interface between a SGSN and a HLR.
Gs	Interface between an SGSN and MSC/VLR.
kbit/s	Kilobits per second.



- R The reference point between a non-ISDN compatible TE and MT. Typically this reference point supports a standard serial interface.
- Um The interface between the MS and the GPRS fixed network part. The Um interface is the GPRS network interface for providing packet data services over the radio to the MS. The MT part of the MS is used to access the GPRS services through this interface.

## 4. Stages of GPRS O&M Standardisation

In order not to obstruct the availability of GPRS within the timescales required, the introduction of GPRS into a PLMN will be supported by a phased introduction of GPRS O&M. The phasing of GPRS O&M is performed in three possible phases, known as Stage 1, Stage 2 and Stage 3.

The three stages represent an evolutionary approach, from an initial introduction with little or no standardised OS management of the NEs, through to Stage 3 with higher levels of GPRS management control performed by the OS. A PLMN operator need not necessarily introduce each of the three stages, and may indeed choose to introduce GPRS network management as identified by Stage 1, or at a later stage as identified by Stage 2 or 3. The choice is made by the PLMN operator as best fits the PLMN operator's requirements. The three stages are subsequently described.

### 4.1 Stage 1

The initial stage of GPRS O&M, called Stage 1, identifies a network configuration where GSN/IP nodes are introduced into the GSM network to support GPRS. The GSN/IP nodes refer not only to the SGSN, GGSN and the GSN backbone, but also refer to any other IP node such as the DNS.

Stage 1 is considered as an optional stage in the rollout of GPRS, and is intended to facilitate rapid introduction of GPRS into a PLMN without being impeded by the lack of a standardised OS management having been defined for GPRS. For Stage 1 there are thus no defined management protocols or interfaces, as the objective is to permit the rapid rollout of a GPRS network. What Stage 1 does identify is a limited set of O&M functionalities which must be supported in one way or another.

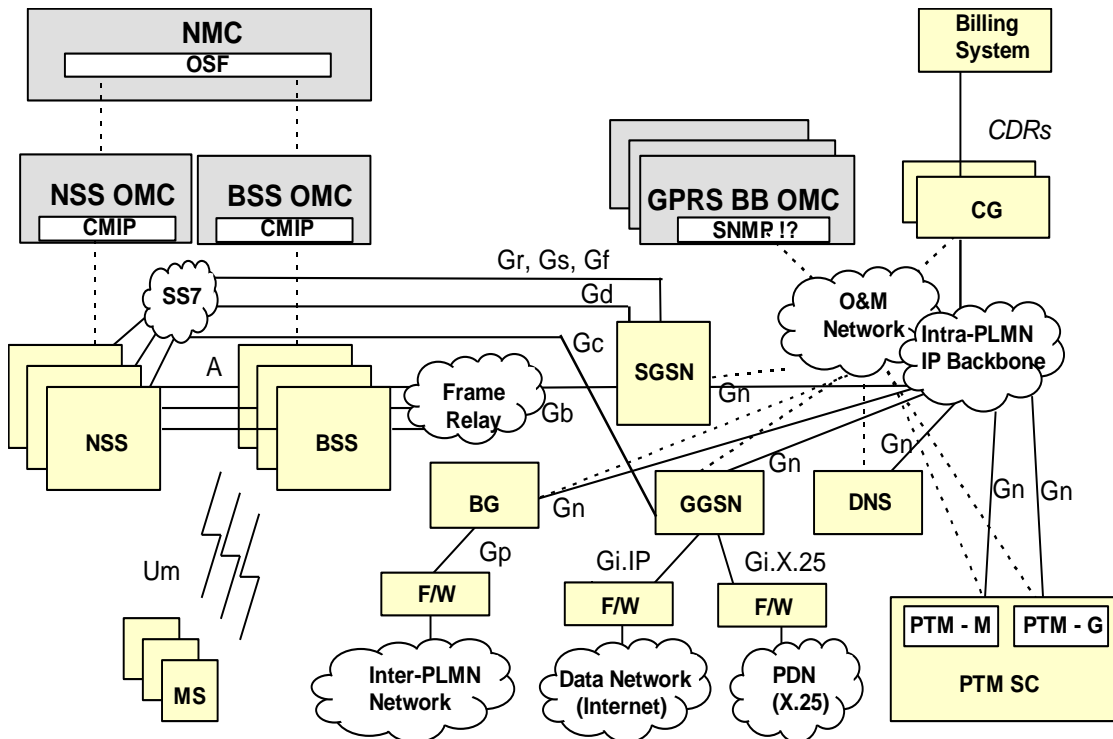


Figure 1: Stage 1 GPRS O&M

Figure 1 presents a typical architectural view of a GPRS network. It should be noted that the figure represents an architectural overview, together with some O&M aspects. The continuous lines represent data/signalling, and the dotted lines represent O&M management.

The management of the GSN/IP nodes in Stage 1 are performed independently and separately from the BSS part of the network, with no required interaction between the two O&M areas. These GSN/IP are managed from vendor-specific management platforms, generically referred as GPRS OMCs.

The GPRS OMCs support the management of GPRS functionality attached to the GPRS backbone system. The main functional areas supported by the GPRS OMCs (which in some cases may be represented by individual physical entities or groups of physical entities) are the:-

- SGSN (IP aspects)
- GGSN (IP aspects)
- BG
- DNS
- CG
- PTM SC
- FR (Frame Relay) (Not incorporated, it is part of a separate network, and out of scope of this specification).

and may themselves mediate GPRS O&M management to their sub-ordinate functionalities (e.g. firewall management by the GGSN). The precise role of the GPRS OMCs, as the first OS remote from the GPRS backbone system, may be more or less complex depending on the specific implementations and the functionalities managed by them.

Different suppliers of the GSN/IP nodes may have their own proprietary interfaces to the GSN/IP nodes, and the GPRS OMC is therefore represented by multiple instances to represent the various managers that vendors may provide for the GSN/IP nodes.

There is no defined interconnection between the various GPRS OMCs in GPRS O&M Stage 1. SNMP is recommended in Stage 1 for the interface between the GPRS OMCs and the GSN/IP nodes, however no specific mandatory protocol is required in Stage 1. A GPRS network does not necessarily require to provide SNMP to support GPRS O&M in Stage 1. Thus any vendor supplied GPRS OMC and/or protocol is deemed to be acceptable in Stage 1.

## 4.2 Stage 2

In GPRS O&M Stage 2, the management of the GSN/IP part of the network continues to be distinct and separate from the management of the BSS part of the network (as for Stage 1). There will continue to be vendor-specific GPRS OMC management entities directly interfacing to the GSN/IP nodes. The vendor-specific O&M management for all the different SGSN/IP nodes in Stage 2 will however be managed from a single GPRS OMC.

The single GPRS OMC incorporates MIB extracts from the managed SGSN/IP nodes enabling the OS to manage their differing characteristics. The single GPRS OMC is a platform able to perform the O&M management of all the GSN/IP nodes of the GPRS part of the network.

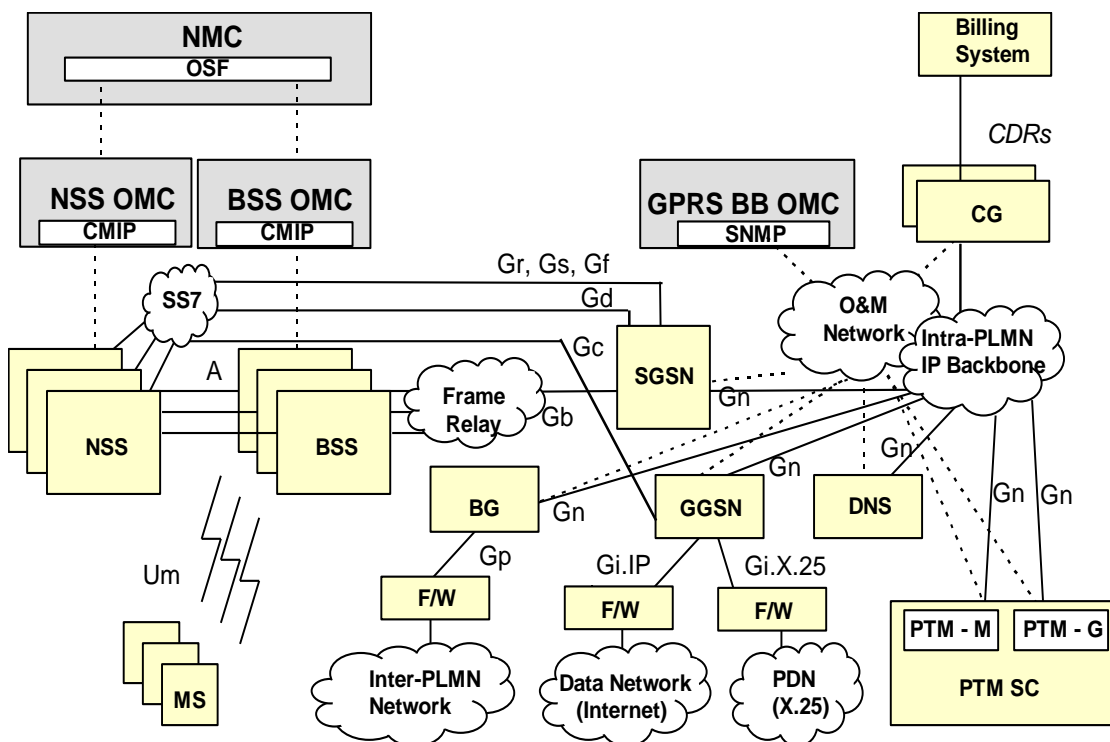


Figure 2: Stage 2 GPRS O&M

The above figure presents a typical Stage 2 architectural view of a GPRS network. The continuous lines represent data/signalling, and the dotted lines represent O&M management. Management of the GSN/IP (SGSN IP aspects, GGSN IP aspects, BG, DNS, CG, PTM SC) nodes is performed from a single GPRS OMC, with a defined set of functionalities.

The minimum set of O&M information (i.e. the MIB extracts) in the GPRS OMC in order to be manage the GSN/IP nodes is defined for this stage, together with a limited set of O&M functionalities. The GPRS OMC will be able to manage the individual characteristics of the vendor-specific GPRS entities.

Point to multi-point groups will be supported as part of Stage 2. SNMP is the recommended protocol for the GPRS OMC interfaces to the GSN/IP nodes.

### 4.3 Stage 3

In GPRS O&M Stage 3, the GPRS OMC is defined for a multi-vendor GSN/IP configuration. The GPRS OMC consists of the GPRS OMC from stage 2, and in addition would be a mediation function (acting as an OSF agent) to the network management operations system (i.e. OSF) of the operators' networks, resulting in the complete integrated management of the BSS and GSN/IP parts of the GPRS network.

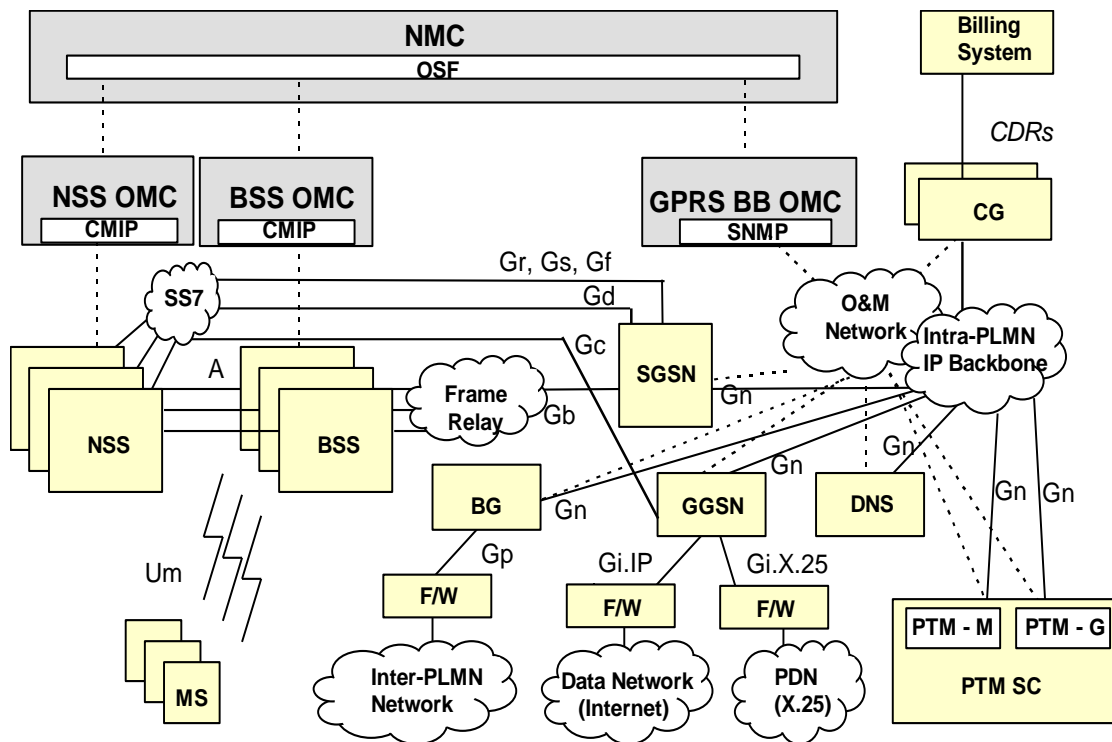


Figure 3: Stage 3 GPRS O&M

SNMP is the recommended protocol for the GPRS OMC interfaces to the GSN/IP nodes. No decision has been taken on the standardisation of the GPRS OMC/OSF interface for Stage 3. Further, the set of OS functions supported over the GPRS OMC/OSF interface may be considered for enhancement as part of Stage 3.

## 5. GPRS O&M Architecture

?????????? different figure only showing O&M functional architecture required. Ian Deakin to provide input for this

## 6. GPRS O&M Requirements and Principles

### 6.1 Requirements

#### 6.1.1 Configuration Management

The GPRS O&M requirements shall be supported by Configuration Management in the Network Elements which comprise a GPRS PLMN.

Configuration Management identifies a set of controls to be employed to effect set-up and changes to a GPRS PLMN, in such a way that operational capability, network integrity and inter-working co-operation are ensured. In this way, Configuration Management describes the interface behaviour for the management of GPRS PLMN NEs in the context of the described management environment. The context is described for both the OS and NE functionality.

#### 6.1.2 Fault Management

The GPRS O&M requirements shall be supported by Fault Management functions for:-

- routine maintenance of switching and radio equipment
- recognition, investigation, diagnosis and correction of faults
- the recognition and logging of failures (by means of unsolicited alarm messages)
- routine testing of all PLMN and interconnect functions.

Where possible, existing tried and tested procedures should be adopted. The functionality required to support fault and maintenance management within the GSM area shall also allow for new procedures. The maintaining of system integrity through a fault condition, wherever it occurs within the PLMN, may be a critical requirement of functions in this area.

### 6.1.3 Performance Management

GPRS O&M requirements shall be supported by Performance Management functions for:-

- performance data generation, gathering and analysis
- traffic management
- observations of grade of service and quality of service
- the tracing of subscriber activity and related call path information.

The objective shall be to describe and implement functions which allow the GPRS PLMN Operator to monitor the performance of a GPRS PLMN and, to alter the configuration of the GPRS PLMN to improve the quality of service provided to subscribers. Functions shall also be available to allow for the collection of detailed activity, call and call path information related to individually identifiable subscribers, i.e. by IMSI. The way in which these functions are used will be PLMN Operator dependent.

It is important, when these functions are defined, that a terminology is established, especially for measurements, to ensure that, in a multi-vendor environment, performance data can be readily compared without the necessity for local interpretation.

Generation techniques and transport mechanisms shall allow for the timely collection, analysis and display of performance data. Functions to identify and suppress repeated failures caused by badly behaved MS' shall be defined. It is equally, if not more, important to transport and execute traffic management commands and functions, especially when a PLMN is being subjected to heavy load.

### 6.1.4 Security Management

GPRS O&M requirements shall be supported by Security Management functionalities for:-

- security of subscriber access to and usage of the services offered
- security of access to and usage of the TMN and, therefore, potentially sensitive or confidential PLMN data.

Described functions in this area shall provide for activity logging to enable the execution of security audit procedures. Most security mechanisms will be implemented in some form of hierarchy, the extent of which will relate to the organisational and responsibility levels of the PLMN Operator.

Areas which are not covered, but are important nevertheless, include:

- physical security, e.g. access to a site;
- data security of transmitted data and stored data; each functional area shall specify its own particular requirement. This may also be PLMN Operator dependent.

### 6.1.5 Accounting Management

GPRS O&M requirements shall be supported by Accounting Management functionalities.

This section is a placeholder for potential support that may be required, however it is considered that most, if not all, of the required support will be identified in the GPRS charging specification (10.17 Charging in GPRS).

## 6.1.6 FFSMapping of Functions to Logical Architecture

The functions identified in the functional model are assigned to the logical architecture as identified in the subsequent table:-

Function	BSS	SGSN	GGSN	HLR	DNS	CG	BG
<b>Network Access Control:</b>							
Registration				X			
Authentication and Authorisation		X		X			
Admission Control	X	X					
Message Screening			X				
Packet Terminal Adaptation							
Charging Data Collection		X	X			X	FFS
<b>Packet Routeing &amp; Transfer:</b>							
Relay	X	X	X			X	
Routeing	X	X	X				X
Address Translation and Mapping		X	X		X		
Encapsulation		X	X				
Tunnelling		X	X				
Compression		X				FFS	FFS
Ciphering		X		X			FFS
<b>Mobility Management:</b>							
		X	X	X			
<b>Logical Link Management:</b>							
Logical Link Establishment		X					
Logical Link Maintenance		X					
Logical Link Release		X					
<b>Radio Resource Management:</b>							
Um Management	X						
Cell Selection	X						
Um-Tranx	X						
Path Management	X	X					

Figure 4: Mapping of Functions to Logical Architecture

## 6.2 Principles

FFS

The routing of trace information from one N.E. through other N.E.s towards OMCs can result in a reduction of GPRS capacity in the network. It is recommended that trace information should avoid this reduction of the GPRS capacity in the network as far as possible.

## 7. GPRS Configuration Management

### 7.1 HLR

*Editor's Note: In the Berlin meeting, the SMG6 GPRS chair had proposed the introduction of Tdoc 97g42 into this section, however Tdoc 96g50 from the Helsinki meeting proposes an alternative. HLR configuration management remains undefined.*

#### 7.1.1 Subscription Data

There may be several sets of GPRS subscription data for each IMSI Multiple Subscriber Profile (MSP), with the following subscription data to be managed:-

Field	Description
IMSI	IMSI is the main reference key.
SGSN SS7 Address	The SS7 address of the SGSN currently serving this MS.
SGSN IP Address	The IP address of the SGSN currently serving this MS.
MNRG	Indicates that the MS is not reachable through a SGSN, and that the MS is marked as not reachable for GPRS at the SGSN and possibly at the GGSN.
GGSN-list	The addresses of the GGSNs to be contacted when activity from the MS is detected and MNRG is set.
Each IMSI contains zero or more of the following PDP contexts:	
PDP Type	PDP type, e.g., X.25 or IP.
PDP Address	PDP address, e.g., an X.121 address. This field may be empty if dynamic addressing is allowed.
QoS Subscribed	The quality of service subscribed for this PDP context, 4 levels. QoS Subscribed is the highest level allowed for the PDP context, and it is the default level if a particular QoS level is not requested.
Dynamic Address Allowed	Specifies whether the MS is allowed to use a dynamic address.
VPLMN Address Allowed	Specifies whether the MS is allowed to use a dynamic address allocated in the VPLMN.
GGSN Address	The DNS-type GSN name of the GGSN providing the Gi reference point for this PDP Address. This field may be empty if dynamic addressing is allowed.

**Figure 5: HLR GPRS Subscription Data**

#### 7.1.2 Other HLR Functions

Functions to be considered are:-

- extension of existing HLR entries and attributes
- MSP administration and PDP contexts
- EIR: management of 3 GPRS MS classes?
- Routing Areas: administration required?
- Anonymous Access: administration required?



### 7.1.3 Management of Partner GSNs

## 7.2 MSC/VLR

The MSC/VLR may store the SGSN address of GPRS-attached MSs that are also IMSI-attached. Table 6 shows the MSC/VLR association for one MS.

**Table 6: MSC/VLR Association**

Field	Description
IMSI	IMSI is the main reference key.
SGSN Address	The SS7 address of the SGSN currently serving this MS.
MS Class	The GPRS MS class, A, B or C.

## 7.3 BSS

### 7.3.1 GPRS Trace

Stage 1 GRPS trace data is proposed as the support of a Basic GRPS trace records containing the following records.

Field	Description
Invocation reason	The sending of the SGSN-INVOKE-TRACE (08.18) from the SGSN to the BSS is potentially the message to be sent to the BSS following identification of an invoking event
End Indication	A possible candidate is the use of a time-constrained trace (following invocation by the SGSN)
MS Classmark 1	The MS Classmark 1 indicated during the period of the trace invocation, each timestamped.
MS Classmark 2	The MS Classmark 2 indicated during the period of the trace invocation, each timestamped.
MS Classmark 3	The MS Classmark 3 indicated during the period of the trace invocation, each timestamped.
GPRS MS Class A	The GPRS MS Class A indicated during the period of the trace invocation, each timestamped.
GPRS MS Class B	The GPRS MS Class B indicated during the period of the trace invocation, each timestamped.
GPRS MS Class C	The GPRS MS Class C indicated during the period of the trace invocation, each timestamped.
Negotiated QoS	The Negotiated QoS, each timestamped.
...	...

### 7.3.2 Other BSS Functions

Functions to be considered are:-

- configuration of new channel types
- configuration of GPRS broadcast parameters for BCCH/PBCCH
- Allocation of RTs and/or timeslots on the Um interface
  - Maximum number of packet channels per BTS or RT
  - Fixed allocation of RTs or timeslots for circuit switched
  - Fixed allocation of RTs or timeslots for packet channel

- Allocation of RTs and/or timeslots on the Um interface
- Routing Area (consistency with SGSN)
- Configuration of Radio Channel Measurements
- PCU
  - Connections to BTSs
  - Protocol layer configuration
  - MAC
    - Load thresholds to increase/decrease number of PDCHs
    - Load Threshold for allocation/deallocation of a PCCCCH
- Configuration of the SGSN Interface (Gb)
  - Number of FR circuits
  - Allocation of physical channels on the Gb interface (ref. GSM 08.14)
  - Allocation of PVCs (Permanent Virtual Circuit) (ref. GSM 08.16)

## 7.4 SGSN

### 7.4.1 GPRS Trace

For SGSN trace activation options to be considered are:-

- direct O&M activation at the SGSN (from the GPRS BB OMC)
- new HLR-to-SGSN message (re-using the information content of the MAP-ACTIVATE-TRACE-MODE, however the informational content of this message requires to be verified)

Stage 1 GRPS trace data is proposed as the support of a Basic GRPS trace records containing the following records.

Field	Description
Served Subscriber	IMSI/IMEI, however in the case of Anonymous Access (when an IMSI/IMEI is not supplied), the SGSN address is used
PDP Address	PDP address, e.g., an X.121 address
SGSN Address	The SS7 address of the SGSN.
TEI	
TID	
GPRS MS Class A	The GPRS MS Class A indicated during the period of the trace invocation, each timestamped.
GPRS MS Class B	The GPRS MS Class B indicated during the period of the trace invocation, each timestamped.
GPRS MS Class C	The GPRS MS Class C indicated during the period of the trace invocation, each timestamped.
Negotiated QoS	The Negotiated QoS, each timestamped.
...	...

### 7.4.2 Other SGSN Functions

Functions to be considered are:-

- Routing Area management
- Cell Identifier. Consistency with BTS required
- Configuration of interface to GGSN:-
  - Allocation of physical channels on the Gn interface (ref. GSM 08.14)
  - Allocation of PVCs (Permanent Virtual Circuit) (ref. GSM 08.16)
- Configuration of interface to BSS:-
  - Allocation of physical channels on the Gb interface (ref. GSM 08.14)
  - Allocation of PVCs (Permanent Virtual Circuit) (ref. GSM 08.16)
- Configuration of interface to MSC
- Configuration of interface to SMSC
- Configuration of interface to DNS
- Configuration of interface to HLR
- Configuration of interface to EIR
- Configuration of interface to CG

## 7.5 GGSN

### 7.5.1 GPRS Trace

The GGSN trace activation options to be considered are:-

- direct O&M activation at the GGSN (from the GPRS BB OMC)
- new SGSN-to-GGSN message (re-using the information content of the SGSN-INVOKE-TRACE)
- via the Gc interface (however this is optional, no trace activation messages exist, and is therefore not a true option).

Stage 1 GPRS trace data is proposed as the support of a Basic GPRS trace records containing the following records.

Field	Description
Served Subscriber	IMSI/IMEI, however in the case of Anonymous Access (when an IMSI/IMEI is not supplied), the GGSN address is used
PDP Address	PDP address, e.g., an X.121 address
GGSN Address	The SS7 address of the GGSN.
TEI	
TID	
GPRS MS Class A	The GPRS MS Class A indicated during the period of the trace invocation, each timestamped.
GPRS MS Class B	The GPRS MS Class B indicated during the period of the trace invocation, each timestamped.
GPRS MS Class C	The GPRS MS Class C indicated during the period of the trace invocation, each timestamped.
Negotiated QoS	The Negotiated QoS, each timestamped.
...	...

## 7.5.2 Other GGSN Functions

Functions to be considered are:-

- Screening
- Configuration of interfaces to
  - Gi X.25
  - Gi IP
  - DNS
  - BG
  - CG
  - HLR

## 7.6 DNS

The Domain Name System functionality provides a means to map logical names to lower layer Internet Protocol network addresses. The DNS service is needed in GPRS networks for several reasons.

1. In the roaming scenario where a packet requires to be sent from one PLMN to another PLMN, Border Gateways (BG) must be used. There may be several BGs in a GPRS network to support, for example, different levels of security offered, to provide redundancy by alternate inter-PLMN routing, to satisfy scalability needs etc.. SGSNs and GGSNs do not know about the BGs. Thus, in order to map a logical GGSN address received from the HLR, the VPLMN SGSN must use the VPLMN DNS to identify (via a root DNS) the address of the HPLMN DNS that can provide the logical-to-physical IP address mapping of the HPLMN GGSN.
2. To enable the coexistence of IPv4 and IPv6 capable network elements in one GPRS network, the DNS service provides an easy and handy way for IPv4 to IPv6 interworking. If a GSN uses IPv4 protocol to request the IP address of another GSN, the requested address is returned in IPv4 format. Similarly, if the DNS request is in IPv6 protocol, the response is also in IPv6 format.
3. The DNS service is also useful for the GPRS network's O&M and configuration management performed by the network operator.

Functions to be considered are:-

- Configuration of interfaces to:-
  - GGSN
  - SGSN

## 7.7 Charging Gateway (CG)

The CG functionality may reside in a separate network element (the Charging Gateway N.E.), or it may be integrated into the GSNs. The CG receives call detail records from the GSNs in real time mode, and has sufficient mass memory that to enable it transmit the collected charging data to a Billing System in file mode.

Charging Gateway functionality may have to support several transmission protocols towards the Billing System, depending on the host network's Billing System(s).

Functions to be considered are:-

- Configuration of interface to Billing System
- Configuration of interface to SGSN
- Configuration of interface to GGSN
- Transfer protocol with Billing System

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## 8. GPRS Fault Management

- Alarm monitoring: application of 12.11 to GPRS nodes
- Management of operator controlled tests: application of 12.11 to GPRS nodes

### 8.1 HLR

### 8.2 MSC/VLR

### 8.3 BSS

### 8.4 SGSN

### 8.5 GGSN

### 8.6 DNS

### 8.7 Charging Gateway (CG)

### 8.8 Border Gateway (BG)

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## 9. GPRS Performance Management

Functions:-

- Schedule Performance Monitoring (PM) data report
- Set PM attributes
- Trace Support

Example Performance Data:-

- Amount of data
- Amount of data not delivered
- Unsuccessful requests of additional resources
- QoS
  
- Counters:-
  - Update of existing counters
  - Introduction of new counters

- Trace: trace record enhancements

## 9.1 HLR

## 9.2 MSC/VLR

## 9.3 BSS

## 9.4 SGSN

## 9.5 GGSN

## 9.6 DNS

## 9.7 Charging Gateway (CG)

## 9.8 Border Gateway (BG)

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# 10. GPRS Security Management

- management of ciphering functions in GPRS
- Administration of supported security features
- Administration of algorithms
- List of counters for security purposes
- List of security alarm reports
- Handling of security related events

10.1 HLR

10.2 MSC/VLR

10.3 BSS

10.4 SGSN

10.5 GGSN

10.6 DNS

10.7 Charging Gateway (CG)

10.8 Border Gateway (BG)

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## 11. GPRS Accounting Management

11.1 HLR

11.2 MSC/VLR

11.3 BSS

11.4 SGSN

11.5 GGSN

11.6 DNS

11.7 Charging Gateway (CG)

11.8 Border Gateway (BG)

## 12. History

<b>Document history</b>	
v0.0.1	<p>October 1997: created at SMG6 GPRS meeting 16<sup>th</sup>-17<sup>th</sup> October 1997, Sophia Antipolis, France.</p> <p>Basic document structure in terms of sections agreed.</p>
v0.1.0	<p>November 1997: input to SMG6 GPRS meeting 6<sup>th</sup>-7<sup>th</sup> November 1997, Berlin, Germany.</p> <p>Introduction of details and figures describing the 3 phases, and initial input into requirements for CM, FM, PM and SM. Broad outline of functional requirements into various sections.</p>
v0.2.0	<p>November 1997: input to SMG6 GPRS meeting 4<sup>th</sup>-5<sup>th</sup> December 1997, Helsinki, Finland.</p>
V0.3.0	<p>December 1997: input to SMG6 GPRS meeting 7<sup>th</sup>-9<sup>th</sup> January 1997, Cork, Ireland</p> <p>Minor modifications following Helsinki meeting. Addition of trace requirements following LS to 12.08 group.</p>
<p>Rapporteur: Mark Cataldo, Lucent Technologies</p> <p>Email: mcataldo@lucent.com <span style="float: right;">Ph: +44 1793 883247</span></p>	



## 13. List of GPRS Tdocs

<b>GPRS Tdocs</b>	
97g1	Haninge SMG6 GPRS Meeting #1 Agenda
97g2	Three new functional elements in the GPRS backbone
97g3	OA&M for GPRS
97g4	Managing GPRS Support Nodes
97g5	Impact in the 12-series of GRPS
97g6	Unused Tdoc number
97g7	Liaison Statement on GPRS Charging
97g8	Haninge SMG6 GPRS Meeting #1 Report
97g9	London SMG6 GPRS Meeting #2 Agenda
97g10	Scope of OA&M Standardisation in GPRS
97g11	Status of SNMP
97g12	How to use the ETSI list server
97g13	London SMG6 GPRS Meeting #2 Report
97g14	Turku SMG6 GPRS Meeting #3 Agenda
97g15	Comments on London SMG6 GPRS Meeting #2 Report
97g16	Draft Minutes of CAGE 2+ #03
97g17	Draft Minutes of CAGE 2+ #04
97g18	Draft Minutes of CAGE 2+ #05
97g19	Brief Architectural View and Comments on GPRS O&M
97g20	Turku SMG6 GPRS Meeting #3 Report
97g21	Helsinki SMG6 GPRS Meeting #4 Agenda
97g22	Invitation for SMG6 members to the first TC TMN meeting
97g23	Discussion paper on Charging aspects in a GPRS network
97g24	Helsinki SMG6 GPRS Meeting #4 Report
97g25	Cork SMG6 GPRS Meeting #5 Agenda
97g26	Comments on the GPRS O&M Architecture
97g27	GPRS Charging and interworking with ISP(s)
97g28	Tracing GPRS "Calls"

97g29	LS to TC TMN on Forthcoming Meetings
97g30	Sophia Antipolis SMG6 GPRS Meeting #6 Agenda
97g31	Cork SMG6 GPRS Meeting #5 Report
97g32	Status of Radius and Radius accounting protocol
97g33	Proposal for GPRS management functions
97g34	Recommendations Concerning GPRS Accounting (Charging)
97g35	LS to SMG4 About using RADIUS protocol as part of GPRS accounting
97g36	LS to T1P1 GPRS Charging
97g37	Sophia Antipolis SMG6 GPRS Meeting #6 Report
97g38	Berlin SMG6 GPRS Meeting #7 Agenda
97g39	Version 0.1.0 of TS 10.18
97g40	Version 0.2.0 of TS 10.17
97g41	GPRS Call Tracing Requirements
97g42	Approaches for modelling GPRS subscriber data
97g43	ETSI additions to tdoc 36 - LS to T1P1 on their charging recommendations
97g44	Presentations of Main Functional Elements for GPRS Charging and O&M Architectures
97g45	Minutes of meeting #7
97g46	Agenda for meeting #8
97g47	Charging Record Identification in an GPRS Network
97g48	GPRS Charging and Data Collection
97g49	Hannu Kari's comments to 97g48
97g50	Modelling GPRS subscriber data in the HLR
97g51	TR 10.17 v 0.3.1
97g52	TR 10.18 v 0.2.0
97g53	Liaison statement to SMG6 12.08 on call tracing requirements
97g54	Redraft of Tdoc 53.