Technical Specification Group Services and System Aspects
Meeting #12, Stockholm, Sweden, 18-21 June 2001

TSGS#12(01)0237

Source: **SA5**

Title: **Rel4 CR to Telecommunication Management; Performance Management (PM) (32.104)**

Document for: **Approval**

Agenda Item: **7.5.3**

1. SA#12 is invited to approve the CR (Addition of new Features & TS Split)

Doc-1st-Level	Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
SP-010237	32.104	009		Rel-4	**Add new Features and Split into a multi-part TS**	B	4.0.0	--	S5-010251	OAM-PM

2. SA#12 is invited to:

a) withdraw 32.104 Rel4
b) approve Part 3 now at SA#12;
c) postpone the Approval of Parts 1 and 2 for SA#13

Performance Management (OAM-PM) - Status at SA#12:
50% for Approval TSG#12, 50% for TSG#13, 10% re-classified Rel5 (Rel4, 85% complete)**Attachments:** 32.104-1 V1.0.0 (32104-1-100.doc) - **for Information**

32.104-2 V1.0.0 (32104-2-100.doc) - **for Information**

32.104-3 V1.0.2 (32104-3-102.doc) - **for Approval**

3GPP TSG-SA5 (Telecom Management) **S5-010351**
Meeting #20, Brighton, UK, 28 May - 1 June 2001

CR-Form-v3

CHANGE REQUEST

⌘ **32.104** **CR** **009** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	**Add new Features and Split into a multi-part TS**
Source:	⌘	SA5
Work item code:	⌘	OAM-PM
Date:	⌘	01/06/2001
Category:	⌘	**B**
Release:	⌘	Rel4

Use one of the following categories
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*

Use one of the following releases:
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: **Addition of features** (SA5 PM RG's Work Tasks under Feature: Charging & OAM enhancements in the 3GPP Work Plan - SP-00524 / S5-000574_BB OAM-PM:

Performance monitoring
File format enhancement
Plug and Measure
Measurement definitions

Summary of change: **Split the TS into multiple documents (multi-part TS) as follows:**

32.104-1	Part 1:	Performance Management Concept and Requirements
32.104-2	Part 2:	Performance Measurements - GSM
32.104-3	Part 3:	Performance Measurements - UMTS and combined UMTS/GSM

Consequences if not approved: ⌘ PM will not be available for 3GPP Rel4/5

Clauses affected: ⌘ All

Other specs affected: ⌘
☐ Other core specifications ⌘
☐ Test specifications
☐ O&M Specifications

Other comments:

Background Information

Performance monitoring	Define the functional requirements for the generation of performance alarms for the standard measurement set specified in TS 32.104, including the control and configuration of performance thresholds.	Release 4/5
File format enhancement	Non-3G-standard measurement results to be contained in the PM files; Ability to select measurement results that are included in the PM files; Control of the transfer of PM result files from the network to the NM.	Release 4/5
Plug and Measure	Scoping of measurements inside a node with automatic reconfiguration of the measurement when a scoped resource is added or removed.	Release 4/5
Measurement definitions	Definition of the standard measurement set for UMTS	Release 4/5

TS 32.104-1 Release 4 will contain all the contents of the current TS 32.104 clauses 1 – 5 and annex A (Measurement Report File Format), annex B (Measurement Report File Conventions and Transfer Procedure), and annex D (examples). It will also contain all relevant material from the corresponding clauses of GSM 12.04 in order to make it applicable also for GSM. In addition, the following functions from the above work plan table will be included:

- Performance monitoring: generation of alarms based on performance measurements and transmission of these alarms via the Alarm IRP.
- File format enhancements: these will be limited to enhancements necessary to transfer the measurement result files for the measurement definitions specified in the other parts of TS 32.104, see below.
- Plug and Measure: It is envisaged that the complete functionality will be specified for Release 4.

TS 32.104-1 is provided for information to SA#12, with a completion rate of 80%, and will be presented for approval to SA#13.

TS 32.104-2 Release 4 will include all GSM only Measurement definitions and the GSM Q3 interface specification from GSM 12.04. Basically, this part of the TS is intended to maintain the relevant parts of GSM 12.04 for the future in 3GPP. The necessary work is mainly editorial updates and alignment of existing GSM 12.04 contents, and no enhancements to the substance are planned at this time.

Therefore, only a first "copy&paste" draft of TS 32.104-2 is submitted for information to SA#12, and submission for approval is planned for SA#13. However, due to the emphasis of the work being placed on parts 1 and 3 of the TS, which provide the substance for UMTS, approval readiness of part 2 may have to be postponed to TSG #14.
GSM 12.04 should be used as the reference for GSM measurements in the meantime.

TS 32.104-3 Release 4 will include the set of Measurement definitions for UMTS and combined UMTS/GSM application. Due to the introduction of the inter-system cases, and in order to enhance the quality of the specification, the measurement definition template (contained in TS32.104-1) will be upgraded with respect to previous versions of TS 32.104 and GSM 12.04.

TS 32.104-3 is presented for information to SA#12, with a completion rate of 95%, and will be provided for approval to SA#13.

3GPP TS 32.104-1 V1.0.0 (2001-06)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Telecommunication Management;
Performance Management (PM);
Part 1: Concept and Requirements (Release 4)

Keywords
UMTS, TMN, management

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part of a set of specifications, which describe the requirements and information model necessary for the standardised Operation, Administration and Maintenance (OA&M) of a multi-vendor GSM or UMTS PLMN.

During the lifetime of a PLMN, its logical and physical configuration will undergo changes of varying degrees and frequencies in order to optimise the utilisation of the network resources. These changes will be executed through network configuration management activities and/or network engineering, see GSM TS 12.06 [x1] and 3GPP TS 32.106 [3].

Many of the activities involved in the daily operation and future network planning of a PLMN network require data on which to base decisions. This data refers to the load carried by the network and the grade of service offered. In order to produce this data performance measurements are executed in the NEs, which comprise the network. The data can then be transferred to an external system, e.g. an Operations System (OS) in TMN terminology, for further evaluation. The purpose of this TS and its companion parts 2 and 3 is to describe the mechanisms involved in the collection of the data and the definition of the data itself.

1 Scope

The present document describes the requirements for the management of performance measurements and the collection of performance measurement result data across GSM and UMTS networks. It defines the administration of measurement schedules by the Network Element Manager (EM), the generation of measurement results in the Network Elements (NEs) and the transfer of these results to one or more Operations Systems, i.e. EM(s) and/or Network Manager(s) (NM(s)).

The basic Performance Management concept that the present document is built upon is described in clause 4. The requirements how an EM administers the performance measurements and how the results can be collected are defined in detail in clause 5. Annex A specifies the file format for the bulk transfer of performance measurement results to the NM, while annex B discusses the file transfer procedure utilised on that interface. A set of measurements available for collection by NEs are described in TS 32.104-2 for GSM and in TS 32.104-3 for UMTS and combined UMTS/GSM systems, effort has been made to ensure consistency in the definition of measurements between different NEs and generations.

The following is beyond the scope of the present document, and therefore the present document does not describe:

- the formal definition of the interface that the EM uses to administer performance measurements in the NEs;
- the formal definition of the interface that the EM uses to collect measurement results from the NEs;
- how the data, once accumulated and collected, could or should be processed, stored, or presented to an end user;
- the information which may be obtained through the collection and processing of call or event related records which have been produced by the NEs primarily for the purpose of raising bills and other charges.

The management requirements have been derived from existing telecommunications operations experience. The management definitions were then derived from other standardisation work so as to minimise the re-invention factor. References are given as appropriate.

The objectives of this standardisation are:

- to provide the descriptions for a standard set of measurements;
- to produce a common description of the management technique for measurement administration and result accumulation; and
- to define a method for the bulk transmission of measurement results across a management interface.

The definition of the standard measurements is intended to result in comparability of measurement result data produced in a multi-vendor wireless network, for those measurement types that can be standardised across all vendors' implementations.

As far as possible, existing standardisation in the area of Performance Management has been re-used and enhanced where particular requirements, peculiar to the mobile telephony environment, have been recognised.

The present document considers all the above aspects of Performance Management for a GSM and UMTS network and its NEs defined in the core Technical Specifications. However, only those aspects which are specific to a GSM / UMTS system and particular to wireless network operation are included in the present document.

2 References

to be updated

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.

[1] 3GPP TS 32.101: "3G Telecom Management principles and high level requirements".

[2] 3GPP TS 32.102: "3G Telecom Management architecture".

[3] 3GPP TS 32.106: "3G Configuration Management".

[4] 3GPP TS 25.442: "UTRAN Implementation Specific O&M Transport".

[5] ITU-T Recommendation E.880: "Field data collection and evaluation on the performance of equipment, network and services".

[6] ITU-T Recommendation X.731: "Information technology - Open Systems Interconnection - Systems Management: State management function".

[7] ISO 8571: "File Transfer, Access and Management".

[8] GSM 12.04: "Performance Management and Measurements for a GSM Public Land Mobile Network (PLMN)".

…

[20] 3GPP TR 32.800: "3rd Generation Partnership Project (3GPP); Technical Specification Group Services and System Aspects; Management Level Procedures and Interaction with UTRAN (Release 4)".

3 Definitions and Abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

- A **Network Element Manager** (EM) provides a package of end-user functions for management of a set of closely related types of Network Elements. These functions can be divided into two main categories:
  - Element Management Functions for management of Network Elements on an individual basis. These are basically the same functions as supported by the corresponding local terminals.
  - Sub-Network Management Functions that are related to a network model for a set of Network Elements constituting a clearly defined sub-network, which may include relations between the Network Elements. This model enables additional functions on the sub-network level (typically in the areas of network topology presentation, alarm correlation, service impact analysis and circuit provisioning).
- A **Network Manager** (NM) provides a package of end-user functions with the responsibility for the management of a network, mainly as supported by the EM(s) but it may also involve direct access to the Network Elements. All communication with the network is based on open and well-standardised interfaces supporting management of multi-vendor and multi-technology Network Elements.
- **Operations System (OS)**. This abbreviation indicates a generic management system, independent of its location level within the management hierarchy.

3.2 Abbreviations

to be completed

For the purposes of the present document, the following abbreviations apply:

3G	3rd Generation
3GPP	3G Partnership Project
AGCH	Access Grant Channel
APN	Access Point Name
ASN.1	Abstract Syntax Notation 1
AuC	Authentication Centre
BER	Basic Encoding Rules
BSC	Base Station Controller
BSS	Base Station System
BSSAP	BSS Application Part
BTS	Base Transceiver Station
CBCH	Cell Broadcast Channel
CCCH	Common Control Channel
DCCH	Dedicated Control Channel
DCN	Data Communication Network
DTD	Document Type Definition
EIR	Equipment Identity Register
EM	(Network) Element Manager
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
FACCH	Fast Associated Control Channel
FTAM	File Transfer Access and Management
FTP	File Transfer Protocol
GMSC	Gateway Mobile Services Switching Centre
GGSN	Gateway GPRS Service Node
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
GSN	GPRS Service Node
HLR	Home Location Register
HO	Handover
HPLMN	Home PLMN
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
ISDN	Integrated Service Digital Network
ISO	International Standards Organisation
Itf	Interface
ITU-T	International Telecommunication Union - Telecommunications Standardisation Sector
LLC	Logical Link Control
LR	Location Register
MS	Mobile Station
MSC	Mobile Services Switching Centre
MSRN	Mobile Subscriber Roaming Number
MTP	Message Transfer Part
NE	Network Element
NM	Network Manager
NSS	Network Sub System (including EIR, HLR, SMS-IWMSC, MSC and VLR)
OA&M	Operation, Administration and Maintenance
OACSU	Off-Air Call Set Up
OS	Operations System (EM, NM)
OSI	Open Systems Interconnection
PCCCH	Packet Common Control Channel
PCCH	Packet Paging Channel
PCH	Paging Channel

PLMN	Public Land Mobile Network
PM	Performance Management
PTCH	Packet Traffic Channel
PVLR	Previous VLR
QoS	Quality of Service
RACH	Random Access Channel
Rec.	Recommendation
RF	Radio Frequency
RNC	Radio Network Controller
RR	Radio Resource
RXLEV	Reception Level
RXQUAL	Reception Quality
SACCH	Slow Associated Control Channel
SDCCH	Stand alone Dedicated Control Channel
SCCP	(ITU-T) Signalling Connection Control Part
SGSN	Serving GPRS Service Node
SNDCP	Sub Network Dependency Control Protocol
SMS-IWMSC	Short Message Service Inter Working MSC
SS	Supplementary Service
TCAP	(ITU-T) Transaction Capabilities Application Part
TCH	Traffic Channel
TFTP	Trivial FTP
TMSI	Temporary Mobile Subscriber Identity
TMN	Telecommunications Management Network
TS	Technical Specification
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Terrestrial Radio Access Network
VLR	Visitors Location Register

4 Concept

Any evaluation of PLMN-system behaviour will require performance data collected and recorded by its NEs according to a schedule established by the EM. This aspect of the management environment is termed Performance Management. The purpose of any Performance Management activity is to collect data, which can be used to verify the physical and logical configuration of the network and to locate potential problems as early as possible. The type of data to be collected is defined by the equivalent measurements (refer to annex C). The present document concentrates on the requirements of GSM and UMTS telecom management to produce this data. Any management actions performed at the OSs subsequently to analyse the performance data are not considered in the present document.

Data is required to be produced by the NEs to support the following areas of performance evaluation:

- traffic levels within the network, including the level of both the user traffic and the signalling traffic (4.1.1);
- verification of the network configuration (4.1.2);
- resource access measurements (4.1.3);
- Quality of Service (e.g. delays during call set-up, packet throughput, etc) (4.1.4); and
- resource availability (e.g. the recording of begin and end times of service unavailability) (4.1.5).

The production of the measurement result data by the NEs also needs to be administered by the EM. Several phases of administration of performance measurements can be distinguished:

- the management of the performance measurement collection process (4.2.1);
- the generation of performance measurement results (4.2.2);
- the local storage of measurement results in the NE (4.2.3);

- the transfer of measurement results from the NE to an OS (EM and/or NM) (4.2.4); and
- the storage, preparation and presentation of results to the operating personnel (4.2.5).

In respect to the evaluation of the results produced by the measurements the following has to be considered:

- to understand the nature of the results received from the network (4.3.1);
- to assure the reliability and accuracy of the measurement results (4.3.2);
- to ensure comparable measurement results for the same measurements being performed in equipment from different vendors; and
- the ability to identify the results with respect to the measurement jobs managed by the EM.

Performance measurements may also be used to supervise operator defined threshold values and generate alarms upon exceeding the thresholds (4.4).

The following subclauses provide further background on the performance measurement concept that is applicable to GSM and UMTS networks. Although any implementation of GSM or UMTS network elements shall adopt the concept described below, not all of the text - due to its conceptual nature - is usable to actually determine compliance of the equipment. In these cases, more strictly specified requirements, against which conformance shall be proven, are found in clause 5 of the present document.

4.1 Measurement result data requirements

This subclause describes the typical requirements for performance data to be produced by the NEs, which comprise a GSM or UMTS network. It is important to note that an actual measurement value collected from the network may be used to satisfy requirements in more than one category of measurement described below.

4.1.1 Traffic measurements

Traffic measurements provide the data from which, among other uses, the planning and operation of the network can be carried out.

The types of traffic evaluations for which PLMN specific measurements may be used include:

- traffic load on the radio or core network interfaces (signalling and user traffic);
- usage of resources within the network nodes;
- user activation and use of supplementary services, etc.

Examples of measured values may include:

- pages per location area per hour;
- busy hour call attempts per BSC, RNC, MSC;
- handovers per BSC/RNC per hour, etc.

4.1.2 Network configuration evaluation

Once a network plan, or changes to a network plan, have been implemented it is important to be able to evaluate the effectiveness of the plan or planned changes. Typically, the measurements required to support this activity indicate the traffic levels with particular relevance to the way the traffic uses the network.

4.1.3 Resource access

For accurate evaluation of resource access, each measurement result would need to be produced for regular time intervals across the network, or for a comparable part of the network.

4.1.4 Quality of Service (QoS)

The user of a PLMN views the provided service from outside the network. That perception can be described in observed QoS terms. QoS can indicate the network performance expected to be experienced by the user. For further detail see ITU-T Recommendation E.880 [5].

The QoS parameters applied by the network to specific user services may also be relevant to determine the charges levied towards the user for the provision of those services.

4.1.5 Resource availability

The availability performance is dependent on the defined objectives, i.e. the availability performance activities carried out during the different phases of the life cycle of the system, and on the physical and administrative conditions. For further detail see ITU-T Recommendation E.880 [5].

4.2 Measurement administration

The range of measurements which will be available from the NEs are expected to cover all of the requirements described in subclause 4.1. However, not all of these measurements will be required all of the time, from every occurrence, of every relevant NE. Therefore, it is necessary to administer the measurements so as to determine which measurement types, on which measured resources, at which times, are to be executed. With a highly distributed network like a GSM or UMTS mobile telecommunication system it is also necessary to gather the measurement result data so as to perform consistent analysis of the results and to evaluate the interactions between the NEs.

This subclause describes the requirements for the various areas of administration of measurements.

4.2.1 Measurement job administration

Measurement jobs, i.e. the processes which are executed in the NEs in order to accumulate measurement result data and assemble it for collection and/or inspection, will need to be scheduled by the EM for the period or periods for which gathering of data shall be performed.

The administration of measurement jobs by the EM comprises the following actions:

1) Create/delete a measurement job. This action implies the instantiation respectively deletion of a measurement collection process within the network.

2) Modifying a measurement job, i.e. changing the parameters (specifically the schedule) of a measurement job that has been previously created.

3) Definition of measurement job scheduling. This action defines the period or periods during which the measurement job is configured to collect performance data.

4) Specification of the measurement types to be contained in the job, e.g. “number of GPRS attach attempts”. The measurement types for GSM and UMTS networks are specified in annex C.

5) Identification of the measured resources, i.e. the NEs (e.g. MSC, NodeB) or NE components (e.g. trunkgroups, radio channels, transceivers) to which the measurement types, specified in the measurement job, pertain.

6) Suspend/resume a measurement job. The "suspend" action inhibits the collection of measurement result data by a measurement job, regardless of its schedule, without deleting it. The "resume" action will re-enable measurement result data collection according to the measurement job schedule.

7) Setting up any necessary requirements for the reporting and routing of results to one or more OSs (EM and/or NM).

8) Retrieval of information related to measurement jobs, i.e. view the current measurement job definition.

A measurement job is thus characterised by a set of measurement types which all pertain to the same set of measured resources and share the same schedule. Typically a large number of measurement jobs will run simultaneously within the

NEs comprising the PLMN, and one or more EM is involved in the administration of those measurement jobs. In order for the operator to manage this large number of measurements effectively and efficiently, it is necessary that the administration functions in the EM can not only deal with individual measurements on individual NEs, but also scope the execution environment across the measured resources, and apply an additional filter to the resources/NEs selected by the measurement scope. The scoping and filtering of the measurement(s) shall then be automatically adapted if measured resources that match the selection criteria are added to or removed.

There are several instances of this “plug&measure” feature:

1) execute the same (set of) measurement type(s) on a set of identical resources within a single NE. An example of this is to measure the average bit error rate on all channels in a cell, or all channels of the cell that match the filter criterion;

2) execute the same (set of) measurement type(s) on a set of identical NEs or resources according to the hierarchical structure of the network. Examples of this are to measure the average bit rate on all Iups links of the same U-MSC or to measure inter-cell handovers for all cells attached to the same BSC.

3) execute the same (set of) measurement type(s) across all resources/NEs of the same type that belong to a specific administrative domain. An example of this is to measure the call set-up failure rate in all cells located in a certain city, or otherwise defined geographical area (this may be a combination of scope and filter), or within the responsibility area of system operator number 2.

The definition of those administrative, or management, domains is part of the measurement job administration functions provided by the EM. The functionality of scoping and filtering of measurements within the same NE may either be distributed across the NE and the EM (e.g. EM creates a single measurement job with scope and filter, and NE determines the measured resources that match the selection criteria), or it may be realised solely in the EM (EM determines measured resources from the scope and filter set by the system operator, and multiple measurement jobs will be created), according to implementation choice.

4.2.2 Measurement result generation

Each measurement job will be collecting result data at a particular frequency, known as the granularity period of the measurement job. At the end of the granularity period a scheduled result report is generated for each measurement job that is actively collecting performance measurement result data, i.e. for all the measurement types and measured resources covered by the job.

The measurement result data can be collected in each NE of the network in a number of ways:

- cumulative incremental counters triggered by the occurrence of the measured event;
- status inspection (i.e. a mechanism for high frequency sampling of internal counters at pre-defined rates);
- gauges (i.e. high tide mark, low tide mark);
- discrete event registration, where data related to a particular event is captured.

These are described in the following paragraphs.

Cumulative counter:
The NE maintains a running count of the event being counted. The counter is reset to a defined value (usually "0") at the beginning of the granularity period.

Status inspection:
Network elements maintain internal counts for resource management purposes. These counts are read at a predetermined rate, the rate is usually based upon the expected rate of change of the count value. Status inspection measurements shall be reset at the beginning of the granularity period and will only have a valid result at the end of the granularity period.

Gauge:
Gauges represent dynamic variables that may change in either direction. Gauges can be integer or real valued. If a gauge is required to produce low and high tide marks for a granularity period (e.g. minimum and maximum call duration), then it shall be reinitialised at the beginning of the granularity period. If a gauge is required to produce a consecutive readout over multiple granularity periods (e.g. cabinet temperature), then it shall only be reinitialised at the start of a recording interval (see definition of "recording interval" in subclause 5.2.1.2 below).

Discrete Event Registration:
This is a measurement of a specified event where every Nth event would be taken into account. The value of N is dependent on the frequency of occurrence of the event being measured. Discrete event registration measurements shall be reset at the beginning of the granularity period and will only have a valid result at the end of the granularity period.

4.2.3 Local storage of results at the Network Element

It is necessary for the NE to retain measurement result data it has produced until they have been sent to, or retrieved by, the destination OS(s). Depending on implementation and configuration details, e.g. the transfer method, the number and type (EM/NM) of the destination OS(s), this data will be retained at the NE under the control of the destination OS(s), or solely under the control of the EM. The storage capacity and the duration for which the data will be retained at the NE will be Operator and implementation dependent.

4.2.4 Measurement result transfer

Measurement results produced by the NEs are transferred to an external OS for storage, post-processing, and presentation to the system operator for further evaluation. In a network with more than one OS (e.g. EM and NM) the data may be required by several OSs. It is therefore necessary to support the possibility for multiple destinations for the transfer of measurement result data.

The results of the measurement jobs can be forwarded from the NE to the EM in either of two standard ways:

1) the scheduled result reports, generated by the measurement jobs executing in the NE, can be sent to the EM as soon as they are available (notifications);

2) the reports can be stored in the NE (files) and transferred to or retrieved by the EM when required.

Measurement results can be forwarded to the NM via a bulk transfer (i.e. file-based) interface. It is an implementation option whether this interface resides in the EM or in the NEs.

It should be noted that, depending on an Operator's needs, measurement results may have to be transferred to the EM only, the NM only, or both. Depending on a vendor's implementation, measurement results may be transferred to the NM directly from the NE or via the EM. This implies that not all of the result transfer options described above have to be implemented in all cases.

4.2.5 Performance data presentation

The performance data user interface presentation, including the storage and preparation of the data in the OS(s), is outside the scope of the present document.

4.3 Measurement type definition

This subclause looks at the requirements for the definition of the individual measurement types.

4.3.1 Nature of the result

The measurement types defined for the GSM and UMTS systems have to be collected in the NEs. As each NE has its own role to play in the provision of the mobile service then each will have a different perspective on the performance of the network. The measurement type definitions shall, therefore, contain a description of the intended result of the measurement in terms of what is being measured. Appropriate information is therefore included in the measurement type definition template, see annex C.

4.3.2 Perceived accuracy

The accuracy of measurements can be seen in three ways:

- whether the result produced represents all occurrences of the defined event;
- whether related measurements produced for the same period refer to the same events; or,
- whether a measurement result refers to the whole or part of a granularity period.

Representation of all occurrences:

The definition of a measurement needs to accurately reflect which types of events are to be included in the collection of the data. If a general event or procedure description can be characterised by several sub-types then the measurement definition will have to be precise as to which sub-types are included or specifically excluded from that measurement. Depending on the measurement definition, it may prove more acceptable to count the event or procedure by causes, e.g. successful termination, unsuccessful termination for all reasons. If the definition of a measurement refers to specific failure causes then care shall be taken to assess whether all causes are included - the sum of which can provide the total number of failures - or whether a count of the total is defined as well as for the specific causes.

Same period for the same two events:

Consider two events being counted which refer to the same resource allocation procedure, falling on either side of a granularity period boundary. i.e. the attempt is counted in one period while the termination is counted in the subsequent period. This will lead to discrepancies appearing in the actual figures when trying to compare attempt and termination counts for the same period. In order to avoid this discrepancy, implementations shall ensure that the termination of a procedure started within a given granularity period shall be captured within the measurement results for that same period, even if the termination of the procedure falls within the next granularity period.

Measurement collection periods:

A typical measurement collection period can be interrupted by system events.

These interruptions can be one or more of the following:

- failure of the measured network resource;
- failure of the procedure being measured, e.g. location update;
- resource only becomes available after the measurement period has commenced;
- procedure only becomes available after the measurement period has commenced.

Any such interruption implies that the affected measurement result is incomplete, and in extreme circumstances, no result reports at all can be generated. In these cases the measurement result shall highlight such interruptions to indicate that the result is suspect. Any actions to be taken subsequently with regards to the usefulness of the data will depend on the circumstances and the requirements of individual Operators.

4.3.3 Comparability of measurement result data

In a multi-vendor network it is important to know that measurement result data produced by equipment from one supplier is equivalent to the measurement result data being produced by the equivalent equipment from another supplier. This is particularly important when analysing data across the whole network. The measurement type definitions (in annex C of the present document) shall therefore use a common understanding of the events being measured (e.g. by relating to protocol messages) so as to produce comparable results.

4.3.4 Measurement identification

In complex networks it is easy to generate large amounts of performance data. For the administration of the measurement jobs, and for the attribution of result data to the correct measurements, it is essential that all measurement result data is recognisable in respect of each request made. As all the required information, which can distinguish each request already, exists by definition the request, it makes sense to use this information, rather than create anything new.

The information, which can be used to distinguish requests from each other may be e.g. NE name, measurement type, granularity period, or a combination of these. NE names defined within the realm of CM (3GPP TS 32.106 [3]) shall be reused. For the measurement job administration in the EM, it is also possible to use measurement job ids, or other implementation specific parameters that identify the measurements.

4.4 Performance alarms

Instead of, or in addition to, generating regular scheduled result reports, measurements may be administered in a way so as to supervise operator-defined thresholds. The thresholds are set when instantiating the measurements, and alarms are generated when the threshold value is crossed. These performance alarms are generated instead of, or in addition to, the generation of the scheduled result reports, as configured by the system operator. In UMTS, the alarms are send to the OS via the Alarm IRP specified in TS 32.111 [x2]. In GSM, the alarms are sent via the Alarm IRP or via the Q3 interface specified in GSM 12.04 [8]. Depending on the nature of the measurement (cumulative counter, status inspection, gauge, discrete event registration), the observed value, which is checked against the threshold, may have to be reset at the beginning of a new granularity period.

A GSM or UMTS NE may also generate threshold alarms based on system-internal supervision of counters and their threshold values. Neither the threshold nor the counters can be administered, but they depend on internal system behaviour, defined by implementation. As the present document only specifies results and alarms based on manageable performance measurements, the system internal threshold alarms explained above are outside the scope of the present document and are solely within the realms of Fault Management.

5 Functional requirements

5.1 Introduction

This subclause describes all basic functions to allow the system operator to have measurement data collected by the NEs and to forward the results to one or more OS(s), i.e. EM or NM. All functions are gathered to provide the system operator with the means to administer, plan, execute measurements and to store and evaluate the measurement results.

Building on the concept established in clause 4 of the present document, the following subclauses further specify the requirements which all standard GSM and UMTS implementations shall comply to.

5.1.1 Basic functions

The Performance Management concept as applicable in this specification is based on the general framework for 3G-telecom management as outlined in 3GPP TS 32.101 [1] and 3GPP TS 32.102 [2]. As an example, figure 1 outlines this concept in the context of the UTRAN.

As the O&M functions for NodeB are partitioned into Logical and Implementation Specific O&M (cf. 3GPP TR 32.800 [20]), it should be understood that the functionalities described in the present document are completely within the scope of Implementation Specific O&M. This implies that no information pertaining to measurement administration and result transfer, as described here, is exchanged between the RNC and NodeB via the Iub interface. Such information may, however, be sent or received by the NodeB over the Iub physical bearer, cf. 3GPP TS 25.442 [4].

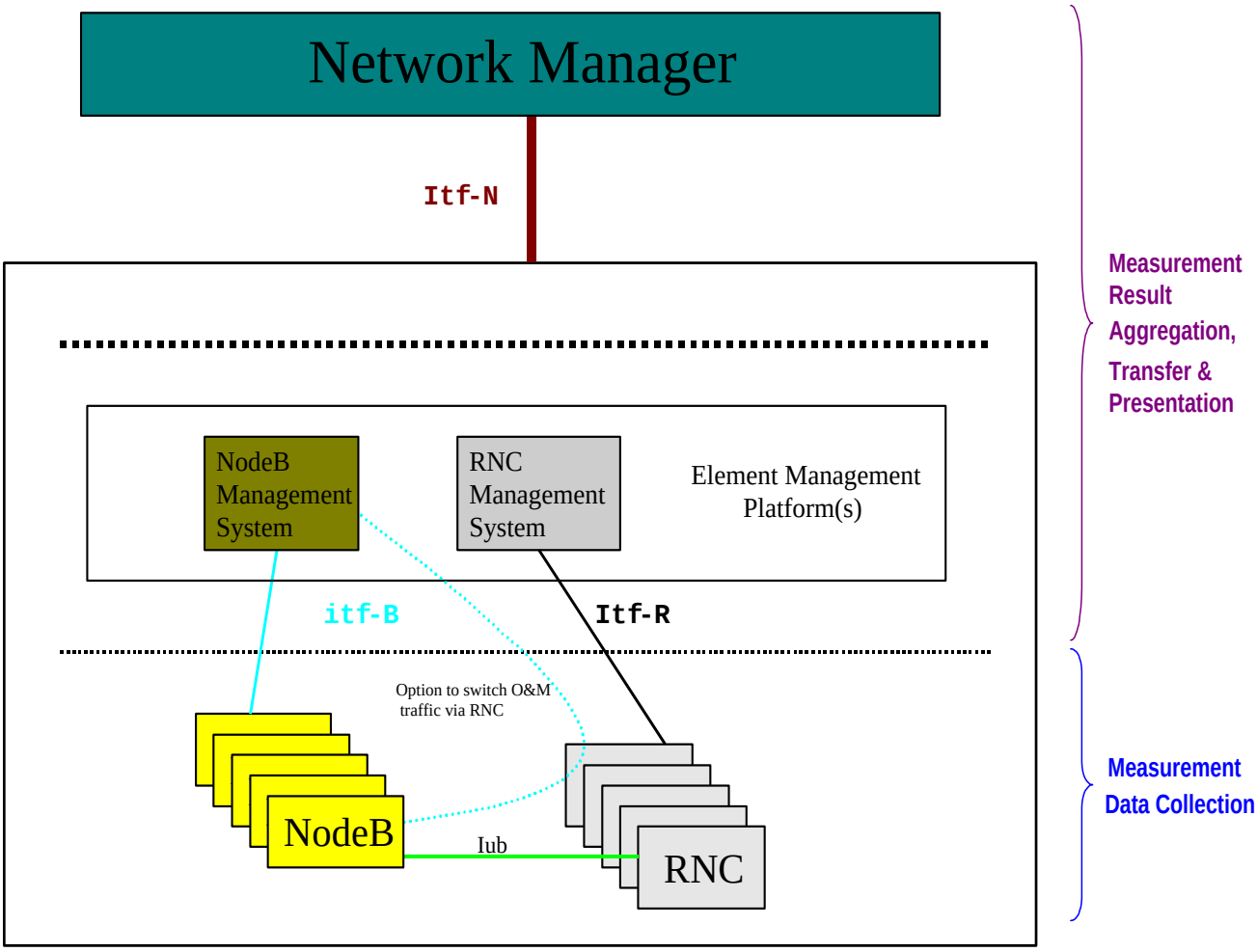


Figure 1: UTRAN Performance management concept

The basic requirement from an NE for measurements is to collect data according to the definition of the measurements and to return results to an OS (EM or NM).

The EM shall be able to administer the measurements, e.g. create/delete measurement jobs and define their schedules. The EM and/or the NM can retrieve the measurement results via appropriate interfaces. This data may be used in its original form or processed according to the system operator requirements.

A standard set of measurements that generate the required data is defined in annex C of the present document. However, a significant number of additional measurements is expected from real implementations. These will mainly consist of measurements for the underlying technologies, which are not 3G specific, such as ATM or IP, but is also due to specific vendor implementations. While the NM interface (Itf-N) for result transfer of both standard and non-standard measurements is fully standardised in annexes A and B of the present document, the interface between EM and NE is implementation specific.

The data collected in the NE will be made available according to the schedule defined by the measurement parameters. With respect to the retrieval of this data, the EM can control:

- the transfer of scheduled reports from the NE to the EM;
- the storage of scheduled reports in the NE; and
- deferred retrieval by the EM of scheduled reports stored in the NE.

Depending on the implementation option chosen for the NM interface (cf. subclause 4.2.4), the EM and/or NM may be involved in the control of the measurement result transfer to the NM. For details see subclause 5.3.2 and annex B.

5.1.2 Measurement administration

(Performance) measurement administration functions allow the system operator, using functions of the EM, to determine measurement data collection in the network and forwarding of the results to one or more OS(s).

A (performance) measurement concept covers:

1) measurement data collection requirements:

   - **Measurement types.** Corresponds to the measurements as defined in annex C, i.e. measurement types specified in the present document, defined by other standards bodies, or manufacturer defined measurement types;

   - **Measured network resources.** The resource(s) to which the measurement types shall be applied have to be specified, e.g. one or more NodeB(s);

   - **Measurement recording**, consisting of periods of time at which the NE is collecting (that is, making available in the NE) measurement data.

2) measurement reporting requirements:

   - the measurement related information to be reported has to be specified as part of the measurement. The frequency at which scheduled result reports shall be generated has to be defined.

3) measurement result transfer requirements:

   - measurement results can be transferred from the NE to the EM according to the measurement parameters, and/or they are stored locally in the NE and can be retrieved when required;

   - measurement results can be stored in the network (NEs or EM) for retrieval by the NM when required.

A (performance) measurement job, covers the measurement data collection and measurement reporting requirements, as described in points 1 and 2 above. It is up to the implementation whether requirements for the result transfer or the local storage of results are specified within the measurement job, particularly since the use of standard protocols, such as FTP, is foreseen.

A measurement job can be created, modified, displayed or deleted by the EM. In addition, measurement job activities in the NE can be suspended and resumed on request of the EM.

The system operator shall specify the required measurement parameters upon initiation of a measurement job. These parameters consist of, among others, recording schedule, granularity, and measurement type(s).

5.2 Plug & Measure

To be completed until SA#13.

5.3 Measurement jobs

Measurement jobs may be only visible at the (proprietary) interface between the EM and the NE. Measurement job administration functions in the EM may hide the measurement jobs from the user interface by providing higher levels of abstraction for the benefit of ease of use.

When defining a measurement job, the following aspects have to be considered:

5.3.1 Measurement job characteristics

5.3.1.1 Measurement types

Every measurement job consists of one or more measurement types (as defined in annex C), for which it collects measurement data. The measurement type(s) contained in a job may apply to one or more network resources of the same type, e.g. a measurement job may be related to one or several NodeB(s). A measurement job will only produce results for the measurement type(s) it contains.

5.3.1.2 Measurement schedule

The measurement schedule specifies the time frames during which the measurement job will be active. The measurement job is active as soon as the starttime - if supplied in the schedule - is reached. The system shall support a job starttime of up to at least 30 days from the job creation date. If no starttime is provided, the measurement job shall become active immediately. The measurement job remains active until the stoptime - if supplied in the schedule - is reached. If no job stoptime is specified the measurement job will run indefinitely and can only be stopped by EM intervention, i.e. by deleting or suspending the measurement job.

The time frame defined by the measurement schedule may contain one or more recording intervals. These recording intervals may repeat on a daily and/or weekly basis and specify the time periods during which the measurement data is collected within the NE. A recording interval is identified by an interval starttime and an interval endtime, which lie between 00.00 and 24.00 hours, aligned on granularity period boundaries. Thus the length of a recording interval will be a multiple of the granularity period. For a single measurement type it shall be possible to specify several measurement jobs with different recording intervals as long as these intervals do not overlap. If it is required that a measurement type be observed by multiple measurement jobs with overlapping schedules then the system shall support multiple instances of that measurement type.

5.3.1.3 Granularity period

The granularity period is the time between the initiation of two successive gatherings of measurement data. Required values for the granularity period are 5 minutes, 15 minutes, 30 minutes, 1 hour. The minimum granularity period is 5 minutes in most cases, but for some measurements it may only make sense to collect data in a larger granularity period. The granularity period shall be synchronised on the full hour, but its value is not required to be changeable during the lifetime of the job.

5.3.1.4 Measurement reporting

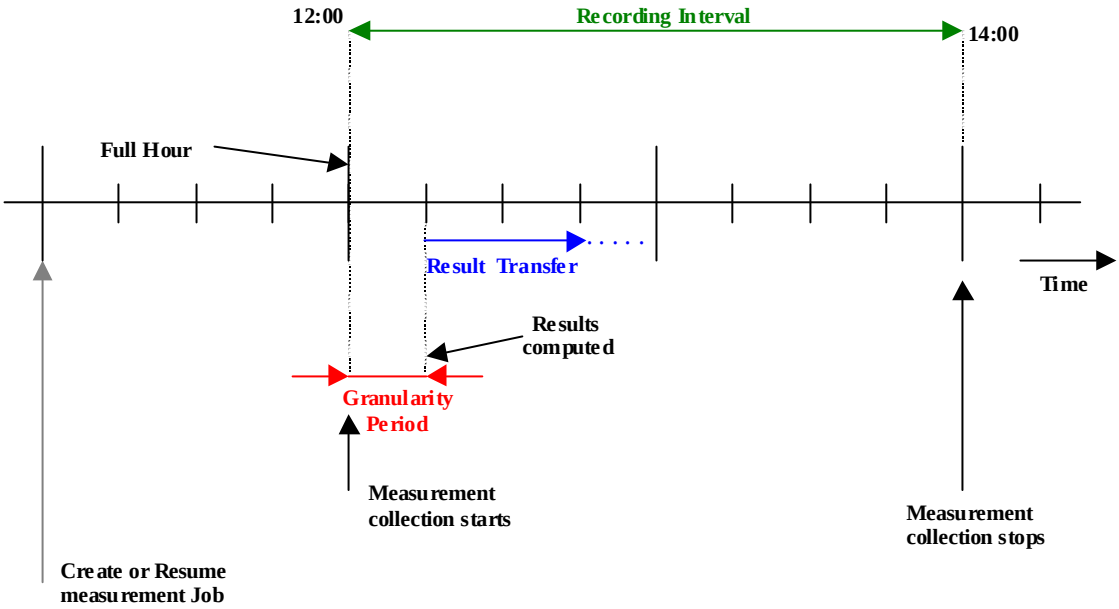
Each measurement job running on an NE produces scheduled measurement reports at the end of each granularity period, and contains the information as requested by the system operator. This information consists of:

- an identification of the measurement job that generated the report;
- an identification of the involved measurement type(s) and the measured network resource(s) (e.g. NodeB);
- a time stamp, referring to the end of the granularity period;
- for each measurement type, the result value(s) and an indication of the validity of the result value(s);
- an indication if the scan is not complete, and the reason why the scan could not be completed.

The exact layout of the measurement result reports generated by the NEs may be vendor specific. For the result file transfer to the NM via Itf-N, however, annex A of the present document defines in detail which information of the report is included in the result files, as well as the file format. Section 5.4.2 specifies how these reports can be transferred to the destination EM and/or NM.

5.3.1.5 Illustration of the measurement scheduling principles

The diagram below gives an example of a NE which runs a measurement job, with a 15 minute granularity period, that has a recording interval start and end time, respectively, of 12:00 and 14:00.



- At 12:00 the measurement job starts collecting data for its defined measurements;
- At 12:15, and every 15 minutes during the Recording Interval, the results for the measurements will be computed from the data gathered over the previous 15 minutes, and measurement reporting occurs as specified in section 5.3.1.4 above;
- Beginning at 12:15, the results for the expired granularity periods may be sent to a destination OS;
- At 14:00 the measurement job activity is terminated for this recording interval.

5.3.2 Measurement job state and status attributes

According to the OSI systems management concept, the state of a resource is reflected in indicators (attributes). Status attributes are provided to qualify these state attributes. Full details are provided in ITU-T Recommendation X.731 [6]. As for a measurement job, the following information is provided:

Administrative state: The administrative state attribute allows the system operator to permit or prohibit administratively the execution of the measurement job (suspend/resume).

Operational state: The operational state attribute reflects the operability of the measurement job.

Availability status: The availability status attribute denotes particular conditions applicable to the measurement job. It indicates:

- whether or not the measurement job is collecting measurement data according to its schedule;
- if, for whatever reason, some of the requested measurement data cannot be collected by the measurement job, in particular whether the measurement schedule inhibits the collection of measurement data.

It should be noted that the application of OSI state and status attributes within the 3G-measurement concept does not enforce the provision of an OSI interface for measurement administration.

5.3.3 Measurement job administration

Measurement jobs can be administered by the EM according to the following stipulations.

Creating a measurement job: On creation of a measurement job, all information has to be supplied in order to collect the required data from the selected network resources as specified by the measurement job characteristics (see subclause 5.2.1).

Modifying a measurement job: In general, the modification of measurement job parameters may be requested by the EM during the lifetime of a measurement job when the job is suspended (explained below).

Displaying a measurement job: The system operator shall be able to get a list of all measurements that are currently defined, together with all available actual information as stored in the NE. This information consists of the data that is supplied on creation/modification and the actual state and status information of the measurement job.

Deleting a measurement job: A measurement job is automatically deleted by the system when it reaches the job endtime and all scheduled measurement reports have been generated. A created measurement job can also be deleted by manual intervention at any time. When deleted, the measurement process associated with the job is stopped, and all allocated resources are freed.

Suspending/resuming a measurement job: On normal operation, the measurement job collects measurement data within the NE according to the actual values of the measurement job parameters. However, the system operator may decide for some reason to discard temporarily the collection of measurement data (e.g. in case of system overload or congestion, measurement results not used,...). The system operator therefore is able to suspend a defined measurement job at any time, using the Administrative State. This implies that the measurement job definition remains in the system, but that no measurement gathering activities are performed for this job. When the measurement job is resumed, measurement data collection is started again at the next granularity period within the measurement schedule.

5.4 Measurement results

5.4.1 Measurement result characteristics

During its specified recording intervals, each measurement job produces a result at the end of the granularity period if it is not suspended. Annex C provides for each measurement type that is specified within the present document a description of the expected measurement result.

Measurement results for all measurements of a particular measurement job are gathered in a single report at the end of the granularity period. The report may contain - in addition to the specific measurement results - fixed information, which is global for all measurement results associated with that measurement job, such as an identification of the involved network resources and a time stamp referring to the time at which the NE started collecting the measurement results. If measurement results are sent to the EM then the exact format may be vendor specific. For details about the standard file format for the transfer of measurement results to the NM via Itf-N see annex A of the present document.

Once the result reports have been generated, they shall be stored locally within the NE if so requested by the EM/system operator. The storage capacity and duration as well as the method how the data may be deleted from the NE will be implementation dependent.

If some or all of the requested measurement data cannot be collected by a measurement job (administrative state = locked, operational state = disabled, see subclause 5.2.2), this shall be indicated in the measurement report, cf. subclause 5.2.1.4. In extreme cases, no report at all can be generated by the measurement job. This means that the destination of the result report (EM and/or NM) shall be capable of coping with missing or incomplete measurement reports.

5.4.2 Transfer of measurement results

During the recording intervals specified for a measurement job, scheduled measurement reports are generated at the end of each granularity period if the measurement job is not suspended. These reports can be transferred to the EM in either of two ways:

1) immediate notifications:

   The reports are automatically forwarded to the EM at the end of the granularity period.

2) deferred retrieval:

   The reports are stored locally in the NE, where they can be retrieved when required.

For each individual report, the transfer of measurement results in either one or both ways is to be established by the system operator, i.e. under the control of the EM. The actual control of the result transfer and the mechanisms applied may be implementation specific.

Each implementation shall support a file transfer facility to an external OS (i.e. not supplied by the NE vendor), such as an NM. This facility shall be implemented using either the FTAM [7] or (T)FTP protocol. This interface may be located either in the NEs or the EM, as chosen by the vendor. As a result, it may not at all be necessary to transfer measurement result reports to the EM, if:

- the NM interface is implemented in the NEs, and
- the Operator chooses to post-process measurement results only in the NM.

Details of the file format to be used on the NM interface can be found in annex A of the present document. The measurement report file conventions and transfer procedure are specified in annex B.

The results of the measurement job can be forwarded to the EM in either of two standard ways:

1) the scheduled result reports generated by the NE (notifications) can be sent to the EM as soon as they are available;
2) the reports can be stored in the NE (files) and transferred to or retrieved by the EM when required.

It shall be possible for the EM to specify the details for its result retrieval as a part of the measurement administration.

Measurement results can be forwarded to the NM via a bulk transfer interface. It is an implementation option whether this interface resides in the EM or the NEs. Depending on the implementation, the control of the bulk transfer of measurement results to the NM may involve the EM and/or the NM. See annex B for details.

In a network with more than one OS (e.g. EM and NM) the data produced may be required by several OSs. It is therefore necessary to support the possibility for multiple destinations for transfer of data.

All scenarios for the result transfer, as far as they are relevant for standardisation of 3G systems, are defined above. It should be noted that, depending on an Operator's needs, measurement results may have to be transferred to the EM only, the NM only, or both. Depending on a vendor's implementation, measurement results may be transferred to the NM directly from the NE or via the EM. This implies that not all of the result transfer options described above shall be implemented in all cases, however, those procedures that are implemented shall comply with the present document. A detailed specification of the measurement result transfer to the NM can be found in annex B of the present document.

Annex A (normative): Measurement Report File Format

This annex describes the format of measurement result files that can be transferred from the network (NEs or EM) to the NM. Two alternative format definitions are specified, one using ASN.1 with binary encoding (BER), the other applying XML, which is ASCII based. Each 3G-system implementation complying with the present document shall support at least one of the two alternatives.

Both the ASN.1 and XML file format definitions implement the measurement result structure and parameters defined in subclauses 5.2 and 5.3 of the present document, except from the measurement job id, which is only needed to correlate measurement result reports with measurement jobs within the area of measurement administration (see subclause 5.2.1.4). The two defined file format definitions correspond 1:1 to each other. This implies that the value ranges and size constraints defined in the ASN.1 definition shall also be valid for implementations of the XML format definition. From that perspective, the two format definitions can be regarded as two different instances of the same single format.

The following conditions have been considered in defining this file format:

* Since the files are transferred via a machine-machine interface, the files applying the format definitions should be machine readable using standard tools;
* The file format should be independent of the data transfer protocol used to carry the file from one system to another;
* The file format should be generic across 3G systems;
* The file format should be flexible enough to include all possible measurement types, i.e. those specified within annex C as well as measurements defined within other standards bodies, or vendor specific measurement types;
* The file format should not impose any dependency between granularity periods for the generation of measurement results and file upload cycles for the file transfer from the network to the NM;
* The file format should be flexible enough to support both the NE-based and the EM-based approaches, as discussed in annex B.1.1 of the present document;
* The file format should be usable for other interfaces than Itf-N if required. The measurement file header could be augmented to indicate this other usage, however this would be a non-standard extension. In the ASN.1 file format definition, this is accommodated by the use of the ellipse notation. XML allows such additions through extra DTDs, provided by the definer of the non-standard extension.

A.1 Parameter description and mapping table

Table A.1 maps the tags defined in the ASN.1 file format definition to those used in the XML file format definition. It also provides an explanation of the individual parameters. The XML tags defined in the DTD (see subclause A.3.1) have been kept as short as possible in order to minimise the size of the XML measurement result files.

Table A.1 Mapping of ASN.1 Measurement Report File Format tags to XML tags

ASN.1 Tag	XML tag	Description
MeasDataCollection	mdc	This is the top-level tag, which identifies the file as a collection of measurement data. The file content is made up of a header ("measFileHeader"), the collection of measurement result items ("measData"), and a measurement file footer ("measFileFooter").
measFileHeader	mfh	This is the measurement result file header to be inserted in each file. It includes a version indicator, the name, type and vendor name of the sending network node, and a time stamp ("collectionBeginTime").
measData	md	The measData construct represents the sequence of zero or more measurement result items contained in the file. It can be empty in case no measurement data can be provided. The individual measData elements can appear in any order. Each measData element contains the name of the NE ("nEId") and the list of measurement results pertaining to that NE ("measInfo").
measFileFooter	mff	The measurement result file footer to be inserted in each file. It includes a time stamp, which refers to the end of the overall measurement collection interval that is covered by the collected measurement results being stored in this file.
fileFormatVersion	ffv	This parameter identifies the file format version applied by the sender. The format version defined in the present document shall be "1" for both the XML and ASN.1 formats alike.
senderName	sn	The senderName uniquely identifies the NE or EM that assembled this measurement file, according to the definitions in 3GPP TS 32.106. It is identical to the sender's nEDistinguishedName. The string may be empty (i.e. string size =0) in case it is not configured in the sender.
senderType	st	This is a user configurable identifier of the type of network node that generated the file, e.g. NodeB, EM, SGSN. The string may be empty (i.e. string size =0) in case the "senderType" is not configured in the sender.
vendorName	vn	The vendorName identifies the vendor of the equipment that provided the measurement file. The string may be empty (i.e. string size =0) if the "vendorName" is not configured in the sender.
collectionBeginTime	cbt	The collectionBeginTime is a time stamp that refers to the start of the first measurement collection interval (granularity period) that is covered by the collected measurement results that are stored in this file.
nEId	neid	The unique identification of the NE in the system. It includes the user name ("nEUserName") and the distinguished name ("nEDistinguishedName") of the NE.
nEUserName	neun	This is the user definable NE name, cf. 3GPP TS 32.106. The string may be empty (i.e. string size =0) if the "nEUserName" is not configured.
nEDistinguishedName	nedn	This is the distinguishedName (DN) defined for the NE in 3GPP TS 32.106. It is unique across an operator's 3G network. The string may be empty (i.e. string size =0) if the " nEDistinguishedName " is not configured.
measInfo	mi	The sequence of measurements, values and related information. It includes a list of measurement types ("measTypes") and the corresponding results ("measValues"), together with the time stamp ("measTimeStamp") and granularity period ("granularityPeriod") pertaining to these measurements.
measTimeStamp	mts	Time stamp referring to the end of the granularity period.
granularityPeriod	gp	Granularity period of the measurement(s) in seconds.
measTypes	mt	This is the list of measurement types for which the following, analogous list of measurement values ("measValues") pertains. The 3G standard measurement types are defined in annex C of this TS.
measValues	mv	This parameter contains the list of measurement results for the resource being measured, e.g. trunk, cell. It includes an identifier of the resource ("measObjInstId"), the list of measurement result values ("measResults") and a flag that indicates whether the data is reliable ("suspectFlag").
measObjInstId	moid	The "measObjInstId" field identifies the relative distinguished name (RDN) of the measured object within the scope defined by the nEDistinguishedName. The

ASN.1 Tag	XML tag	Description
		concatenation of the nEDistinguishedName and the measObjInstId yields the DN of the measured object. The measObjInstId is therefore empty if the nEDistinguishedName already specifies completely the DN of the measured object, which is the case for all measurements specified on NE level. For example, if the measured object is an "RncFunction" representing RNC "RF-1", then the nEDistinguishedName will be "G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-1,RncFunction=RF-1", and the measObjInstId is empty. On the other hand, if the measured object is a "UtranCell", representing cell "Gbg-997" managed by that RNC, then the nEDistinguishedName would be as before, i.e. "G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-1,RncFunction=RF-1" and the measObjInstId is "UtranCell=Gbg-997" The class of the measObjInstId is defined in item F of each measurement definition template.
measResults	r	This parameter contains the sequence of result values for the observed measurement types. The "measResults" sequence shall have the same number of elements, which follow the same order as the measTypes sequence. Normal values are INTEGERs and REALs. The NULL value is reserved to indicate that the measurement item is not applicable or could not be retrieved for the object instance.
suspectFlag	sf	Used as an indication of quality of the scanned data. FALSE in the case of reliable data, TRUE if not reliable. The default value is "FALSE", in case the suspect flag has its default value it may be omitted.
TimeStamp	ts	ASN.1 GeneralizedTime format. The minimum required information within timestamp is year, month, day, hour, minute, and second.

The measInfo contains the sequence of measurements, values and related information, in a table-oriented structure. A graphical representation of this structure, together with an ASN.1 and a XML example, can be found in annex D.

Measurement types and measurement groups will be defined in Release 2000. This also applies to the exact details concerning the arrangement of the information in the files, since that aspect may be dependent on the measurement type/group definitions.

At least for those measurement types that are re-used from non-3GPP standards (e.g. IP, ATM), it is required that the measType be operator definable. This is necessary to allow the operator to harmonise the numbering between different vendors' systems where appropriate. Through this harmonisation, it can be assured that identical measurements always carry the same measType value, which is required by the post-processing system. This requirement will eventually be reflected in annex C, which discusses and specifies the measurement definition.

A.2 ASN.1 file format definition

For ASN.1 formatted files, BER encoding rules shall apply. Embedded comments are integral parts of the standard format; i.e. any implementation-claiming conformance to this annex shall also conform to the comments.

PM-File-Description

```
DEFINITIONS AUTOMATIC TAGS::= BEGIN
MeasDataCollection::= SEQUENCE
        {
          measFileHeader        MeasFileHeader,
          measData              SEQUENCE OF MeasData,
          measFileFooter        MeasFileFooter
        }

MeasFileHeader::= SEQUENCE
```

```
        {
          fileFormatVersion     INTEGER,
          senderName            PrintableString (SIZE (0..400)),
          senderType            SenderType,
          vendorName            PrintableString (SIZE (0..32)),
          collectionBeginTime   TimeStamp,
    ...
        }
      -- The sole purpose of the ellipse notation used in the file header is to facilitate inter-release compatibility,
         vendor specific additions are not allowed in implementations claiming conformance to the TS.  However, it is
         acknowledged that this feature does enable the use of non-standard extensions to the file header without
         loosing compatibility to the file format specified in the present document.

SenderType::= PrintableString (SIZE (0..8))

TimeStamp::= GeneralizedTime

MeasData::= SEQUENCE
        {
          nEId                  NEId,
          measInfo              SEQUENCE OF MeasInfo
        }

NEId::= SEQUENCE
        {
          nEUserName            PrintableString (SIZE (0..64)),
          nEDistinguishedName   PrintableString (SIZE (0..400))
        }

MeasInfo::= SEQUENCE
        {
          measTimeStamp         TimeStamp,
          granularityPeriod     INTEGER,
          measTypes             SEQUENCE OF MeasType,
          measValues            SEQUENCE OF MeasValue
        }

MeasType::= PrintableString (SIZE (1..32))
MeasValue::= SEQUENCE
        {
          measObjInstId         MeasObjInstId,
          measResults           SEQUENCE OF MeasResult,
          suspectFlag           BOOLEAN DEFAULT FALSE
        }

MeasObjInstId::= PrintableString (SIZE (0..64))

MeasResult::= CHOICE

        {
          iValue                INTEGER,
          rValue                REAL,
          noValue               NULL,
          ...
        }

-- Normal values are INTEGERs and REALs.  The NULL value is reserved to indicate that the measurement item is
   not applicable or could not be retrieved for the object instance.  The sole purpose of the ellipse notation used in the
```

MeasResult choice is to facilitate inter-release compatibility in case the choice needs to be extended in future releases.

MeasFileFooter::= TimeStamp
END

A.3 XML file format definition

The character encoding shall be a subset of UTF-8. The characters in the ASN.1 type PrintableString are allowed, i.e.:

- A-Z
- a-z
- 0-9
- <space> ‘ ( ) + , - . / : = ?’

For encoding of the information content, XML (see Extensible Markup Language (XML) 1.0, W3C Recommendation 10-Feb-98) will be used. The XML **document type declaration** contains the mark-up declarations that provide a grammar for the measurement file format. This grammar is known as a Document Type Definition (DTD).
The DTD to be used is defined below. The type definitions and constraints for data types and values defined in the ASN.1 format, such as string sizes, shall implicitly be applied to the XML result files also. The representation of the timestamps within the XML file shall follow the “GeneralizedTime” ASN.1 type.

```
<!-- MeasDataCollection.dtd version 1.1-->
<!ELEMENT mdc (mfh , md*, mff )>
<!ELEMENT mfh (ffv, sn, st, vn, cbt) >
<!ELEMENT md (neid , mi*)>
<!ELEMENT neid (neun, nedn)>
<!ELEMENT mi (mts,gp, mt*, mv*)>
<!ELEMENT mv (moid , r*, sf? )>
<!ELEMENT mff (ts)>
<!ELEMENT ts (#PCDATA)>
<!ELEMENT sf (#PCDATA)>
<!ELEMENT r (#PCDATA)>
<!ELEMENT mt (#PCDATA)>
<!ELEMENT moid (#PCDATA)>
<!ELEMENT gp (#PCDATA)>
<!ELEMENT mts (#PCDATA)>
<!ELEMENT nedn (#PCDATA)>
<!ELEMENT neun (#PCDATA)>
<!ELEMENT cbt (#PCDATA)>
<!ELEMENT vn (#PCDATA)>
<!ELEMENT st (#PCDATA)>
<!ELEMENT sn (#PCDATA)>
<!ELEMENT ffv (#PCDATA)>

<!-- end of MeasDataCollection.dtd -->
```

The number of Measurement Result tags (r) per observed object instance tags (moid) shall always equal the number of Measurement Types (mt) tags. In case the result is a REAL value the decimal separator shall be “.”. In case the result is “NULL” then the “r” mark-up shall be empty.

The following header shall be used in actual XML measurement result files (cf. annex D for an example):

```
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="MeasDataCollection.xsl" ?>
<!DOCTYPE MeasDataCollection SYSTEM "MeasDataCollection.dtd" >
<mdc xmlns:HTML="http://www.w3.org/TR/REC-xml">
```

- Line 1: xml version number 1 shall be used.

- The reference to an XSL (Extensible Stylesheet Language) or CSS (Cascading Style Sheet) file in line 2 of the header is optional. It may be configured by the operator to be inserted for the purpose of presenting the XML file in a web browser GUI. It is up to the receiver of the file to decide on the usage of this stylesheet reference, e.g. ignore it if not needed or choosing a configured default if no style sheet reference is supplied in the file.

- Line 4: A reference to the W3C Recommendation web page for XML.

Quick guide to XML notation: ? zero or one occurrence
+ one or more occurrences
* zero or more occurrences
#PCDATA parsed character data

Annex B (normative): Measurement Report File Conventions and Transfer Procedure

This annex describes the conventions how files containing performance measurement results are generated in the network (EM or NEs) and the procedure to transfer these files from the network to the NM.

B.1 Conventions

The following subclauses define conventions for the generation and the naming of measurement-result files.

B.1.1 File generation

Since vendors may choose to implement the NM interface either in the NEs or the EM, the measurement result files for collection by the NM (push or pull transfer mechanism) may be provided by the NEs or the EM. Note that within one 3G network both possibilities may occur, since NEs of different types may use either one of the two possible approaches (NE based or EM based). This is particularly true in a multi-vendor network.

The procedures for the transfer of the files to the NM from either the NE or the EM are described in clause B.2 below.

B.1.1.1 NE based approach

The NE shall generate one file immediately at the end of each granularity period. This file shall contain all measurement results produced by the NE within that granularity period. For example, if a NodeB runs 10 measurements with a granularity period of 15 minutes and 5 measurements with a granularity period of 5 minutes, then it shall generate one file containing 10 results every 15 minutes, and one file containing 5 measurement results every five minutes. The NE and the granularity period shall be identified both in the file name and the file contents. NE identifiers (names) used for the files shall be in accordance with the NE naming conventions defined in 3GPP TS 32.106 [3]. The file shall be available for transfer to or collection by the NM as soon as all applicable results have been assembled.

Each NE is responsible for the generation and maintenance of the files pertaining to its own measurements (i.e. the measurements it executes). In particular, this implies that the RNC is not involved in the generation, provision or transfer of measurement result files of its controlled NodeBs, i.e. for the measurements defined for the NodeB in the present document, no results will be sent via the Iub interface. (Note that NodeB measurement results may be routed across the same physical interface as Iub, see 3GPP TS 25.442 [4] for details).

B.1.1.2 EM based approach

This approach requires that measurement results be forwarded to the EM according to the mechanisms described in subclause 4.2.4 of the present document. The EM may choose to provide measurement result files as described above for the NEs, however, additional flexibility may be offered. For example, measurement results from several granularity periods and/ or several NEs could be written into one single file. These NEs may be determined based on network hierarchy (e.g. all NodeBs controlled by the same RNC, all NEs controlled by the same EM), or management domains configured by the system operator (e.g. NodeBs belonging to a certain (management or geographical) area). In case such rules are applied by the EM for the routing of measurement results to specific files then they shall be operator configurable. If results from more than one NE are contained in a file, the NE identifier used for the file shall be the EM name as defined in 3GPP TS 32.106 [3], or a domain name configured by the system operator. If results from more than one granularity period are contained in the file then the beginning of the first and the end of the last granularity period shall be indicated in the file name.

The file shall be made available for transfer to or collection by the NM as soon as all applicable results have been assembled.

B.1.2. File naming

The following convention shall be applied for measurement result file naming:

<Type><Startdate>.<Starttime>-[<Enddate>.]<Endtime>_<UniqueId>[:<RC>]

1) The Type field indicates if the file contains measurement results for single or multiple NEs and/or granularity periods, where:

   - "A" means single NE, single granularity period,
   - "B" indicates multiple NEs, single granularity period,
   - "C" signifies single NE, multiple granularity periods,
   - "D" stands for multiple NEs, multiple granularity periods.

   Note that files generated by the NEs will always have the Type field set to "A".

2) The Startdate field indicates the date when the granularity period began if the Type field is set to A or B. If the Type field is either "C" or "D" then Startdate contains the date when the first granularity period of the measurement results contained in the file started. The Startdate field is of the form YYYYMMDD, where:

   - YYYY is the year in four-digit notation,
   - MM is the month in two digit notation (01 – 12),
   - DD is the day in two digit notation (01 – 31).

3) The Starttime field indicates the time when the granularity period began if the Type field is set to A or B. If the Type field is either "C" or "D" then Starttime contains the time when the first granularity period of the measurement results contained in the file began. The Starttime field is of the form HHMMshhmm, where:

   - HH is the two digit hour of the day (local time), based on 24 hour clock (00 – 23),
   - MM is the two digit minute of the hour (local time), possible values are 00, 05, 10, 15, 20, 25, 30, 35, 40, 45, 50, and 55,
   - s is the sign of the local time differential from UTC (+ or -), in case the time differential to UTC is 0 then the sign may be arbitrarily set to “+” or “-“,
   - hh is the two digit number of hours of the local time differential from UTC (00-23),
   - mm is the two digit number of minutes of the local time differential from UTC (00-59).

4) The Enddate field shall only be included if the Type field is set to "C" or "D", i.e. measurement results for multiple granularity periods are contained in the file. It identifies the date when the last granularity period of these measurements ended, and its structure corresponds to the Startdate field.

5) The Endtime field indicates the time when the granularity period ended if the Type field is set to A or B. If the Type field is either "C" or "D" then Endtime contains the time when the last granularity period of the measurement results contained in the file ended. Its structure corresponds to the Starttime field, however, the allowed values for the minute of the hour are 05 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, and 00.

6) UniqueId. This is the name of the NE, EM or domain, as defined in subclauses B.1.1.1 and B.1.1.2 above.

7) The RC parameter is a running count, starting with the value of "1", and shall be appended only if the filename is otherwise not unanimous, i.e. more than one file is generated and all other parameters of the file name are identical. Therefore it may only be used by the EM, since the described situation can not occur with NE generated files.

Some examples describing file naming convention:

1) file name: A20000626.2315+0200-2330+0200_NodeBId,
meaning: file produced by NodeB <NodeBId> on June 26, 2000, granularity period 15 minutes from 23:15 local to 23:30 local, with a time differential of +2 hours against UTC.

2) file name: B20021224.1700-1130-1705-1130_EMId,
meaning: file containing results for multiple NEs, produced by EM <EMId> on December 24, 2002, granularity period 5 minutes from 17:00 local to 17:05 local, with a time differential of –11:30 hours against UTC.

3) file name: D20050907.1030+0000-20050909.1500+0000_DomainId:2,
meaning: file containing results for NEs belonging to domain <DomainId>, start of first granularity period 07 September 2005, 10:30 local, end of last granularity period 09 September 2005, 15:00 local, with a time differential of 0 against UTC. This file is produced by the EM managing the domain, and it is the second file for this domain/granularity periods combination.

B.2. File transfer procedure

Both push (i.e. triggered by the NE) and pull (triggered by the OS) transfer modes shall be supported on the NM interface. Implementation specific means may be employed for the administration and control of the file transfer, concerning

- the time of the transfer (in push mode);
- the routing of the transfer to one or more OS(s) (in push mode);
- the storage/deletion of the files in the NE, particularly when the EM based approach is chosen (cf. subclause B.1.1.1 above).

Measurement result files shall be retained by the file generator (i.e. NE or EM) at least until they have been successfully transferred to or collected by the NM. The storage capacity and the duration for which the data can be retained at the NE or the EM will be Operator and implementation dependent.

The file transfer procedure implemented in the system (NE or EM) shall ensure that no data can get lost under normal operating conditions. The procedure shall also ensure that the files will be deleted after successful transfer to the NM. Depending on the exact implementation of the procedure, the NM may be responsible for deleting those files, or older files will be eventually overwritten by new ones by the file generator in a round robin fashion.

Each implementation shall support all primitives of the selected protocol (e.g. put file, get file, inspect directory contents, delete file) which are needed by the NM. These primitives depend on the details of the procedure, as defined by the manufacturer.

Annex C (informative): The table oriented file format structure

Measurement Items (counters) are typically grouped according functionality (cfr GSM 12.04 [8] Measurement Function). The term “measured object class” is used to identify such a group. The file format is based on the fact that the measurements are always collected in sets of one functional group.

The measInfo contains the sequence of measurements, values and related information, in a table-oriented structure. It includes a list of measurement types (“measTypes”) and the corresponding values (“measValues”), together with the time stamp (“measTimeStamp”) and granularity period (“granularityPeriod”) pertaining to these measurements. Whenever one of these 4 elements changes, then a new measInfo sequence is started. If the “measTypes” change, then also the “measValues” change, because these elements are connected in the following way: the “measTypes” correspond to a specific measurement object (NE, trunk, cell, …), of which one or more instances can exist inside the NE. Hence for one set of “measTypes”, there can be one or more sets of “measValues”, according to the “measObjInstId”.

The above is best explained with an example: consider the CELL measurement function (GSM 12.04 [8]). Then the measured object class is Cell. The measInfo contains a “header” line defining which measurements related to Cell are

collected (measTypes), and in which order. The subsequent “data” lines will then contain the values of the measurements for each specific cell, which is measured, one data line per cell (measValues).

This format will generate a kind of table with as column headings the measurement names, and in the rows the corresponding measurement values per measured instance.

C.1 Graphical representation of the table structure

For clarity, the table in the example below only contains the measTypes and measValues (and suspectFlag), not the granularityPeriod and the measTimeStamp.

	attTCHSeizures	succTCHSeizures	attImmediateAssignProcs	succImmediateAssignProcs	
cell=997	234	345	567	789	false
cell=998	890	901	123	234	false
cell=999	456	567	678	789	false

C.2 Example of ASN.1 Measurement Report File

For readability, a kind of pseudo ASN.1 was used in stead of the BER encoding..

```
MeasDataCollection ::= {
    measFileHeader     {
        fileFormatVersion ::= 1,
        senderName ::= “G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-1,RncFunction=RF-1“ ,
        senderType  ::= “RNC”,
        vendorName  ::= “Telecom corp.”,
        collectionBeginTime  ::= 20000301140000
        },
    measData   {
        nEId {
            nEUserName  ::= “RNC Telecomville“,
            nEDistinguishedName  ::= “G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-
            1,RncFunction=RF-1“
        },
        measInfo {
            measTimeStamp ::= 20000301141430,
            granularityPeriod ::= 900,
            measTypes  {
                        “attTCHSeizures”, “succTCHSeizures”, “attImmediateAssignProcs”, “succImmediateAssignProcs”
                       },
            measValues {
                {
                            measObjInstId ::= “UtranCell=Gbg-997”,
                            measResults { iValue ::= 234, iValue ::= 345, iValue ::= 567, iValue ::= 789},
                            suspectFlag ::= FALSE
                       },
                {
                            measObjInstId ::= “UtranCell=Gbg-998”,
                            measResults { iValue ::= 890, iValue ::= 901, iValue ::= 123, iValue ::= 234},
                            suspectFlag ::= FALSE
                       },
                {
                            measObjInstId ::= “UtranCell=Gbg-999”,
                            measResults { iValue ::= 456, iValue ::= 567, iValue ::= 678, iValue ::= 789},
                            suspectFlag ::= FALSE
                       }
                  }
        }
      },
    measFileFooter ::= 20000301141500
}
```

C.3 Example of XML Measurement Report File

```
<?xml version="1.0"?>
```

```
<?xml-stylesheet type="text/xsl" href="MeasDataCollection.xsl" ?>
<!DOCTYPE MeasDataCollection SYSTEM "MeasDataCollection.dtd" >
<mdc xmlns:HTML="http://www.w3.org/TR/REC-xml">
<mfh>
<ffv>1</ffv>
<sn>G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-
1,RncFunction=RF-1</sn>
<st>RNC</st>
<vn>Telecom corp.</vn>
<cbt>20000301140000</cbt>
</mfh>
<md>
<neid>
<neun>RNC Telecomville</neun>
<nedn>G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-
1,RncFunction=RF-1</nedn>
</neid>
<mi>
<mts>20000301141430</mts>
<gp>900</gp>
<mt>attTCHSeizures</mt>
<mt>succTCHSeizures </mt>
<mt>attImmediateAssignProcs</mt>
<mt>succImmediateAssignProcs</mt>
<mv>
<moid>UtranCell=Gbg-997</moid>
<r>234</r>
<r>345</r>
<r>567</r>
<r>789</r>
<sf>FALSE</sf>
</mv>
<mv>
<moid>UtranCell=Gbg-998</moid>
<r>890</r>
<r>901</r>
<r>123</r>
<r>234</r>
<sf>FALSE</sf>
</mv>
<mv>
<moid>UtranCell=Gbg-999</moid>
<r>456</r>
<r>567</r>
<r>678</r>
<r>789</r>
<sf>FALSE</sf>
</mv>
</mi>
</md>
<mff>20000301141500</mff>
</mdc >
```

Annex (D) (informative): Change history

This annex lists all change requests approved for this document since the specification was first approved by 3GPP TSG-SA.

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Jun 2001	S_12	SP-010237	-		Submitted to TSG SA #12 for Information.		1.0.0

3GPP TS 32.104-2 V1.0.0 (2001-06)

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3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

http://www.3gpp.org

Contents

Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part of a set of specifications, which describe the requirements and information model necessary for the standardised Operation, Administration and Maintenance (OA&M) of a multi-vendor 3G-systemGSM or UMTS PLMN.

During the lifetime of a 3G networkPLMN, its logical and physical configuration will undergo changes of varying degrees and frequencies in order to optimise the utilisation of the network resources. These changes will be executed through network configuration management activities and/or network engineering, see GSM TS 12.06 [x1] and 3GPP TS 32.106 [3].

Many of the activities involved in the daily operation and future network planning of a 3G PLMN network require data on which to base decisions. This data refers to the load carried by the network and the grade of service offered. In order to produce this data performance measurements are executed in the NEs, which comprise the network. The data can then be transferred to an external system, e.g. an Operations System (OS) in TMN terminology, for further evaluation. The purpose of the this TS and its companion parts 1 and 3 is to describe the mechanisms involved in the collection of the data and the definition of the data itself.

1 Scope

The present document describes the TMN model for the administration of measurements and the collection of measurement result data in a GSM system. It also includes the measurement definitions for GSM. The concept and functional requirements for performance management in wireless GSM and UMTS systems is set out in TS 32.104-1, while the measurements for UMTS and combined UMTS/GSM systems are specified in TS 32.104-3.

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] GSM 02.16: "Digital cellular telecommunication system (Phase 2+); International Mobile station Equipment Identities (IMEI)".

[2] GSM 04.08: "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".

[3] GSM 04.11: "Digital cellular telecommunication system (Phase 2+); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

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

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

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

[7] GSM 09.02: "Digital cellular telecommunication system (Phase 2+); Mobile Application Part (MAP) specification".

[8] GSM 12.00 (ETS 300 612-1): "Digital cellular telecommunication system (Phase 2); Objectives and structure of Network Management (NM)".

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

[10] GSM 12.06 (ETS 300 617): "Digital cellular telecommunication system (Phase 2); GSM Network Configuration Management ".

[11] GSM 12.30 (ETR 128): "Digital cellular telecommunication system (Phase 2); ETSI Object Identifier tree; Common domain; Mobile domain; Operation and Maintenance (O&M), managed object registration definition".

[12] CCITT Recommendation E.880: "Field data collection and evaluation on the performance of equipment, network and services".

[13] CCITT Recommendation X.710: "Common management information service definition for CCITT applications".

[14] CCITT Recommendation X.721: "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[15] CCITT Recommendation X.730: "Information technology - Open Systems Interconnection - Systems Management: Object management function".

[16] CCITT Recommendation X.731: "Information technology - Open Systems Interconnection - Systems Management: State management function".

[17] CCITT Recommendation X.734: "Information technology - Open Systems Interconnection - Systems Management: Event report management function".

[18] CCITT Recommendation X.735: "Information technology - Open Systems Interconnection - Systems Management: Log control function".

[19] CCITT Recommendation X.738: "Information technology - Open Systems Interconnection - Systems management: Summarization function".

[20] CCITT Recommendation X.739: "Information technology - Open Systems Interconnection - Systems Management: Metric objects and attributes".

[21] ISO 8571: "File Transfer, Access and Management".

[22] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service Description; Stage 2".

[23] 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".

[24] GSM 04.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Logical Link Control (LLC)".

[25] GSM 04.65: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Subnetwork Dependent Convergence Protocol (SNDCP)".

[26] 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".

[27] GSM 09.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".

[28] IETF RFC 959 File Transfer Protocol (FTP)

[29] IETF RFC 783 Trivial File Transfer Protocol (TFTP) revision 2

[30] IETF RFC 1157 A Simple Network Management Protocol (SNMP)

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AGCH	Access Grant Channel
APN	Access Point Name
AuC	Authentication Centre
BSC	Base Station Controller
BSS	Base Station System
BSSAP	BSS Application Part
BTS	Base Transceiver Station
CBCH	Cell Broadcast Channel
CCCH	Common Control Channel
CCITT	The International Telegraph and Telephone Consultative Committee
CMIP	Common Management Information Protocol

CMIS	Common Management Information Service
CMISE	Common Management Information Service Element
DCCH	Dedicated Control Channel
DCN	Data Communication Network
EIR	Equipment Identity Register
ETSI	European Telecommunications Standards Institute
FACCH	Fast Associated Control Channel
FTAM	File Transfer Access and Management
FTP	File Transfer Protocol
GMSC	Gateway Mobile Services Switching Centre
GGSN	Gateway GPRS Service Node
GPRS	General Packet Radio Service
GSN	GPRS Service Node
HLR	Home Location Register
HO	Handover
HPLMN	Home PLMN
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
ISDN	Integrated Service Digital Network
ISO	International Standards Organisation
LLC	Logical Link Control
LR	Location Register
MMI	Man-Machine Interface
MML	Man-Machine Language
MOC	Managed Object Class
MOI	Managed Object Instance
MS	Mobile Station
MSC	Mobile Services Switching Centre
MSRN	Mobile Subscriber Roaming Number
MTP	Message Transfer Part
NE	Network Element
NMC	Network Management Centre
NSS	Network Sub System (including EIR, HLR, SMS-IWMSC, MSC and VLR)
OACSU	Off-Air Call Set Up
OA&M	Operation, Administration and Maintenance
OMAP	(CCITT) Operations, Maintenance and Administration Part
OMC	Operations and Maintenance Centre
OS	Operations System
OSI	Open System Interconnection
O&M	Operations and Maintenance
PCCCH	Packet Common Control Channel
PCCH	Packet Paging Channel
PCH	Paging Channel
PLMN	Public Land Mobile Network (including BSS and NSS)
PM	Performance Management
PTCH	Packet Traffic Channel
PVLR	Previous VLR
QoS	Quality of Service
RACH	Random Access Channel
Rec.	Recommendation
Ref.	Reference
RF	Radio Frequency
RR	Radio Resource
RXLEV	Reception Level
RXQUAL	Reception Quality
ROSE	Remote Operation Service Element
SACCH	Slow Associated Control Channel
SDCCH	Stand alone Dedicated Control Channel
SCCP	(CCITT) Signalling Connection Control Part
SGSN	Serving GPRS Service Node
SNDCP	Sub Network Dependency Control Protocol
SNMP	Simple Network Management Protocol

SMS-IWMSC	Short Message Service Inter Working MSC
Spec.	Specification
SS	Supplementary Service
TCAP	(CCITT) Transaction Capabilities Application Part
TCH	Traffic Channel
TMSI	Temporary Mobile Subscriber Identity
TMN	Telecommunications Management Network
TS	Technical Specification
VLR	Visitors Location Register

4 Detailed description of the measurement system for a GSM PLMN

4.1 Introduction

TS 32.104-1 describes the required functions for the administration of performance measurements and the retrieval of their results. For this purpose, the characteristics of measurement jobs and measurement results have been defined.

This part of the multi-part TS 32.104 explains how these requirements can be met in a GSM system using standard OSI systems management functions or SNMP management operations and, where necessary, tailoring them for GSM PLMN use. In the following, managed object classes and their properties (attributes, notifications, etc.) to be used on the object oriented interface between OS and NEs for the execution of performance management functions are specified.

Note that the implementation of this object oriented approach defined in the following sections is optional. As an alternative, vendors can also choose to implement their GSM systems or GSM parts of combined GSM/UMTS systems according to the interface definition and requirements specified in part 1 of TS 32.104, which implies that:

- for measurement administration, the functional requirements are standardised, but technology and details of the implementation are vendor specific;

- for the retrieval of measurement results, only a file based mechanism for transfer of results to a Network Manager is standardised.

4.1.1 Basic measurement system functions

Before measurement data from the NEs can be collected and the results be forwarded to the OS, the measurement jobs that generate the required data shall be activated in the system. In object oriented terms, this corresponds to the instantiation of managed objects which model the measurement process. In order to control the measurement process, appropriate attributes of these objects shall be defined and have to be set to the required/desired values, either when the objects are created or during the lifetime of the objects. The specific attributes and their values will determine the measurement schedule, the measured network resources, the measurement types and the generation of scheduled result reports as well as the layout of the reports. Scheduled results can be forwarded to the OS using a notification that is defined specifically for this purpose as a part of the measurement object class definitions. A dedicated action will be used for requesting current results of active measurements.

4.1.2 Measurement Object Administration

The management of objects in an open system is performed utilising the internationally standardised "Common Management Information Service Element" (CMISE CCITT Recommendation X.710 [13] or IETF RFC 1157 A Simple Network Management Protocol (SNMP) [30]). Managed objects for the execution of PLMN performance measurement functions can be instantiated and deleted using the M-CREATE and M-DELETE services or SNMP SET and GET operations. Reading and modifying attributes of these objects can be achieved employing the M-GET and M-SET services of CMISE or SET and GET operations of SNMP. The CMISE M-EVENT-REPORT service and SNMP TRAP is defined for the emission of notifications, while actions can be executed using the M-ACTION service.

Specific notifications defined in the OSI object management function (see CCITT Recommendation X.730 [15]) are used to notify the OS of the creation and deletion of managed objects and of the change of attribute values. For the formal definition of the PLMN performance management object model, refer to annex C.

The measurement job can be ideally modelled by the managed object class "simpleScanner" as defined in CCITT Recommendation X.738 [19]. The "simpleScanner" is derived from the "homogeneousScanner" object class (see CCITT Recommendation X.738 [19]), which in turn is a specialisation of the "scanner" class of managed objects (see CCITT Recommendation X.738 [19]). The "simpleScanner" object has attributes to determine:

- the measurement types;
- the measured network resources;
- the recording periods; and
- the reporting requirements;

of the measurement job. The "simpleScanner" generates measurement result reports in the form of notifications, according to the attributes that prescribe the reporting requirements. The measurement transfer requirements are not modelled in the scanner objects, since generic and general services are used (see subclause 4.3.2 and annex D).

4.2 Modelling of measurement jobs

A measurement job is represented by a "simpleScanner" object. The following subclauses define how the measurement job characteristics are mapped onto the properties of the "simpleScanner" managed object class, and how the measurement types of a measurement job are modelled in the PLMN performance measurement system.

4.2.1 Measurement job characteristics

4.2.1.1 Measurement Function

Every measurement job collects measurement data from selected measurement types across one or more network resources of the same type. The selected measurement types shall be identical throughout all network resources observed by a measurement job. For each network resource, the related measurement types have been grouped in one or more measurement functions.

Measurement functions, are modelled by various "measurementFunction" object classes (see annex C). The measurement types for the PLMN performance measurement system are defined in annex B, and their result values are included as attributes in the appropriate "measurementFunction" object class. In case the measurement type is a counter, the attribute represents the counter value as is. In all other cases, the attribute delivers a calculated value (e.g. a mean), over the observed period. The "measurementFunction" objects are contained in the objects that represent the network resource to which the measurement types included in the "measurementFunction" refer. All measurement types that relate only to a network resource alone are grouped into one "measurementFunction" class which is unique for that network resource. Measurement types that are related to the network resource and the same type(s) of adjacent resource(s) (e.g. Handover neighbour cell) are also grouped into one unique type of measurement function which may exist once or more per instance or per set of that adjacent resource(s). The instances of the adjacent resources that are to be addressed by the measurement function are identified by the values of attributes which are part of that specific "measurementFunction" object class definition.

Measurement types that belong together are grouped together in the same package (e.g. "immediateAssignmentProcedurePackage" has attributes "attemptedImmediateAssignmentProcedures" and "successfullImmediateAssignmentProcedures" - for details refer to annex C). Since all measurement types defined in annex B may or may not be supported by the system, all packages of a "measurementFunction" which contain measurement attributes are conditional. A "measurementFunction" needs to be created before a "simpleScanner" can scan its attributes, i.e. before actual measurements can be taken. The create request from the OS shall specify the values of attributes that identify adjacent resources (like Handover neighbour cell), if any, but it may not specify any measurement attributes of the "measurementFunction" object. Upon creation of a "measurementFunction" object, the system will determine the measurement packages that are included in the object according to the measurement types the system supports. If multiple instances of the same "measurementFunction" object class are created, the packages included in the various instances may be different from instance to instance since the system may have restrictions on how many measurement packages of the same type it supports. The OS can inquire the measurement types supported by a "measurementFunction" object from the system, by reading the "packages" attribute or the attribute list of the object (see CCITT Recommendation X.721 [14]). Unlike the former operation, the latter, however, will also return values of the measurement attributes which are not expected to be meaningful at this time (see below). Deletion of the "measurementFunction" will render the measurement types that correspond to the "measurementFunction" attributes

unavailable to the OS. Creation and deletion of a "measurementFunction" will be notified to the OS using the object creation and deletion notifications as defined in CCITT Recommendation X.730 [15].

Each measurement job may collect data from one or more measurement types across one or more network resources, i.e. a "simpleScanner" object may make a choice of one or more "measurementFunction" instances and scan the same set of attributes across all selected measurement functions. For this purpose, it can scope the set of measurement functions that are eligible for inclusion in the observation, and it may select measurement functions using filtering criteria (similar to the concept of scoping and filtering as described in CCITT Recommendation X.710 [13]). Alternatively, it can use an explicit list of "measurementFunction" objects for scanning. The "simpleScanner" does not explicitly identify the network resource(s) it measures. Instead, this information is derived from the containment relationship between the selected "measurementFunction" instances and the objects that model the network resources, and, where necessary, through specific attributes of the "measurementFunction" objects that identify adjacent resources. In principle, a "simpleScanner" is able to scan attributes of any defined "measurementFunction", but for the purpose of the present document, each "simpleScanner" instance is only required to scan attributes of "measurementFunction" objects that are contained in the same "xxxFunction" object as the "simpleScanner" itself, where "xxx" stands for "bss", "msc", "hlr", "vlr", "eir" or "smsc", respectively (see figure C.1).

All measurement attributes of any "measurementFunction" should only be read by a "simpleScanner" that has been instantiated for this purpose. By definition they can be read directly by systems management protocol, but their values are not expected to have any meaning apart from the scan. Therefore, the system will not return the "attribute list" in the create reply, and the "attributeList" will also not be included in the object creation notification.

4.2.1.2 Measurement schedule

The measurement schedule specifies the time frame during which the measurement job will be active. The schedule consist of a measurement start- and stoptime and one or more recording intervals which may repeat on a daily or weekly basis. The semantics of the scheduling parameters are described in subclause 3.2.1.2.

All of the above parameters are formally defined as attributes of conditional packages of the "simpleScanner" managed object class. The starttime and stoptime are included in the "duration" package and indicate, if the package is present, the specific point in time at which the "simpleScanner" will become active or inactive, respectively. If the "simpleScanner" is instantiated after the specified starttime, this will have the same effect as if no starttime was specified (see subclause 3.2.1.2).

The optional recording intervals, if specified, further restrict the time during which the "simpleScanner" actively collects measurement data within the time frame determined by the duration package. The "dailyScheduling" package may be used to define one or more intervals during each day. Alternatively, the "weeklyScheduling" package can be used to define individual intervals for each day of the week. The recording interval should be a multiple of the granularity period (if non-zero) and the start- and endtimes shall be aligned with granularity period boundaries for the system to accept the values.

It is possible to create several "simpleScanner" objects which scan the same attributes of the same "measurementFunction" instances according to different recording intervals. In this case it is, however, required that these intervals do not overlap. Consequently, if it is required to measure the same measurement type with overlapping schedules, it is necessary to have an appropriate number of instances of the same "measurementFunction" available which all support the required attributes (see subclause 4.2.1.1).

For the definition of the syntactical and additional behavioural aspects of the above parameters, refer to CCITT Recommendation X.721 [14] and CCITT Recommendation X.738 [19].

4.2.1.3 Granularity period

The granularity period defines the periodicity of the generation of results by a measurement job within the timeframe specified in the scheduling attributes. The granularity period of a measurement job is determined by the value of the "granularityPeriod" attribute of the "simpleScanner". The present document requires, as a minimum, the support of granularity periods of 5, 15, 30 and 60 minutes.

The value of this attribute shall specify the required value in minutes. The underlying International Standards allow the modification of the "granularityPeriod" attribute, but for an implementation claiming conformance to the present document, it is not required that its value be changeable during the lifetime of the "simpleScanner" object. If this value is 60, measurement results will be generated every full hour. If the value is 30, results will be generated every 0 and 30 minutes past the full hour. If the value is 15, result output will occur every 0, 15, 30 and 45 minutes past the full hour, and finally, if the value is 5, the "simpleScanner" will generate output every 5 minutes, synchronised on the full

hour. Again, measurement results are only reported at the end of each granularity period within the recording interval. Due to these definitions, synchronisation of granularity periods through the conditional "periodSynchronisationPackage" of the "simpleScanner" is not supported in the scope of the present document.

If periodical generation of results is not required from a "simpleScanner" instance, this can be achieved by specifying the value 0 for the "granularityPeriod" attribute. In this case, it will only be possible to request current measurement results from the "simpleScanner" (see below).

4.2.1.4 Scan reports

At the end of each granularity period within the measurement schedule, the "simpleScanner" will emit a "scanReport" notification, defined in CCITT Recommendation X.738 [19], which contains the measurement results generated by the scanner at the end of that granularity period. The information in the notification shall comprise:

- the managed object class and managed object instance of the "simpleScanner" that emitted the notification, plus the notification type (i.e. "scan report"),
- a time stamp that indicates the time at which the measurement results were taken, i.e. the end time of the respective granularity period,
- for each "measurementFunction" object from which measurements were taken by the scanner, a list of measurement attribute values and optional attribute identifiers, plus a suspect flag for each attribute that indicates the validity of the result value. Missing data is indicated in the list. The time stamp that indicates the time offset forward from scan initiation until the value of the measurement attribute was actually taken is not supported in the PLMN measurement system,
- for an incomplete scan the reason why the scan could not be completed.

The definition of the "scanReport" notification in CCITT Recommendation X.738 [19] provides some flexibility with respect to the actual layout of the report. In the PLMN performance measurement system, the following options can be selected:

- suppressing the reporting of the identification of the "measurementFunction" object from which the measurements reported in the notification were collected. This is only useful when the identification of the "measuremntFunction" can be determined by other means, or if the identification is not required by the OS (e.g. when the statistics are to be calculated).
- omitting the attribute identifiers from the report. In this case, the attribute values are reported in an agreed order, which is defined by an attribute of the "simpleScanner".
- measurement values that are identical throughout all "mesurementFunction" instances from which the scanner takes measurements may be included in the report only once.

CCITT Recommendation X.738 [19] defines in detail the attributes of the "simpleScanner" which are used to control the above features. Additional options of CCITT Recommendation X.738 [19] which are not listed here are not supported in the PLMN performance measurement system (see conformance requirements in subclause 4.4).

4.2.2 Scanner state and status attributes

State and status indicators are defined for the measurement job in subclause 3.2.2 of the present document. These are modelled through appropriate attributes which reflect the state and status of the "simpleScanner" object. These attributes are: administrativeState, operationalState and availabilityStatus.

administrativeState: the administrativeState attribute is used to suspend and resume the scanning performed by the "simpleScanner". This attribute can be altered by means of CMISE M-SET service or SNMP SET operation for the applicable "simpleScanner" object instance.

operationalState: The operationalState attribute represents the operational capability of the scanner to perform it's functions.

availabilityStatus: The availabilityStatus attribute reflects whether or not the simpleScanner object instance is active according to the measurement schedule.

Any changes to the values of the administrativeState and the operationalState attributes will be reported to the OS using the "stateChange" notification, as defined in CCITT Recommendation X.731 [16].

Further details about these attributes can be found in CCITT Recommendation X.738 [19].

4.2.3 Scanner administration

The generic CMISE services M-CREATE, M-DELETE, M-GET and M-SET or SNMP SET and GET, applied to a simpleScanner managed object instance respectively represent creation, deletion, display and modification of a measurement job. A CMISE M-ACTION primitive or SNMP SET with a specific action type for activating a scan report is defined for the retrieval of the current values of measurement results.

Creating a "simpleScanner": A "simpleScanner" can be created by issuing an appropriate M-CREATE request or SNMP SET request. On creation of the object, all attribute values have to be supplied that determine:

- the selection of "measurementFunction" instances and their attributes which shall be measured;
- the schedule of the "simpleScanner"; and
- the reporting requirements

as defined in previous subclauses. The "measurementFunction" objects shall be created before the scanner can be instantiated, and the measurement attributes specified in the scanner shall be present in the selected "measurementFunction" instances, for the scan to return its results. For each object that does not exist, an empty report shall be returned and for each attribute that does not exist, an empty value shall be returned within the report. The relationship between the scan attributes and the scanner is explained in CCITT Recommendation X.738 [19].

Modifying "simpleScanner" attributes: Modification of "simpleScanner" attributes may be requested by the OS during the lifetime of a scanner, using the CMISE M-SET or SNMP SET operation. The conditions for modification of attributes of the "simpleScanner" are specified in CCITT Recommendation X.738 [19] and CCITT Recommendation X.738 [19], but some additional restrictions, defined in the present document with respect to the changeability of "simpleScanner" attributes, apply in the PLMN performance measurement system.

Displaying scanner objects: The system operator can get a list of all "simpleScanner" objects that currently exist in the system, together with all available information as stored in the NE. This information consists of the data that was supplied on creation/modification of the objects and the values of the state and status attributes of the "simpleScanner" objects. The CMISE M-GET or SNMP GET operation can be used to selectively retrieve the required information from the system. For details see CCITT Recommendation X.710 [13].

Deleting a "simpleScanner": A "simpleScanner" instance is automatically deleted by the system when the scheduled endtime is reached and all result reports, either scheduled or on request have been generated. A "simpleScanner" object can also be deleted by manual intervention, utilising the CMISE M-DELETE or SNMP SET operation, at any time. When deleted, the measurement process associated with the scanner is stopped, and all allocated resources are released.

Suspending/resuming scanner operation: On normal operation, the "simpleScanner" collects measurement data from the selected "measurementFunction" objects according to the values of the "simpleScanner" attributes. However, the system operator may decide for some reason to discard temporarily the collection of measurement data (e.g. in case of system overload or congestion, measurement results not used, ...). The system operator therefore is able to suspend scanner operation at any time, setting the administrativeState attribute to "locked". This implies that the "simpleScanner" instance remains in the system, but no measurement gathering and result reporting activities are performed for this scanner. When scanner operation is resumed, i.e. the administrativeState is "unlocked", measurement data collection and result reporting is started again at the next full granularity period within the measurement schedule.

Requesting current measurement result values: The system operator may for some reason be interested in the current values of the measurement results of a particular measurement process, independently of the scheduled data collection and reporting of the respective scanner, e.g. for tracing the increment of some of the measurement attributes. To this aim, the "activateScanReport" CMISE M-ACTION or SNMP GET is used as defined in CCITT Recommendation X.738 [19]. The action reply will return current results according to the attributes of the scanner that govern the generation of the "scanReport" notification, i.e. the format of the reply is identical to that of scheduled reports generated by the scanner. Any such request does not affect the underlying measurement process, and may only be issued when the scanner is operating according to its schedule and not suspended (i.e. "offduty" not present in the availability status , administrative state equals "unlocked"), otherwise an error will be returned.

4.3 Modelling of measurement results

Each measurement produces a result at the end of the granularity period or on request of the OS. Annex B provides for each measurement type a description of the expected measurement result. Annex C contains the formal definition of the attribute that represents the measurement type.

4.3.1 Characteristics of the result report

A scheduled result report is generated in the form of a "scanReport" notification. Current measurement results requested by the OS using the "activateScanReport" action will be supplied by the system in the reply to the request. All measurement attributes that are observed by a "simpleScanner" object are included in a single report or action reply, respectively. The layout of the two result reports - notification or action reply - is identical, as far as the contained measurement information is concerned. For details on the result report characteristics, please refer to the previous subclauses.

4.3.2 Result report transfer control

Result reports from a "simpleScanner" object are either produced according to the measurement schedule (notification) or on receipt of an explicit request (action) from the OS. There are no mechanisms to control the forwarding of the reply to that request (action reply), or to store it in the NE. There are, however, functions to determine the forwarding, local storage in the NE and deferred retrieval of the "scanReport" notification. These functions are described in the following paragraphs.

The forwarding of notifications can be controlled by the OS via "Event Forwarding Discriminator" (EFD) objects, as defined in CCITT Recommendation X.734 [17]. For each EFD, the OS can specify a discriminator construct which will be applied as a filter to any event report generated in the system. If an event report passes the filter, a notification will be forwarded to the OS accordingly. The following filter criteria are allowed in an EFD for the PLMN performance measurement system:

- the event type, which allows to enable or disable completely the forwarding of scan report notifications;
- the "simpleScanner" managed object instance, which allows to restrict forwarding of result reports to those that are generated by specific scanner instances;
- the time stamp contained in the scan report ("scanInitiationTime"), which allows to selectively enable the forwarding of result reports that were generated at a specific time or during specific periods of time;
- any operation on the above attributes in any combination.

Measurement result reports can be stored in the NE. This property is modelled through the managed object class "log", as specified in CCITT Recommendation X.721 [14] and "log control function" as specified in CCITT Recommendation X.735 [18]. The storage of event reports in the "log" can be controlled through a discriminator construct, similar to the event forwarding control. The present document requires for the "log" discriminator construct the same criteria as for the EFD discriminator construct.

All scan report notifications that pass the discriminator construct of the "log" will create a "scanReportRecord" object which is contained in the log. These records can be retrieved by the OS at any time, as defined in CCITT Recommendation X.735 [18] and CCITT Recommendation X.710 [13], using either CMISE, SNMP, FTP or using FTAM (see annex D). The use of FTAM or FTP services is especially suitable for bulk data transfer. From the common procedures defined in GSM TS 12.00 [8] for data transfer in a PLMN, only the method that provides logged information into file(s) can be used for the measurement system. The "resultType" requested in the action will identify the appropriate log instance(s) as the source of the measurement data, and optionally additional filter criteria which determines the actual records to be put into the file(s) can be supplied. The filter criteria that shall be supported are identical to those defined for the discriminator construct of the logs. On receipt of the action, the requested records will be put into one or more files, which will then be made available to the OS. The format of the records in the file shall be according to the definition of the "scanReportRecord" as given in CCITT Recommendation X.738 [19].

Since all measurement attributes and the identification of the network resource observed by a "simpleScanner" are included in a single attribute of the result reports, it is not possible to filter on the measured resource or the measurement type. If the selective forwarding/logging/retrieval of measurement results referring to individual network resources or individual measurement types is required by the system operator, then "simpleScanner" objects shall be instantiated such that the scanner identity will implicitly identify the measured resource and measurement types, i.e. the

scanner attributes should be set such that the scanner observes only the specific resources and/or the specific measurement attributes which shall be filtered, according to the system operator's requirements.

4.4 Conformance requirements

In the following subclause, conformance requirements for object classes, notifications and actions defined in CCITT Recommendation X.738 [19] are specified. In cases where requirements in the present document restrict options of CCITT Recommendation X.738 [19], like e.g. changeability of attribute values, the conditions of the present document shall apply.

4.4.1 Simple scanner

The following subclause lists the attributes and packages of the "simpleScanner", as defined in CCITT Recommendation X.738 [19], and those inherited from the "scanner" as defined in CCITT Recommendation X.738 [19]. It specifies which properties shall be supported to conform with the present document.

MANDATORY PACKAGES:

scannerPackage

scannerId: this attribute identifies a "simpleScanner" instance. It is a mandatory attribute of the "simpleScanner" managed object class and will be supported in the PLMN measurement system.

granularityPeriod: this attribute specifies the granularity period of the scanner, as defined in subclause 4.2.1.3. It is a mandatory attribute of the "simpleScanner" managed object class and will be supported in the PLMN measurement system.

administrativeState and operationalState: (see subclause 4.2.2) are mandatory attributes of the "simpleScanner" managed object class and will be supported in the PLMN measurement system. Their semantics are defined in CCITT Recommendation X.738 [19].

homogeneousScannerPackage

scanAttributeIdList: this attribute is interrelated with the "numericAttributeIdArray" attribute of the "simpleScannerPackage". It is supported in the PLMN measurement system according to the definitions of subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

simpleScannerPackage

numericAtributeIdArray: this attribute is interrelated with the "scanAttributeIdList" attribute of the "homogeneousScannerPackage". It is supported in the PLMN measurement system according to the definitions of subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

suppressObjectInstance: this attribute determines whether or not the object instance of the observed measurement function is included in the measurement results. It is supported in the PLMN measurement system according to the definitions of subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

activateScanReport: this action is supported in the PLMN measurement system (see below).

scanReport: this notification is supported in the PLMN measurement system (see below).

CONDITIONAL PACKAGES:

availabilityStatusPackage

availabilityStatus: this attribute is supported in the PLMN measurement system (see subclause 4.2.2) according to the definition of CCITT Recommendation X.738 [19].

duration

startTime and stopTime: these attributes constitute the start- and stoptime of the scanner. They are supported according to subclause 4.2.1.2 and CCITT Recommendation X.738 [19].

dailyScheduling

intervalsOfDay: this attribute defines the periods within a day during which the scanner actively collects measurement data. It is supported according to subclause 4.2.1.2 and CCITT Recommendation X.738 [19].

weeklyScheduling

weekMask: this attribute defines, for each day of the week, the periods during which the scanner actively collects measurement data. It is supported according to subclause 4.2.1.2 and CCITT Recommendation X.738 [19].

externalScheduler

The support of this package is not required in the PLMN measurement system.

periodSynchronisationPackage

The support of this package is not required in the PLMN measurement system. Synchronisation of granularity periods is described in subclause 4.2.1.3.

createDeleteNotificationsPackage

This package contains the object creation and object deletion notifications. Both are required in the PLMN measurement system.

attributeValueChangeNotificationPackage

This package contains the attribute value change notification. It is required in the PLMN measurement system.

stateChangeNotificationPackage

This package contains the state change notification. It is required in the PLMN measurement system.

timeStampReportPackage

timeStampReportMode: this attribute specifies the time stamping requirements for the measurement results. The value "1" ("globalTimeStampOnly") shall be used.

scopedSelectionPackage and managedObjectInstanceSelectionPackage

Either one of these packages is present in any scanner instance. The attributes contained in the packages determine the measurement functions selected for observation by the scanner. They are supported according to the definitions of CCITT Recommendation X.738 [19].

timingSelectionPackage

The support of this package is not applicable in the PLMN measurement system, since the observed "measurementFunction" managed objects do not contain any time attributes.

onceReportAttributeIdListPackage

onceReportAttributeIdList: this attribute contains a list of attribute identifiers. The values of these attributes shall be included in a result report only once if they are identical throughout all "measurementFunction" objects observed by the "simpleScanner". It may be supported in the PLMN measurement system as an option, see CCITT Recommendation X.738 [19].

4.4.2 Scan report record

The "scanReportRecord" managed object class will be supported in the PLMN measurement system as defined in CCITT Recommendation X.738 [19] and CCITT Recommendation X.721 [14].

4.4.3 Scan report notification

The "scanReport" notification will be supported in the PLMN measurement system as defined in subclause 4.2.1.4 and CCITT Recommendation X.738 [19].

4.4.4 Activate scan report action

In the scope of the present document, there are no specific conformance requirements for the action request. The action reply will be supported according to the requirements for the scan report notification.

4.5 Application Context

The Application Context Name of the 12.04 application context shall have the following object identifier value:

{gsm-OM-DomainId gsm-12-04 (4) protocolSupport (1) applicationContext (0) gsm-Management (0)}

and the following object description value:

"gsm12.04 management application context"

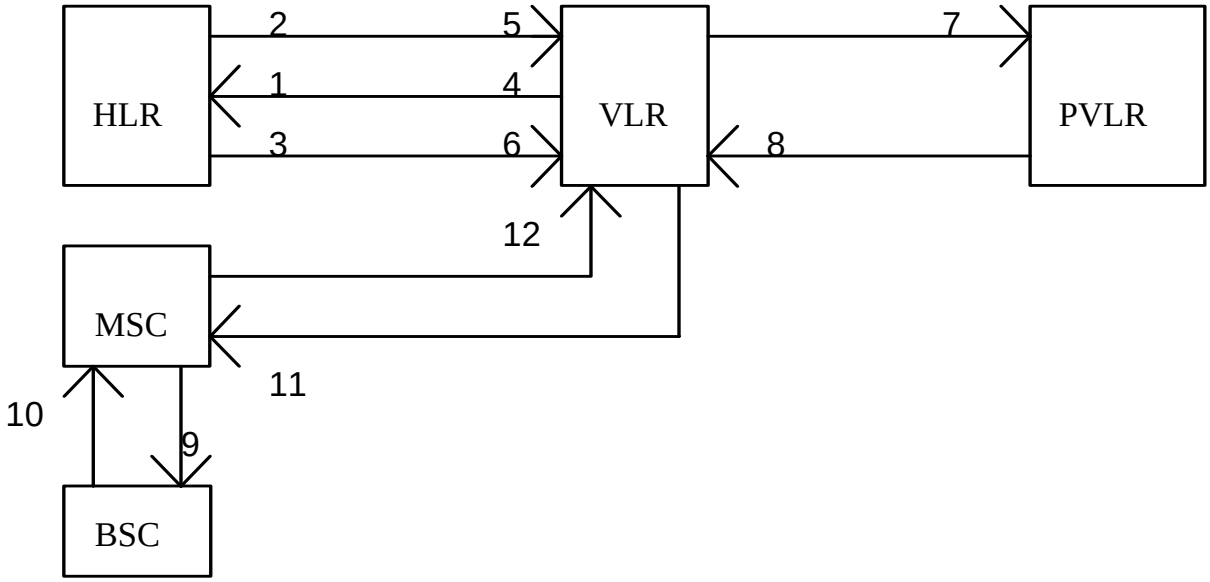
The object identifier gsm-OM-DomainId is defined in the GSM 12.30 (ETR 128) [11].

Annex A (informative): Graphical examples

This annex gives some graphical examples to demonstrate how the measurements in annex B, can be combined to express a specific function.

EXAMPLE 1: Authentication and Authentication Set requests.

This diagram shows which measurements in the annex B need to be activated to collect the statistical information for Authentication of a subscriber.

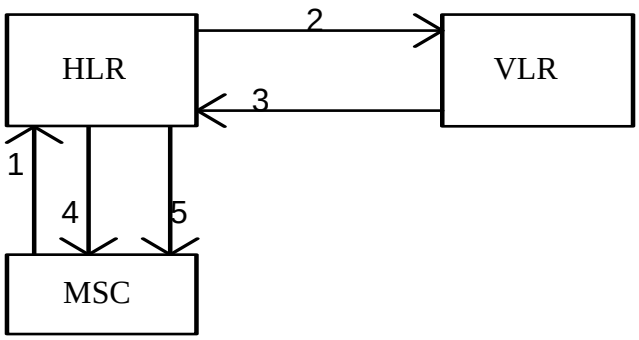


EXAMPLE 1: Authentication and Authentication Set requests

Nbr.	Measurement Attribute Name	Measurement Name
1	attReqForAuthSetsReceivedByHLRFromVLRs	Attempted requests for Authentication sets received by HLR from VLRs
2	succReturnedAuthSetsFromHLRToVLRs	Successful returned Authentication sets from HLR to VLRs
3	emptyResponsesForAuthSetsFromHLRToVLRs	Empty responses to request for Authentication sets from HLR to VLRs
4	attReqForAuthSetsSentToHLR	Attempted requests for Authentication sets sent to HLR by the VLRs
5	succReceivedAuthSetsFromHLR	Successful received Authentication sets from the HLR to the VLRs
6	emptyResponsesForAuthFromHLR	Empty responses to request for Authentication sets from HLR to VLRs
7	attIdentificationReqToPVLRs	Attempted identification requests to PVLRs
8	succIdentificationReqToPVLRs	Successful identification requests to PVLRs
9	attCipheringModeControlProcs	Attempted ciphering mode controlled procedures
10	succCipheringModeControlProcs	Successful ciphering mode controlled procedures
11	attAuthProcsInVLR	Attempted authentication procedures in the VLR
12	succAuthProcsInVLR	Successful authentication procedures in the VLR

EXAMPLE 2: Interrogation of HLR for routing.

This diagram shows which measurements in the annex B need to be activated to collect the statistical information for Routing.

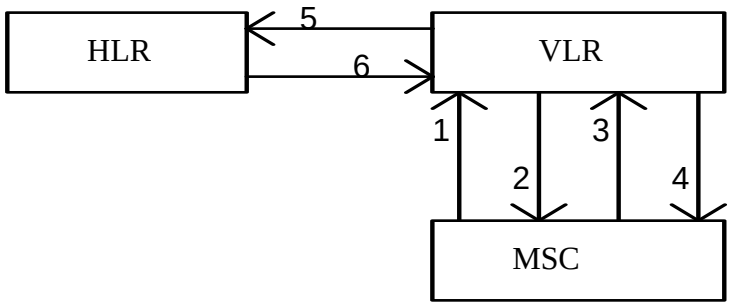


Example 2: Interrogation of HLR for routing

Nbr.	Measurement Attribute Name	Measurement Name
1	attInterrogationOfHLRsForRouting	Attempted interrogations of HLRs for routing
2	attReqForMSRN	Attempted request for MSRN
3	succReqForMSRN	Successful request for MSRN
4	succInterrogationOfHLRsMSRNObtained	Successful interrogations of HLR (MSRN obtained)
5	succInterrogationOfHLRsCallForwarding	Successful interrogations of HLR (call forwarding)

EXAMPLE 3: Location Updating.

This diagram shows which measurements in the annex B need to be activated to collect the statistical information for Location Updating.



EXAMPLE 3: Location Updating

Nbr.	Measurement Attribute Name	Measurement Name
1	attIntraVLRLocationUpdates	Attempted intra-VLR location updates
2	succIntraVLRLocationUpdates	Successful intra-VLR location updates
3	attInterVLRLocationUpdates	Attempted inter-VLR location updates
4	succInterVLRLocationUpdates	Successful inter-VLR location updates
5	attLocationUpdate	Attempted location updates
6	succLocationUpdate	Successful location updates

Annex B (normative): Performance Measurement Requirements Summary

Following is the template used to describe the measurements contained in this annex.

A. **Description**

A short explanation of the measurement operation.

B. **Collection Method**

The form in which this measurement data is obtained:

- CC (Cumulative Counter);
- GAUGE (dynamic variable), used when data being measured can vary up or down during the period of measurement;
- DER (Discrete Event Registration), when data related to a particular event are captured every nth event is registered, where n can be 1 or larger;
- SI (Status Inspection).

C. **Condition**

The GSM condition which causes this measurement data to be updated. Where it is not possible to give a precise GSM condition, then the conditional circumstances leading to the update is stated.

D. **Measurement Attribute Name**

The Measurement Attribute Name which will be referenced by the Object Model.

E. **Measurement Result** (measured value, Unit)

A short description of expected result value (e.g. A single integer value).

F. **Measurement Function Name**

Measurement Function Name for which this measurement is defined.

G. **Switching Technology**

The Switching product this Measurement is applicable to. Circuit Switched and / or Packet Switched (GPRS). When packet switching (GPRS) is identified for an MSC measurement function, this measurement type is related to a combined circuit/packet switched event.

B.1 Measurements Related To The BSC

B.1.1 BSC Measurement Function

B.1.1.1 Unsuccessful requests for service

A. This measurement provides the number of unsuccessful mobile originated services for the BSC. Note, the "reject cause" indicates why the service request was rejected. Possible causes include, B-Subscriber busy, network out of order, protocol errors.

B. CC.

C. Transmission of "CM-SERVICE REJECT" Message to MS requesting service (GSM 04.08 [2]).

D. unsuccReqsForService.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.2 Unsuccessful requests for service, per cause

A. This measurement provides the number of unsuccessful mobile originated services for the BSC per cause. Note, the "reject cause" indicates why the service request was rejected. Possible causes include, B-Subscriber busy, network out of order, protocol errors.

B. CC.

C. Transmission of "CM-SERVICE REJECT" Message to MS requesting service (GSM 04.08 [2]).

D. unsuccReqsForServicePerCause.

E. An integer value per cause.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.3 Mean Inter-arrival Time (Circuit Switched)

A. This measurement provides the arithmetic mean of the sum of time intervals between consecutive mobile originating call attempts.

B. CC.

C. This measurement is obtained by accumulating the time segments between receipt of consecutive access Message on the RACH with establishment cause "MOBILE ORIGINATING CALL" and then taking the arithmetic mean (GSM 04.08 [2]).

D. meanInterArrivalTime

E. A single real value.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.4 Attempted Transmission of Paging Messages, per BSC

A. This measurement provides the number of Paging messages transmitted, on a per BSC basis (these are counted as attempts).

B. CC.

C. Transmission of "PAGING REQUEST" (GSM 04.08 [2]).

D. attTransOfPagingMessagesPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit and packet switching.

B.1.1.5 Unsuccessful Transmission of Paging Messages, per BSC

A. This measurement provides the number of unsuccessful Paging requests, on a per BSC basis.

B. CC.

C. No "PAGING RESPONSE" received for the "PAGING REQUEST", expiry of timer T3113 (GSM 04.08 [2]).

D. unsuccTransOfPagingMessagesPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit and packet switching.

B.1.1.6 Attempted IMMEDIATE ASSIGNMENT Procedures, per BSC

A. This measurement provides the number of attempted immediate assignment procedures, on a per BSC basis.

B. CC.

C. Receipt of "CHANNEL REQUEST" Message. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING", "ONE PHASE PACKET ACCESS", "SINGLE BLOCK PACKET ACCESS" and "OTHER PROCEDURES" as defined in (GSM 04.08 [2]).

D. attImmediateAssingProcsPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit and packet switching.

B.1.1.7 Successful IMMEDIATE ASSIGNMENT Procedures, per BSC

A. This measurement provides the number of successful immediate assignment procedures, on a per BSC basis.

B. CC.

C. Transmission of "IMMEDIATE ASSIGN COMMAND" Message. This Message contains either an "IMMEDIATE ASSIGNMENT" Message or an "IMMEDIATE ASSIGNMENT EXTENDED" Message. If an "IMMEDIATE ASSIGNMENT EXTENDED" Message is transmitted, the counter shall be incremented by two, because that Message contains assignment information for two mobiles (GSM 04.08 [2]).

D. succImmediateAssingProcsPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit and packet switching.

B.1.1.8 Successful Internal Handovers, intra-CELL, per BSC

A. This measurement provides the number of times a call moves from the occupied channel of the CELL to another free channel of the same CELL, on a per BSC basis.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succInternalHDOsIntraCellPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.9 Unsuccessful Internal Handovers, intra-CELL, per BSC

A. This measurement provides the number of unsuccessful intra CELL Handovers, i.e. an attempt was made to move a call .from the occupied channel of the CELL to another free channel of the same CELL, on a per BSC basis.

B. CC.

C. Receipt of "ASSIGNMENT FAILURE" Message for the attempted handover (GSM 04.08 [2]).

D. unsuccInternalHDOsIntraCellPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.10 Successful Internal Handovers per BSC

A. This measurement provides the number of successful Handovers on a per BSC basis, it includes intra-CELL as well as inter-CELL Handovers.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succInternalHDOsPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.11 Successful Internal Handovers per cause

A. This measurement provides the number of successful Handovers per cause, it includes intra-CELL as well as inter-CELL Handovers.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succInternalHDOsPerCause.

E. An integer value per Handover cause.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.12 Unsuccessful Internal Handovers with reconnection to old channels, per BSC

A. This measurement provides the number of unsuccessful Handovers, on a per BSC basis (with reconnection to the original channels).

B. CC.

C. Receipt of "HANDOVER FAILURE" Message for the attempted handover (GSM 04.08 [2]).

D. unsuccInternalHDOsWithReconnectionPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.13 Unsuccessful Internal Handovers with loss of connection, per BSC

A. This measurement provides the number of unsuccessful Handovers that end in loosing the call, on a per BSC basis.

B. CC.

C. Expiry of timer T3103 for Inter CELL Handovers and Expiry of timer T3107 for Intra CELL Handovers (GSM 04.08 [2]).

D. unsuccInternalHDOsWithLossOfConnectionPerBSC.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for circuit switching.

B.1.1.14 Flush Requests Received

A. This measurement provides the total number of flush request messages received from the SGSN to flush the PDUs for a given cell.

B. CC.

C. Update count for each receipt of a PDU flush request message from the SGSN.

D. flushReqReceived.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for packet switching.

B.1.1.15 Paging Requests Received from SGSN

A. This measurement provides the total number of "PAGING" messages received by the BSS from the SGSN.

B. CC.

C. Update count for each receipt of a "PAGING" message by the BSS from the SGSN.

D. pagingReqReceivedfromSGSN.

E. A single integer value.

F. BSC Measurement Function.

G. Valid for packet switching.

B.1.1.16 Mean Inter-arrival Time (Packet Switched)

A. This measurement provides the arithmetic mean of the sum of time intervals between consecutive mobile originating packet channel access request .

B. CC.

C. This measurement is obtained by accumulating the time segments between receipt of consecutive 'PACKET CHANNEL REQUEST' message with the establishment cause being either one phase packet access or single block packet access, on the PRACH and then taking the arithmetic mean GSM 04.60 [23].

D. meanPSInterArrivalTime

E. A single real value.

F. BSC Measurement Function.

G. Valid for packet switching.

B.2 Measurements related to the BTS

B.2.1 CELL Measurement Function

B.2.1.1 Mean PCH-AGCH queue length

A. This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the PCH-AGCH. Note: this is valid for circuit only when a PCCCH is provided.

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the PCH-AGCH queue length and then taking the arithmetic mean (GSM 04.08 [2]).

D. meanPCHAGCHQueueLength.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.2 Attempted Transmission of Paging Messages (the PCH)

A. This measurement provides the number of Paging messages transmitted (these are counted as attempts). Note: this is valid for circuit only when a PCCCH is provided.

B. CC.

C. Transmission of "PAGING REQUEST" (GSM 04.08 [2]).

D. attTransOfPagingMessagesThePCH.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.3 Unsuccessful Transmission of Paging Messages (the PCH)

A. This measurement provides the number of unsuccessful Paging requests .

B. CC.

C. No "PAGING RESPONSE" received for the "PAGING REQUEST", expiry of timer T3113 (GSM 04.08 [2]). Note: this is valid for circuit only when a PCCCH is provided.

D. unsuccTransOfPagingMessagesThePCH.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.4 Attempted IMMEDIATE ASSIGNMENT Procedures

A. This measurement provides the number of attempted immediate assignment procedures.

B. CC.

C. Receipt of "CHANNEL REQUIRED" Message. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING", "ONE PHASE PACKET ACCESS", "SINGLE BLOCK PACKET ACCESS" and and "OTHER PROCEDURES" as defined in (GSM 04.08 [2]).

D. attImmediateAssingProcs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.5 Successful IMMEDIATE ASSIGNMENT Procedures

A. This measurement provides the number of successful immediate assignment procedures.

B. CC.

C. Transmission of "IMMEDIATE ASSIGN COMMAND" Message. This message contains either an "IMMEDIATE ASSIGNMENT" Message or an "IMMEDIATE ASSIGNMENT EXTENDED" Message. If an "IMMEDIATE ASSIGNMENT EXTENDED" Message is transmitted, the counter shall be incremented by two, because that Message contains assignment information for two mobiles (GSM 04.08 [2]).

D. succImmediateAssingProcs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.6 Attempted IMMEDIATE ASSIGNMENT Procedures, per cause

A. This measurement provides the number of attempted immediate assignment procedures, per cause.

B. CC.

C. Receipt of "CHANNEL REQUIRED" Message. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING" and "OTHER PROCEDURES" as defined in (GSM 04.08 [2]).

NOTE: System implementation will allow the establishments causes of **PS *** Att IMM ASS Poc** can be incorporated in this measurement.

F. attImmediateAssingProcsPerCause.

G. An integer value per cause.

H. CELL Measurement Function.

I. Valid for circuit and packet switching.

B.2.1.7 Successful IMMEDIATE ASSIGNMENT Procedures, per cause

A. This measurement provides the number of successful immediate assignment procedures, per cause.

B. CC.

C. Transmission of "IMMEDIATE ASSIGN COMMAND" Message. This Message contains either an "IMMEDIATE ASSIGNMENT" Message or an "IMMEDIATE ASSIGNMENT EXTENDED" Message, per cause. Note, the establishment causes are: "EMERGENCY CALL", "CALL RE-ESTABLISHMENT", "ANSWER TO PAGING", "ORIGINATING CALL" , "LOCATION UPDATING" and "OTHER PROCEDURES". The "IMMEDIATE ASSIGNMENT EXTENDED" Message contains assignment information for two mobiles (GSM 04.08 [2]). If the establishment cause is identical for the the two mobile stations, the counter shall be incremented by two. Otherwise the affected counters shall be incremented by one.

NOTE: System implementation will allow the establishments causes of **PS *** Att IMM ASS Poc** can be incorporated in this measurement.

D. succImmediateAssingProcsPerCause.

E. An integer value per cause.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.8 Number of Pages Discarded from the PCH Queue

A. This measurement provides the number of Paging messages which are discarded from the PCH queue before they could be transmitted .

B. CC.

C. Pages can be discarded from the queues (assuming queuing is in operation) for a number of reasons, including queue overflow, priority insertion in the queue causing an overflow and in-queue timer expiry (GSM 04.08 [2]). Note: this is valid for circuit only when a PCCCH is provided.

D. nbrOfPagesDiscardedFromPCHQueue.

E. An integer value for the paging queue in the CELL.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.9 Mean duration of a successful Paging Procedure

A. This measurement provides the arithmetic mean duration of a successful Paging procedure, i.e. from transmission of the page request towards the MS and receipt of a positive response.

B. CC.

C. An accumulation is performed for the time taken by each Paging procedure during the granularity period and an arithmetic mean is taken from the observed values. The measured time will be between Transmission of a "PAGING REQUEST" service request to Receipt of "PAGING RESPONSE" service confirmation (GSM 04.08 [2]).

D. meanDurationOfSuccPagingProcs.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.10 Number of Time Slots Available for Traffic (Prevoiusly TCHs)

A. This measurement provides the number of TS which are available for use by either CS or PS traffic(including those which are actually in use).

B. GAUGE.

C. The gauge will be incremented when the TS becomes available and decremented when it becomes unavailable. The TS is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of TS with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled", (GSM 04.08 [2]).

D. nbrOfAvailableTCHs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.11 Mean number of busy Time Slots Occupied by Circuit Traffic

A. This measurement provides the arithmetic mean number of TS which are simultaneously in use for CS traffic (TCHs).

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of TS which are carrying circuit traffic (TCHs) and then taking the arithmetic mean (GSM 04.08 [2]).

D. meanNbrOfBusyTCHs.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.12 Maximum number of busy Time Slots Occupied by Circuit Traffic

A. This measurement provides the highest recorded value for the number of TS simultaneously in use for Circuit switched traffic.

B. GAUGE.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of TSs which are "busy", and then taking the maximum of all such values at the end of the granularity period. A TS is

busy between an "ASSIGNMENT COMPLETE" Message and the complementary "RELEASE" Message, (GSM 04.08 [2]).

D. maxNbrOfBusyTCHs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.13 Mean number of idle Time Slots per interference band (Previously TCHs)

A. This measurement provides the arithmetic mean of the number of idle TS per interference band. The TS is said to be idle if it can be allocated for a request. Idle TS are allocated in five classes (GSM 05.01) depending on the measured interference level.

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of idle TS per interference band and then taking the arithmetic mean (GSM 04.08 [2]).

D. meanNbrOfIdleTCHsPerInterferenceBand.

E. A real value per interference band.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.14 Attempted Time Slots seizures (Previously TCHs)

A. This measurement provides the number of attempted TS seizures.

B. CC.

C. Transmission of "ASSIGNMENT COMMAND" Message to the MS, (GSM 04.08 [2]).

D. attTCHSeizures.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.15 Successful TCH/PDTCH seizures (Previously TCHs)

A. This measurement provides the number of successful TCH/PDTCH seizures.

B. CC.

C. Receipt of "ASSIGNMENT COMPLETE" Message from the MS, (GSM 04.08 [2]).

D. succTCHSeizures.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit and packet switching.

B.2.1.16 Attempted TCH Seizures meeting an TCH blocked state

A. This measurement provides the number of attempted TCH seizures meeting all busy TCH state.

B. CC.

C. Receipt of "SETUP" Message from the MS meeting all TCH busy state (GSM 04.08 [2]).

D. attTCHSeizuresMeetingTCHBlockedState.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.17 All Available TCH Allocated Time

A. This measurement provides the accumulated time during the granularity period when all available Time slots available for CS traffic were in use or otherwise unavailable to be allocated.

B. CC.

C. Each time segment represents the elapsed time from the last available TS being allocated to the next occurrence of a release of a TCH, so making it available for allocation. The allocation event can be for any reason e.g. new call, Handover and is represented by an "ASSIGNMENT COMPLETE" Message. These time segments are accumulated to give a single total (GSM 04.08 [2]).

D. allAvailableTCHAllocatedTime.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.18 Mean busy time of allocated CS Time Slots

A. This measurement provides the arithmetic mean of the busy time of the maximum number of Time slots allocated for CS TCHs in a CELL,.

B. SI.

C. This measurement is obtained by accumulating each Timeslots busy time. A TS is considered busy when it carries one or more TCHs, i.e. between an "ASSIGNMENT COMPLETE" Message and the complementary "RELEASE" Message for those TCHs. All values are added up and divided by the number of TS (maximum allocated for circuit on this Cell) at the end of the granularity period to obtain the arithmetic mean. (Further information can be found in GSM 04.08 [2]).

D. meanTCHBusyTime.

E. A single real value

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.19 Mean TCH queue length

A. This measurement provides the arithmetic mean of the number of queued TCH assignment procedures.

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the TCH queue length and then taking the arithmetic mean (GSM 04.08 [2]).

D. meanTCHQueueLength.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.20 Number of lost Radio links while using a TCH

A. This measurement provides the number of calls terminated due to RF failure on the radio path.

B. CC.

C. A local end release due to a "RADIO LINK FAILURE" experienced by the BTS when using a TCH (GSM 05.08 [4]).

D. nbrOfLostRadioLinksTCH.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.21 Number of Available SDCCHs

A. This measurement provides the number of SDCCHs which are available to be used (including those actually in use).

B. GAUGE.

C. The gauge will be incremented when the SDCCH becomes available and decremented when it becomes unavailable. The SDCCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of SDCCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled", (GSM 04.08 [2]).

D. nbrOfAvailableSDCCHs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.22 Mean number of busy SDCCHs

A. This measurement provides the arithmetic mean of the number of SDCCHs which are simultaneously in use.

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the SDCCHs which are busy and then taking the arithmetic mean (GSM 04.08 [2]).

D. meanNbrOfBusySDCCHs.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.23 Maximum number of busy SDCCHs

A. This measurement provides the highest recorded value for the number of SDCCHs simultaneously in use.

B. GAUGE.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of SDCCHs which are "busy", and then taking the maximum of all such values at the end of the granularity period, (GSM 04.08 [2]).

D. maxNbrOfBusySDCCHs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.24 Attempted SDCCH Seizures meeting an SDCCH blocked state

A. This measurement provides the number of attempted SDCCH seizures meeting all busy SDCCH state.

B. CC.

C. Receipt of "CHANNEL REQUEST" Message from the MS sent on the RACH meeting all SDCCH busy state (GSM 04.08 [2]).

D. attSDCCHSeizuresMeetingSDCCHBlockedState.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.25 All Available SDCCH Allocated Time

A. This measurement provides the accumulated time during the granularity period when all available SDCCHs are in use or otherwise unavailable to be allocated.

B. CC.

C. Each time segment represents the elapsed time from the last available SDCCH being allocated to the next occurrence of a release of a SDCCH, so making it available for allocation. The allocation event can be for any reason e.g. new call, Handover, and is represented by a SABM Message. These time segments are accumulated to give a single total (GSM 04.08 [2]).

D. allAvailableSDCCHAllocatedTime.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.26 Mean SDCCH queue length

A. This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the SDCCH.

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the SDCCH queue length and then taking the arithmetic mean (GSM 04.08 [2]).

D. meanSDCCHQueueLength.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.27 Number of lost Radio links while using an SDCCH

A. This measurement provides the number of RF failure while using the SDCCH.

B. CC.

C. A local end release, due to a "RADIO LINK FAILURE", experienced by the BTS when using an SDCCH (GSM 08.58 [6]).

D. nbrOfLostRadioLinksSDCCH.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.28 Relative time downlink power control at maximum

A. This measurement provides the time downlink power control was running at maximum level for the busy TCHs over the measured period, relative to the total TCH busy time.

B. CC.

C. Each time segment represents the elapsed time when BS_TXPWR_MAX is at maximum for each busy TCH. These time segments are accumulated to give a single total. From this information a value is derived such that it reflects a percentage of the total channel busy time, (GSM 05.08 [4]).

D. relativeTimeDLPowerControlAtMax.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.29 Relative time uplink power control at maximum

A. This measurement provides the time uplink power control was running at maximum level for the seized TCHs over the measured period, relative to the total TCH busy time.

B. CC.

C. Each time segment represents the elapsed time when MS_TXPWR_MAX is at maximum for each busy TCH. These time segments are accumulated to give a single total. From this information a value is derived such that it reflects a percentage of the total channel busy time, (GSM 05.08 [4]).

D. relativeTimeULPowerControlAtMax.

E. A single real value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.30 Successful Internal Handovers, intra-CELL

A. This measurement provides the number of times a call moves from the occupied channel of the CELL to another free channel of the same CELL.

B. CC.

C. Transmission of "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succInternalHDOsIntraCell.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.31 Unsuccessful Internal Handovers, intra-CELL

A. This measurement provides the number of unsuccessful intra CELL Handovers, i.e. an attempt was made to move a call .from the occupied channel of the CELL to another free channel of the same CELL.

B. CC.

C. Receipt of "ASSIGNMENT FAILURE" Message for the attempted handover (GSM 04.08 [2]).

D. unsuccInternalHDOsIntraCell.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.32 Attempted incoming Internal inter CELL Handovers

A. This measurement provides the number of attempted incoming Handovers into the observed CELL from the related adjacent CELLs controlled by the same BSC, further information can be found in GSM 04.08 [2], 08.08 [5] and 08.58 [6].

B. CC.

C. An occurrence of a BSC internal event, depending on Handover algorithm.

D. attIncomingInternalInterCellHDOs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.33 Successful incoming Internal inter CELL Handovers

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the related adjacent CELLs controlled by the same BSC.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succIncomingInternalInterCellHDOs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.34 Attempted outgoing Internal inter CELL Handovers

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by the same BSC.

B. CC.

C. Transmission of a "HANDOVER COMMAND" Message (GSM 08.08 [5]).

D. attOutgoingInternalInterCellHDOs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.35 Successful outgoing Internal inter CELL Handovers

A. This measurement provides the number of successful outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by the same BSC.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succOutgoingInternalInterCellHDOs.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.36 Unsuccessful Internal Handovers with reconnection to old channels

A. This measurement provides the number of unsuccessful Handovers (with reconnection to the original channels), for the observed CELL.

B. CC.

C. Receipt of "HANDOVER FAILURE" Message received for the attempted handover (GSM 04.08 [2]).

D. unsuccHDOsWithReconnection.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.37 Unsuccessful Internal Handovers with loss of connection

A. This measurement provides the number of unsuccessful Handovers that end in loosing the speech channel, for the observed CELL.

B. CC.

C. Expiry of timer T3103 for Inter CELL Handovers and Expiry of timer T3107 for Intra CELL Handovers (GSM 04.08 [2]).

D. unsuccHDOsWithLossOfConnection.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for circuit switching.

B.2.1.38 Number of Available PDCH

A. This measurement provides the current number of PDCHs which are available to be used (including those actually in use).

B. GAUGE.

C. The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D. availablePDCH

E. A single integer value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.39 Mean Number of Available PDCH

A. This measurement provides the mean number of PDCHs which are available to be used (including those actually in use) over the measured period.

B. GAUGE.

C. The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D. meanNbrAvailablePDCH

E. A single integer value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.40 Maximum Number of Available PDCH

A. This measurement provides the maximum number of PDCHs which are available to be used (including those actually in use) over the measured period.

B. GAUGE.

C. The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D. maxNbrAvailablePDCH

E. A single integer value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.41 Minimum Number of Available PDCH

A. This measurement provides the minimum number of PDCHs which are available to be used (including those actually in use) over the measured period.

B. GAUGE.

C. The gauge will be incremented when the PDCH becomes available and decremented when it becomes unavailable. The PDCH is available when its administrative state is "unlocked" or "shuttingdown" and the operational state is "enabled", and is unavailable when its administrative state changes to "locked" or operational state changes to "disabled". The gauge value equals the number of PDCHs with an administrative state of "unlocked" or "shuttingdown" and an operational state of "enabled".

D. minNbrAvailablePDCH

E. A single integer value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.42 Mean number of occupied PDCHs

A. This measurement provides the arithmetic mean number of occupied PDCHs.

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of PDCHs which are carrying packet traffic and then taking the arithmetic mean (GSM 04.60 [23]).

D. meanNbrOfOccPDCHs.

E. A single real value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.43 Maximum number of occupied PDCHs

A. This measurement provides the highest recorded value for the number occupied by PDCHs..

B. GAUGE.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the maximum number of PDCHs which are carrying packet traffic. (GSM 04.60 [23]).

D. maxNbrOfOccPDCHss.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.44 Minimum number of occupied PDCHs

A. This measurement provides the lowest recorded value for the number of occupied PDCHs.

B. GAUGE.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the maximum number of PDCHs which are carrying packet traffic. (GSM 04.60 [23]).

D. minNbrOfOccPDCHss.

E. A single integer value

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.45 All available PDCH allocated time

A. This measurement gives the total amount of time in the granularity period, where all PDCHs were allocated.

B. SI

C. This time is computed with starting time when the last PDCH is assigned and the end time when a PDCH is first released.

D. availablePDCHAllocatedTime

E. A single integer value.

F. CELL Measurement Function

G. Valid for packet switching.

B.2.1.46 Transmission of Packet Paging Messages on the PCCCH

A. This measurement provides the number of Packet Paging messages transmitted over PCCCH(these are counted as attempts).

B. CC.

C. Transmission of "PACKET PAGING REQUEST" (GSM 04.60 [23]).

D. nbrPacketPagingMessagesPCHOnPCCCH.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.47 Mean PPCH-PAGCH queue length on PCCCH

A. This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the PPCH-PAGCH sub channel on the PCCCH.

B. SI.

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the PPCH-PAGCH queue length and then taking the arithmetic mean (GSM 04.60 [23]).

D. meanPPCHPAGCHQueueLengthOnPCCCH.

E. A single real value.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.48 Number of Packet Pages Discarded from the PPCH Queue on PCCCH

A. This measurement provides the number of Packet Paging messages which are discarded from the PPCH queue before they could be transmitted on PCCCH.

B. CC.

C. Pages can be discarded from the queues (assuming queuing is in operation) for a number of reasons, including queue overflow, priority insertion in the queue causing an overflow and in-queue timer expiry (GSM 04.60 [23]).

D. nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH.

E. An integer value for the paging queue in the CELL.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.49 Number of Packet Channel Assignment Requests, per cause

A. This measurement provides the number of packet channel assignment requests, per cause.

B. CC.

C. Receipt of "PACKET CHANNEL REQUEST" message sent from the MS on the PRACH or by the "CHANNEL REQUEST" message sent on the RACH.. Note, the establishment causes are: defined in (GSM 04.08 [2]) for channel request message and (GSM 04.60[ ] for the packet channel request message.

D. attPCReqAssPerCause.

E. An integer value per cause.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.50 Successful Packet Channel Assignment Procedures, per cause

A. This measurement provides the number of successful packet channel assignment procedures, per cause. Note: A packet channel assignment is considered successful when either the "PACKET UPLINK ASSIGNMENT" message or the "IMMEDIATE ASSIGNMENT COMMAND" message is sent.

B. CC.

C. Transmission of "IMMEDIATE ASSIGN COMMAND" message on the AGCH or the "PACKET UPLINK ASSIGNMENT" message on the PAGCH. Note, If the message contains assignment information for two mobiles (GSM 04.60 [23]). If the establishment cause is identical for the two mobile stations, the counter shall be incremented by two. Otherwise the affected counters shall be incremented by one.

NOTE: System implementation will allow these establishment causes to be incorporated into B 2.1.7.

D. succPDTCHAssProcsPerCause.

E. An integer value per cause.

F. CELL Measurement Function.

G. Valid for packet switching.

B.2.1.51 Successful PDTCH seizures

A. This measurement provides the number of successful PDTCH seizures.

B. CC.

C. Receipt of the first RLC Block (PDU) on the PDTCH from the MS, (GSM 04.60 [23]).

D. succPDTCHSeizures.

E. A single integer value.

F. CELL Measurement Function.

G. Valid for Packet switching.

B.2.1.52 Mean PDTCH queue length

A. This measurement provides the arithmetic mean of the number of all messages waiting for transmission on the PDTCH.

B. CC

C. This measurement is obtained by sampling at a predefined interval (System design), , the PDTCH queue length and then taking the arithmetic mean.

D. meanPacketQueueLength

E. A single real value

F. CELL Measurement function

G. Valid for packet switching

B.2.1.53 Number of service upgrades/downgrades

A. With service upgrade and downgrade it is meant a switch from the used coding scheme (CS1, CS2, ...) to another one. This measurement counts the number of these upgrades / downgrades per cell.

B. CC

C. The Trigger Event is a Service upgrade or downgrade for the observed object.

D. nbrOfServiceChanges

E. A single integer value for Upgrades and a single integer value for downgrades

F. CELL Measurement function

G. Valid for packet switching

B.2.2 Internal HDO Measurement Function

This measurement function allows Internal Handover information per observed CELL to be collected on a per adjacent originating or target CELL basis. This is achieved by specifying the adjacent originating or target CELL identity as parameter when initiating the Measurement Function.

B.2.2.1 Attempted incoming Internal inter CELL Handovers per originating CELL

A. This measurement provides the number of attempted incoming Handovers into the observed CELL from the specified adjacent originating CELL, controlled by this BSC, further information can be found in GSM 04.08 [2], 08.08 [5] and 08.58 [6].

B. CC.

C. An occurrence of a BSC internal event, depending on Handover algorithm.

D. attIncomingInternalInterCellHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. Internal HDO Measurement Function.

G. Valid for circuit switching.

B.2.2.2 Successful incoming Internal inter CELL Handovers per originating CELL

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the specified adjacent originating CELL controlled by this BSC.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succIncomingInternalInterCellHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. Internal HDO Measurement Function.

G. Valid for circuit switching.

B.2.2.3 Attempted outgoing Internal inter CELL Handovers per target CELL

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the specified adjacent target CELL controlled by this BSC.

B. CC.

C. Transmission of a "HANDOVER COMMAND" Message (GSM 04.08 [2]).

D. attOutgoingInternalInterCellHDOsPerTargetCell.

E. A single integer value for the observed CELL to the target CELL.

F. Internal HDO Measurement Function.

G. Valid for circuit switching.

B.2.2.4 Successful outgoing Internal inter CELL Handovers per target CELL

A. This measurement provides the number of successful outgoing Handovers from the observed CELL to the specified adjacent target CELL controlled by this BSC.

B. CC.

C. Transmission of a "HANDOVER PERFORMED" Message to the MSC (GSM 08.08 [5]).

D. succOutgoingInternalInterCellHDOsPerTargetCell.

E. A single integer value for the observed CELL to the target CELL.

F. Internal HDO Measurement Function.

G. Valid for circuit switching.

B.3 Measurements Related to the MSC

B.3.1 MSC Measurement Function

B.3.1.1 Number of class mark updates

A. This measurement provides the number of classmark updates received from the BSS at the MSC.

B. CC.

C. Receipt of "CLASSMARK UPDATE" Message (GSM 08.08 [5]).

D. nbrOfClassMarkUpdates.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.2 Attempted mobile originating calls

A. This measurement provides the number of call attempts for mobile originating traffic.

B. CC.

C. Receipt of "CM_SERV_REQ" Message from the originating MS, with service type set to originating call establishment (GSM 04.08 [2]).

D. attMobileOriginatingCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.3 Successful mobile originating calls

A. This measurement provides the number of successful calls for mobile originating traffic.

B. CC.

C. Receipt of "ASSIGNMENT COMPLETE" Message from the originating MS, for the requested mobile originating call (GSM 08.08 [5]). Note, the "ALERTING" Message from GSM 04.08 [2] is not used as the implementation of it is optional.

D. succMobileOriginatingCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.4 Answered mobile originating calls

A. This measurement provides the number of answered calls for mobile originating traffic.

B. CC.

C. Receipt of "CONNECT ACKNOWLEDGE" Message from the originating MS, for the requested mobile originating call (GSM 04.08 [2]).

D. ansMobileOriginatingCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.5 Attempted mobile terminating calls

A. This measurement provides the number of call attempts for mobile terminating traffic.

B. CC.

C. Transmission of "SETUP" Message to the called MS, for the requested mobile terminating call (GSM 04.08 [2]).

D. attMobileTerminatingCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.6 Successful mobile terminating calls

A. This measurement provides the number of successful calls for mobile terminating traffic.

B. CC.

C. Receipt of "ASSIGNMENT COMPLETE" Message from the called MS, for the requested mobile terminating call (GSM 08.08 [5]). Note, the "ALERTING" Message from GSM 04.08 [2] is not used as the implementation of it is optional.

D. succMobileTerminatingCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.7 Answered mobile terminating calls

A. This measurement provides the number of answered calls for mobile terminating traffic.

B. CC.

C. Transmission of "CONNECTION ACKNOWLEDGE" Message to the called MS, for the requested mobile terminating call (GSM 04.08 [2]).

D. ansMobileTerminatingCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.8 Attempted Mobile Emergency calls

A. This measurement provides the number of emergency call attempts.

B. CC.

C. Receipt of "CM_SERV_REQ" Message from the originating MS, with service indicator set to emergency call (GSM 04.08 [2]).

D. attMobileEmergencyCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.9 Successful Mobile Emergency calls

A. This measurement provides the number of successful emergency calls.

B. CC.

C. Receipt of "ASSIGNMENT COMPLETE" Message from the originating MS, for the requested emergency call (GSM 08.08 [5]). Note, the "ALERTING" Message from GSM 04.08 [2] is not used as the implementation of it is optional.

D. succMobileEmergencyCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.10 Answered Mobile Emergency calls

A. This measurement provides the number of answered emergency calls.

B. CC.

C. Receipt of "CONNECTION ACKNOWLEDGE" Message from the originating MS, for the requested emergency call (GSM 04.08 [2]).

D. ansMobileEmergencyCalls.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.11 Attempted ciphering mode control procedures

A. This measurement provides the number of ciphering mode control procedures transmitted (these are counted as attempts).

B. CC.

C. Transmission of "CIPHER MODE COMMAND" (GSM 08.08 [5]).

D. attCipheringModeControlProcs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.12 Successful ciphering mode control procedures

A. This measurement provides the number of successful ciphering mode control procedures.

B. CC.

C. Receipt of "CIPHER MODE COMPLETE" Message (GSM 08.08 [5]).

D. succCipheringModeControlProcs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.13 Attempted interrogations of HLRs for routing

A. This measurement provides the number of HLR interrogations by the GMSC with the purpose of routing incoming calls (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_SEND_ROUTING_INFORMATION" service request (GSM 09.02 [7]).

D. attInterrogationOfHLRsForRouting.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.14 Successful interrogations of HLR (MSRN obtained)

A. This measurement provides the number of successful HLR interrogations, where MSRN is obtained.

B. CC.

C. Receipt of "MAP_SEND_ROUTING_INFORMATION" service confirmation containing a "MSRN" parameter value (GSM 09.02 [7]).

D. succInterrogationOfHLRsMSRNObtained.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.15 Successful interrogations of HLR (call Forwarding)

A. This measurement provides the number of successful HLR interrogations, by the GMSC for call forwarding.

B. CC.

C. Receipt of "MAP_SEND_ROUTING_INFORMATION" service confirmation containing a "Forwarding Data" parameter value (GSM 09.02 [7]).

D. succInterrogationOfHLRsCallForwarding.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.16 Attempted operations for mobile originating point to point SMs

A. This measurement provides the number of operations for mobile originating point to point short messages (these are counted as attempts).

B. CC.

C. Receipt of "RP-DATA" Message (GSM 04.11 [3]).

D. attOpForMobileOriginatingPointToPointSMs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.17 Successful operations for mobile originating point to point SMs

A. This measurement provides the number of successful operations for mobile originating point to point short messages.

B. CC.

C. Transmission of "RP-ACK" Message (GSM 04.11 [3]).

D. succOpForMobileOriginatingPointToPointSMs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.18 Attempted operations for mobile terminating point to point SMs

A. This measurement provides the number of operations for mobile terminating point to point short messages (these are counted as attempts).

B. CC.

C. Transmission of "RP-DATA" Message (GSM 04.11 [3]).

D. attOpForMobileTerminatingPointToPointSMs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.19 Successful operations for mobile terminating point to point SMs

A. This measurement provides the number of successful operations for mobile terminating point to point short messages.

B. CC.

C. Receipt of "RP-ACK" Message (GSM 04.11 [3]).

D. succOpForMobileTerminatingPointToPointSMs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.20 Number of transmitted check IMEI request

A. This measurement provides the number of check IMEI request sent from MSC to the EIR.

B. CC.

C. Transmission of "MAP_CHECK_IMEI" service request (GSM 09.02 [7]).

D. nbrOfTransCheckIMEIRequests.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.21 Number of white answers in MSC

A. This measurement provides the number of white answers received from the EIR.

B. CC.

C. Receipt of "MAP_CHECK_IMEI" service confirmation containing an "equipment status" referring to white listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfWhiteAnsInMSC.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.22 Number of grey answers in MSC

A. This measurement provides the number of grey answers received from the EIR.

B. CC.

C. Receipt of "MAP_CHECK_IMEI" service confirmation containing an "equipment status" referring to grey listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfGreyAnsInMSC.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.23 Number of black answers in MSC

A. This measurement provides the number of black answers received from the EIR.

B. CC.

C. Receipt of "MAP_CHECK_IMEI" service confirmation containing an "equipment status" referring to black listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfBlackAnsInMSC.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.24 Number of unknown IMEI answers

A. This measurement provides the number of unknown IMEI answers received from the EIR.

B. CC

C. Receipt of "MAP_CHECK_IMEI" service confirmation with a parameter "user error" referring to unknown equipment (GSM 09.02 [7]).

D. nbrOfUnknownIMEIAnsInMSC.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.25 Mean time to provide the CALL SETUP service

A. This measurement provides the arithmetic mean of the time to provide the CALL SETUP service to a requesting MS.

B. DER.

C. This measurement is obtained by accumulating the time intervals between "SETUP" and the corresponding "ASSIGNMENT COMPLETE" messages over a granularity period using DER. This end value of the time will

then be divided by the number of call set-ups observed in the granularity period to give the arithmetic mean (GSM 04.08 [2], GSM 08.08 [5]).

D. meanTimeToCallSetupService.

E. A single real value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.26 Mean time to provide the LOCATION UPDATING service

A. This measurement provides the arithmetic mean of the time to provide the LOCATION UPDATING service to an MS changing Location area.

B. DER.

C. This measurement is obtained by accumulating the time interval between "LOCATION UPDATING REQUEST" and the corresponding "LOCATION UPDATING ACCEPT" Message over a granularity period using DER. This end value of the time will then be divided by number of Location Updating requests observed in the granularity period to give the arithmetic mean (GSM 04.08 [2]).

D. meanTimeToLocationUpdateService.

E. A single real value.

F. MSC Measurement Function.

G. Valid for circuit and packet switching.

B.3.1.27 Transactions on the MM-layer where subscriber was identified with TMSI

A. This measurement provides the number of transactions on the MM-layer where the mobile subscriber was identified with his TMSI.

B. CC.

C. Any MM-layer transaction which causes the MS to be identified with his TMSI (GSM 04.08 [2]) i.e. CM_Re-establishment, CM_Service request, Identity response, IMSI detach indication, Location updating accept, Location updating request, TMSI re-allocation command.

D. transSubIdentifiedWithTMSI.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.28 Transactions on the MM-layer where subscriber was identified with IMSI

A. This measurement provides the number of transactions on the MM-layer where the mobile subscriber was identified with his IMSI.

B. CC.

C. Any MM-layer transaction which causes the MS to be identified with his IMSI (GSM 04.08 [2]), i.e. CM_Re-establishment, CM_Service request, Identity response, IMSI detach indication, Location updating accept, Location updating request, TMSI re-allocation command.

D. transSubIdentifiedWithIMSI.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.29 Attempted TMSI re-allocations

A. This measurement provides the number of TMSI re-allocation, invoked either explicitly as part of TMSI re-allocation procedure or implicitly as part of Location Update procedure.

B. CC.

C. Transmission of "TMSI REALLOCATION COMMAND" Message, or a "LOCATION UPDATING ACCEPT" Message where the MS is identified with TMSI (GSM 04.08 [2]).

D. attTMSIReallocations.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.30 Successful TMSI re-allocations

A. This measurement provides the number of successfully performed TMSI re-allocations.

B. CC.

C. Receipt of "TMSI REALLOCATION COMPLETE" Message (GSM 04.08 [2]).

D. succTMSIReallocations.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.31 IMSI detach procedures

A. This measurement provides the number of IMSI procedures that involve a detach within one MSC area, (see BSC Measurement Function for IMSI attach procedures)

B. CC.

C. Receipt of "IMSI DETACH INDICATION" Message from the MS (GSM 04.08 [2]).

D. imsiDetachProcs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit and packet switching.

B.3.1.32 IMSI attach procedures

A. This measurement provides the number of IMSI procedures that involve an attach within one MSC area.

B. CC.

C. Receipt of "LOCATION UPDATING REQUEST" Message from the MS, indicating an IMSI attach, (GSM 04.08 [2]) (see MSC Measurement Function for IMSI detach procedures).

D. imsiAttachProcs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching and packet switched.

B.3.1.33 Attempted incoming External intra-MSC Handovers

A. This measurement provides the number of attempted incoming Handovers into the observed CELL from the related adjacent CELLs controlled by this MSC.

B. CC.

C. Transmission of a "HANDOVER REQUEST" Message to the BSC (GSM 08.08 [5]).

D. attIncomingExternalIntraMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.34 Successful incoming External intra-MSC Handovers

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the related adjacent CELLs controlled by this MSC.

B. CC.

C. Receipt of a "HANDOVER COMPLETE" Message from the BSC (GSM 08.08 [5]).

D. succIncomingExternalIntraMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.35 Attempted outgoing External intra-MSC Handovers

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by this MSC (only first attempt shall be counted).

B. CC.

C. Receipt of a "HANDOVER REQUIRED" Message from the BSC (GSM 08.08 [5]).

D. attOutgoingExternalIntraMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.36 Successful outgoing External intra-MSC Handovers

A. This measurement provides the number of successful outgoing Handovers from the observed CELL to the related adjacent CELLs controlled by this MSC, further information can be found in GSM 04.08 [2], 08.08 [5], and 08.58 [6].

B. CC.

C. Completion of release procedure for the involved channel.

D. succOutgoingExternalIntraMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.37 Attempted incoming inter-MSC Handovers

A. This measurement provides the number of attempted incoming Handovers into the observed CELL from the related adjacent CELLs NOT controlled by this MSC.

B. CC.

C. Receipt of a "MAP_PERFORM_HANDOVER" service indication with target CELL identity equal to the observed CELL (GSM 09.02 [7]).

D. attIncomingInterMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.38 Successful incoming inter-MSC Handovers

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the related adjacent CELLs NOT controlled by this MSC.

B. CC.

C. Receipt of a "MAP_SEND_END_SIGNAL" service confirmation (GSM 09.02 [7]).

D. succIncomingInterMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.39 Attempted outgoing inter-MSC Handovers

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the related adjacent CELLs NOT controlled by this MSC.

B. CC.

C. Transmission of a "MAP_PERFORM_HANDOVER" service request (GSM 09.02 [7]).

D. attOutgoingInterMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.40 Successful outgoing inter-MSC Handovers

A. This measurement provides the number of successful outgoing Handovers from the observed CELL to the related adjacent CELLs NOT controlled by this MSC.

B. CC.

C. Transmission of "MAP_SEND_END_SIGNAL" service response (GSM 09.02 [7]).

D. succOutgoingInterMSCHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.41 Attempted subsequent inter-MSC Handovers (back to MSCa)

A. This measurement provides the number of attempted subsequent inter-MSC Handovers, where the call is handed back to the anchor MSC (MSCa), i.e. the first hand over takes place from MSCa to MSCb then subsequently an attempt is made to hand back to MSCa.

B. CC.

C. Receipt of "MAP_PERFORM_SUBSEQUENT_HANDOVER" service indication with target MSC identity equal to MSCa (GSM 09.02 [7]).

D. attSubsequentInterMSCHDOsMSCa.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.42 Successful subsequent inter-MSC Handovers (back to MSCa)

A. This measurement provides the number of successful subsequent inter-MSC Handovers, where the call is handed back to the anchor MSC (MSCa). i.e. the first hand over takes place from MSCa to MSCb then the call is subsequently successfully handed back to MSCa.

B. CC.

C. Transmission of "MAP_SEND_END_SIGNAL" service response (Handover to MSCa) (GSM 09.02 [7]).

D. succSubsequentInterMSCHDOsMSCa.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.43 Attempted subsequent inter-MSC Handovers (to MSCc)

A. This measurement provides the number of attempted subsequent inter-MSC Handovers, where the call is handed over to MSCc, i.e. the first hand over takes place from MSCa to MSCb then subsequently an attempt is made to hand over to MSCc.

B. CC.

C. Receipt of "MAP_PERFORM_SUBSEQUENT_HANDOVER" service indication, with target MSC identity equal to MSCc (GSM 09.02 [7]).

D. attSubsequentInterMSCHDOsMSCc.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.44 Successful subsequent inter-MSC Handovers (to MSCc)

A. This measurement provides the number of successful subsequent inter-MSC Handovers, where the call is handed over to MSCc, i.e. the first hand over takes place from MSCa to MSCb then the call is subsequently successfully handed over to MSCc.

B. CC.

C. Transmission of "MAP_SEND_END_SIGNAL" service response (Handover to MSCc) (GSM 09.02 [7]).

D. succSubsequentInterMSCHDOsMSCc.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.45 External Handovers

A. This measurement provides the number of attempted MSC controlled Handovers.

B. CC.

C. Receipt of a "HANDOVER REQUIRED" Message (GSM 08.08 [5]).

D. externalHDOs.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.46 External Handovers per cause

A. This measurement provides the number of attempted MSC controlled Handovers, per cause.

B. CC.

C. Receipt of a "HANDOVER REQUIRED" Message (GSM 08.08 [5]).

D. externalHDOsPerCause.

E. An integer value per cause.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.47 Unsuccessful External Handovers with reconnection to old channels, per MSC

A. This measurement provides the number of unsuccessful Handovers with reconnection to the original channels (TCH & SDCCH), on a per MSC basis.

B. CC.

C. Receipt of: "HANDOVER FAILURE" Message for the attempted handover (GSM 08.08 [5]).

D. unsuccExternHDOsWithReconnectionPerMSC.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.1.48 Unsuccessful External Handovers with loss of connection, per MSC

A. This measurement provides the number of unsuccessful Handovers, with loss of the call, on a per MSC basis.

B. CC.

C. Receipt of "CLEAR REQUEST" Message for the requested Handover (GSM 08.08 [5]).

D. unsuccExternHDOsWithLossOfConnectionPerMSC.

E. A single integer value.

F. MSC Measurement Function.

G. Valid for circuit switching.

B.3.2 External HDO Measurement Function

This measurement function allows external Handover information per observed CELL to be collected on a per adjacent originating or target CELL basis. For the external Handovers both the observed CELL and the adjacent originating or target CELL identity has to be specified as the parameter when initiating the Measurement Function.

B.3.2.1 Attempted incoming External intra-MSC Handovers per originating CELL

A. This measurement provides the number of attempted incoming Handovers into the observed CELL from the specified adjacent originating CELL, controlled by this MSC.

B. CC.

C. Transmission of a "HANDOVER REQUEST" Message to the BSC (GSM 08.08 [5]).

D. attIncomingExternalIntraMSCHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.3.2.2 Successful incoming External intra-MSC Handovers per originating CELL

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the specified adjacent originating CELL, controlled by this MSC.

B. CC.

C. Receipt of a "HANDOVER COMPLETE" Message from the BSC (GSM 08.08 [5]).

D. succIncomingExternalIntraMSCHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.3.2.3 Attempted outgoing External intra-MSC Handovers per target CELL

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the specified adjacent target CELL, controlled by this MSC (only first attempt shall be counted).

B. CC.

C. Receipt of a "HANDOVER REQUIRED" Message from the BSC (GSM 08.08 [5]).

D. attOutgoingExternalIntraMSCHDOsPerTargetCell.

E. A single integer value for the observed CELL to the target CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.3.2.4 Successful outgoing External intra-MSC Handovers per target CELL

A. This measurement provides the number of successful outgoing Handovers from the observed CELL to the specified adjacent target CELL, controlled by this MSC, further information can be found in GSM 04.08 [2], 08.08 [5], and 08.58 [6].

B. CC.

C. Completion of release procedure for the involved channel.

D. succOutgoingExternalIntraMSCHDOsPerTargetCell.

E. A single integer value for the observed CELL to the target CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.3.2.5 Attempted incoming inter-MSC Handovers per originating CELL

A. This measurement provides the number of attempted incoming Handovers into the observed CELL from the specified adjacent originating CELL, NOT controlled by this MSC.

B. CC.

C. Receipt of a "MAP_PERFORM_HANDOVER" service indication with target CELL identity equal to the observed CELL (GSM 09.02 [7]).

D. attIncomingInterMSCHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.3.2.6 Successful incoming inter-MSC Handovers per originating CELL

A. This measurement provides the number of successful incoming Handovers into the observed CELL from the specified adjacent originating CELL, NOT controlled by this MSC.

B. CC.

C. Receipt of a "MAP_SEND_END_SIGNAL" service confirmation (GSM 09.02 [7]).

D. succIncomingInterMSCHDOsPerOriginatingCell.

E. A single integer value for the observed CELL from the originating CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.3.2.7 Attempted outgoing inter-MSC Handovers per target CELL

A. This measurement provides the number of attempted outgoing Handovers from the observed CELL to the specified adjacent target CELL, NOT controlled by this MSC.

B. CC.

C. Transmission of a "MAP_PERFORM_HANDOVER" service request (GSM 09.02 [7]).

D. attOutgoingInterMSCHDOsPerTargetCell.

E. A single integer value for the observed CELL to the target CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.3.2.8 Successful outgoing inter-MSC Handovers per target CELL

A. This measurement provides the number of successful outgoing Handovers from the observed CELL to the specified adjacent target CELL, NOT controlled by this MSC.

B. CC.

C. Transmission of "MAP_SEND_END_SIGNAL" service response (GSM 09.02 [7]).

D. succOutgoingInterMSCHDOsPerTargetCell.

E. A single integer value for the observed CELL to the target CELL.

F. External HDO Measurement Function.

G. Valid for circuit switching.

B.4 Measurements Related to the HLR

B.4.1 HLR Measurement Function

B.4.1.1 Number of current MS's Roaming outside HPLMN

A. This measurement provides the current number of home subscribers roaming outside HPLMN.

B. GAUGE.

C. The gauge is updated (increased or decreased) on receipt of a "MAP_UPDATE_LOCATION" service indication in the HLR(GSM 09.02 [7]).

D. nbrOfCurrentMSsRoamingOutsideHPLMN.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.2 Attempted requests for Authentication sets received by HLR

A. This measurement provides the number of requests for Authentication sets received by the HLR (these are counted as attempts).

B. CC.

C. Receipt of an "MAP_SEND_AUTHENTICATION_INFO" service indication requesting Authentication sets (parameter "AuthenticationSetKind" present GSM 09.02 [7]).

D. attReqForAuthSetsReceivedByHLR.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.3 Successful returned Authentication sets from HLR

A. This measurement provides the number of successful requests for Authentication sets from the HLR.

B. CC.

C. Transmission of an "MAP_SEND_AUTHENTICATION_INFO" service response containing Authentication sets (parameter "AuthenticationSetList" present GSM 09.02 [7]).

D. succReturnedAuthSetsFromHLR.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.4 Empty responses to request for Authentication sets from HLR

A. This measurement provides the number of empty responses sent in response to requests for Authentication sets (the implication is that the destination node will have to reuse old Authentication sets).

B. CC.

C. Transmission of an "MAP_SEND_AUTHENTICATION_INFO" service response, no Authentication sets present (GSM 09.02 [7]).

D. emptyResponsesForAuthSetsFromHLR.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.5 Attempted insert subscriber data service

A. This measurement provides the number of insert subscriber data services sent (these are counted as attempts).

B. CC.

C. Transmission of "MAP_INSERT_SUBSCRIBER_DATA" service request (GSM 09.02 [7]).

D. attInsertSubDataService.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.6 Successful insert subscriber data service

A. This measurement provides the number of successful insert subscriber data services sent.

B. CC.

C. Receipt of "MAP_INSERT_SUBSCRIBER_DATA" service indication without "user error" parameter value (GSM 09.02 [7]).

D. succInsertSubDataService.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.7 Attempted Location Updates

A. This measurement provides the number of Location Updates to be performed by the HLR (these are counted as attempts).

B. CC.

C. Receipt of "MAP_UPDATE_LOCATION" service indication (GSM 09.02 [7]).

D. attLocationUpdate.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.8 Successful Location Updates

A. This measurement provides the number of successfully performed Location Updates in the HLR,.

B. CC.

C. Transmission of "MAP_UPDATE_LOCATION" service response without "user error" parameter value (GSM 09.02 [7]).

D. succLocationUpdate.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.9 Attempted SS related operations in HLR

A. This measurement provides the number of attempted SS related operations.

B. CC.

C. Receipt of a MAP service indication of: registerSS, eraseSS, activateSS, deactivateSS, registerPassword, interrogateSS, processSSrequest operations in the HLR, (GSM 09.02 [7]).

D. attSSRelatedOperationsInHLR.

E. A single integer value per SS operation.

F. HLR Measurement Function.

G. Valid for circuit switching.

B.4.1.10 Successful SS related operations in HLR

A. This measurement provides the number of successful SS related operations.

B. CC.

C. Transmission of MAP service response to: registerSS, eraseSS, activateSS, deactivateSS, registerPassword, interrogateSS, processSSrequest operations in the HLR without "user error" parameter (GSM 09.02 [7]).

D. succSSRelatedOperationsInHLR.

E. A single integer value per SS operation.

F. HLR Measurement Function.

G. Valid for circuit switching.

B.4.1.11 Attempted request for SM routing information

A. This measurement provides the number of requests for short Message routing information (these are counted as attempts).

B. CC.

C. Receipt of "MAP_SEND_ROUTING_INFO_FOR_SM" service indication (GSM 09.02 [7]).

D. attReqForSMRoutingInfo.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.12 Successful request for SM routing information

A. This measurement provides the number of successful requests for short Message routing information.

B. CC.

C. Transmission of "MAP_SEND_ROUTING_INFO_FOR_SM" service response without "user error" parameter (GSM 09.02 [7]).

D. succReqForSMRoutingInfo.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.13 Attempted SM delivery status report procedures

A. This measurement provides the number of requests to set Message waiting data into HLR or to inform HLR of successful SM transfer after polling (these are counted as attempts).

B. CC.

C. Receipt of "MAP_REPORT_SM_DELIVERY_STATUS" service indication (GSM 09.02 [7]).

D. attSMDeliveryStatusReportProcs.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.14 Successful SM delivery status report procedures

A. This measurement provides the number of successful requests to set Message waiting data into HLR or to inform HLR of successful SM transfer after polling.

B. CC.

C. Transmission of "MAP_REPORT_SM_DELIVERY_STATUS" service response without "user error" parameter value (GSM 09.02 [7]).

D. succSMDeliveryStatusReportProcs.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.15 Attempted number of send alerts

A. This measurement provides the number of transmissions of send alerts (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_ALERT_SERVICE_CENTRE" service request (GSM 09.02 [7]).

D. attNbrOfSendAlerts.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.16 Successful number of send alerts

A. This measurement provides the successful transmissions of send alerts.

B. CC.

C. Receipt of a "MAP_ALERT_SERVICE_CENTRE" service confirmation without "user error" parameter value (GSM 09.02 [7]).

D. succNbrOfSendAlerts.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit and packet switching.

B.4.1.17 Attempted request for MSRN

A. This measurement provides the number of requests for MSRN from the VLR (these are counted as attempts).

B. CC.

C. Transmission of "MAP_PROVIDE_ROAMING_NUMBER" service request (GSM 09.02 [7]).

D. attReqForMSRN.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit switching.

B.4.1.18 Successful request for MSRN

A. This measurement provides the successful responses for allocations of MSRN received from the VLR.

B. CC.

C. Receipt of "MAP_PROVIDE_ROAMING_NUMBER" service confirmation without "user error" parameter value (GSM 09.02 [7]).

D. succReqForMSRN.

E. A single integer value.

F. HLR Measurement Function.

G. Valid for circuit switching.

B.5 Measurements Related to the VLR

B.5.1 VLR Measurement Function

B.5.1.1 Attempted MS memory available notifications

A. This measurement provides the number of times a VLR informs the HLR that a MS is available for receiving short messages once again (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_READY_FOR_SM" service request (GSM 09.02 [7]).

D. attMSMemoryAvailableNotifications.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.2 Successful MS memory available notifications

A. This measurement provides the number of times a VLR successfully informs the HLR that a MS is available for receiving short messages once again.

B. CC.

C. Receipt of "MAP_READY_FOR_SM" service confirmation without "user error" parameter value (GSM 09.02 [7]).

D. succMSMemoryAvailableNotifications.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.3 Attempted Identification requests to PVLRs

A. This measurement provides the number of identification information requests to the PVLR for subscribers registering afresh in this VLR (these are counted as attempts).

B. CC.

C. Transmission of "MAP_SEND_IDENTIFICATION" service request (GSM 09.02 [7]).

D. attIdentificationReqToPVLRs.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.4 Successful Identification requests to PVLRs

A. This measurement provides the number of successful identification requests to the PVLR for subscriber registering afresh in this VLR.

B. CC.

C. Receipt of "MAP_SEND_IDENTIFICATION" service confirmation without "user error" parameter value (GSM 09.02 [7]).

D. succIdentificationReqToPVLRs.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.5 Attempted page requests

A. This measurement provides the number of page requests (these are counted as attempts).

B. CC.

C. Transmission of "MAP_PAGE" service request (GSM 09.02 [7]).

D. attPageReqs.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.6 Successful page requests

A. This measurement provides the number of successful page requests.

B. CC.

C. Receipt of "MAP_PAGE" service confirmation without a "user error" parameter value (GSM 09.02 [7]).

D. succPageReqs.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.7 Attempted page requests per Location Area

A. This measurement provides the number of page requests per Location Area (these are counted as attempts).

B. CC.

C. Transmission of "MAP_PAGE" service request (GSM 09.02 [7]).

D. attPageReqsPerLocationArea.

E. An integer value per Location Area.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.8 Successful page requests per Location Area

A. This measurement provides the number of successful page requests per Location Area.

B. CC.

C. Receipt of "MAP_PAGE" service confirmation without a "user error" parameter value (GSM 09.02 [7]).

D. succPageReqsPerLocationArea.

E. An integer value per Location Area.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.9 Attempted requests for Authentication sets sent to HLR by VLRs

A. This measurement provides the number of requests to the HLR by the VLR for Authentication sets (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_SEND_AUTHENTICATION_INFO" service request, requesting Authentication sets (parameter "AuthenticationSetKind" present GSM 09.02 [7]).

D. attReqForAuthSetsSentToHLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.10 Successful received Authentication sets from HLR to VLRs

A. This measurement provides the number of successful requests for Authentication sets from the HLR to the VLR.

B. CC.

C. Receipt of a "MAP_SEND_AUTHENTICATION_INFO" service confirmation, containing requested Authentication sets parameter "AuthenticationSetList" present (GSM 09.02 [7]).

D. succReceivedAuthSetsFromHLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.11 Empty responses to request for Authentication sets from HLR to VLRs

A. This measurement provides the number of empty responses received by the VLR in response to requests for Authentication sets (the implication is that the VLR will have to reuse old Authentication sets).

B. CC.

C. Receipt of a "MAP_SEND_AUTHENTICATION_INFO" service confirmation, no Authentication sets present (GSM 09.02 [7]).

D. emptyResponsesForAuthFromHLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.12 Attempted authentication procedures in VLR

A. This measurement provides the number of authentication requests which are sent to the MSC (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_AUTHENTICATE" service request (GSM 09.02 [7]).

D. attAuthProcsInVLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.13 Successful authentication procedures in the VLR

A. This measurement provides the number of successful authentication procedures in the VLR.

B. CC.

C. Receipt of a "MAP_AUTHENTICATE" service confirmation, where the received SRES parameter value matches value stored in the Location register (GSM 09.02 [7]).

D. succAuthProcsInVLR.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.14 Attempted intra-VLR Location Updates

A. This measurement provides the number of Location Updates, between Location areas of the same VLR (these are counted as attempts).

B. CC.

C. Receipt of "MAP_UPDATE_LOCATION_AREA" service indication, with previous Location Area identification parameter referring to the Location Area identity of the same VLR (GSM 09.02 [7]).

D. attIntraVLRLocationUpdates.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.15 Successful intra-VLR Location Updates

A. This measurement provides the successful Location Updates between Location Areas of the same VLR.

B. CC.

C. Transmission of "MAP_UPDATE_LOCATION_AREA" service response without "user error" parameter value, for attempted intra-VLR Location Update (GSM 09.02 [7]).

D. succIntraVLRLocationUpdates.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.16 Attempted inter-VLR Location Updates

A. This measurement provides the number of Location Updates between Location Areas of different VLR (these are counted as attempts).

B. CC.

C. Receipt of "MAP_UPDATE_LOCATION_AREA" service indication, with previous Location Area identification parameter referring to the Location Area identity of the different VLR, or no previous VLR identity (GSM 09.02 [7]).

D. attInterVLRLocationUpdates.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.17 Successful inter-VLR Location Updates

A. This measurement provides the number of successful Location Updates between Location Areas of different VLRs.

B. CC.

C. Transmission of "MAP_UPDATE_LOCATION_AREA" service response without "user error" parameter value, for attempted inter-VLR Location Update (GSM 09.02 [7]).

D. succInterVLRLocationUpdates.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.5.1.18 Arrivals of Visitors from other PLMNs

A. This measurement provides the number of arrivals of visitors from other PLMNs i.e. exclude own MS's returning to HPLMN. This measurement has to be taken in each VLR of the HPLMN to get the total.

B. CC.

C. Receipt of "MAP_UPDATE_LOCATION_AREA" service indication, the previous Location of the subscriber was another PLMN (GSM 09.02 [7]).

D. arrivalOfVisitorsFromOtherPLMNs.

E. A single integer value.

F. VLR Measurement Function.

G. Valid for circuit switching.

B.6 Measurements Related to the EIR

B.6.1 EIR Measurement Function

B.6.1.1 Number of received IMEI check requests

A. This measurement provides the number of IMEI check requests received by the EIR.

B. CC.

C. Receipt of "MAP_CHECK_IMEI" service indication (GSM 09.02 [7]).

D. nbrOfReceivedIMEICheckReqs.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.6.1.2 Number of white answers in EIR

A. This measurement provides the number of white answers transmitted by the EIR.

B. CC.

C. Transmission of "MAP_CHECK_IMEI" service response containing an "equipment status" referring to a white listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfWhiteAnsInEIR.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.6.1.3 Number of grey answers in EIR

A. This measurement provides the number of grey answers transmitted by the EIR.

B. CC.

C. Transmission of "MAP_CHECK_IMEI" service response containing an "equipment status" referring to a grey listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfGreyAnsInEIR.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.6.1.4 Number of black answers in EIR

A. This measurement provides the number of black answers transmitted by the EIR.

B. CC.

C. Transmission of "MAP_CHECK_IMEI" service response containing an "equipment status" referring to a black listed equipment (GSM 09.02 [7] and GSM 02.16 [1]).

D. nbrOfBlackAnsInEIR.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.6.1.5 Number of unknown IMEI answers

A. This measurement provides the number of unknown IMEI answers transmitted by the EIR.

B. CC

C. Transmission of "MAP_CHECK_IMEI" service response containing a parameter "user error" referring to a unknown equipment (GSM 09.02 [7]).

D. nbrOfUnknownIMEIAnsInEIR.

E. A single integer value.

F. EIR Measurement Function.

G. Valid for circuit and packet switching.

B.7 Measurements Related to the SMS IWMSC/GMSC

B.7.1 SMS Measurement Function

B.7.1.1 Attempted mobile originating SM Forwarding

A. This measurement provides the number of attempted short Message forwarding handeled by the interworking MSC.

B. CC.

C. Receipt of "MAP_FORWARD_SHORT_MESSAGE" service indication (GSM 09.02 [7]).

D. attMobileOriginatingSMForwardings.

E. A single integer value.

F. SMS Measurement Function.

G. Valid for circuit and packet switching.

B.7.1.2 Successful mobile originating SM Forwarding

A. This measurement provides the number of successful short Message forwarding handeled by the interworking MSC.

B. CC.

C. Transmission of "MAP_FORWARD_SHORT_MESSAGE" service response without a "user error" parameter value (GSM 09.02 [7]).

D. succMobileOriginatingSMForwardings.

E. A single integer value.

F. SMS Measurement Function

G. Valid for circuit and packet switching.

B.7.1.3 Attempted Mobile Terminating SM Forwarding

A. This measurement provides the number of short messages forwarding from SMS-GMSC to the service node, MSC or SGSN (these are counted as attempts).

B. CC.

C. Transmission of a "MAP_FORWARD_SHORT_MESSAGE" service request (GSM 09.02 [7]).

D. attMobileTerminatingSMForwardings.

E. A single integer value.

F. SMS Measurement Function.

G. Valid for circuit and packet switching.

B.7.1.4 Successful Mobile Terminating SM Forwarding

A. This measurement provides the number of successful of short Message forwarding from SMS-GMSC to the service node, MSC or SGSN.

B. CC.

C. Receipt of a "MAP_FORWARD_SHORT_MESSAGE" service response without a "user error" parameter value (GSM 09.02 [7]).

D. succMobileTerminatingSMForwardings.

E. A single integer value.

F. SMS Measurement Function.

G. Valid for circuit and packet switching.

B.8 Measurements Related to the SGSN

B.8.1 SGSN Measurement Function

B.8.1.1 LLC Measurements

B.8.1.1.1 Number of LLC frames sent

A. This measurement provides the number of LLC frames sent by the SGSN.

B. CC

C. Transmission of LLC frame to a peer entity GSM TS 04.64 [24].

D. nbrLlcFramesSent

E. A single integer value.

F. SGSN Measurement Function

G. Valid for packet switching.

B.8.1.1.2 Number of LLC frames Received

A. This measurement provides the number of received LLC frames by the SGSN.

B. CC

C. Receipt of a LLC frames from a peer entity and before any error checking(GSM TS 04.64).

D. nbrLlcFramesReceived

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.1.3 Erroneously received LLC frames detected by SGSN

A. This measurement provides the number of erroneously received LLC frames in case of error detection in the SGSN (uplink transmission, SGSN).

B. CC

C. Discard of a received frame in the SGSN, GSM TS 04.64 [24].

D. errLlcFramesDetectedBySgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.1.4 Number of Retransmitted LLC frames in Acknowledge Mode

A. This measurement provides the number of retransmitted LLC frames in LLC acknowledge mode, detected in the MS and signalled to the SGSN (downlink transmission, MS).

B. CC

C. Receipt of a NACK or SACK frame from the peer entity (MS), GSM TS 04.64 [24].

D. retransmittedLlcFramestoMs

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.2 SNDCP Measurements

B.8.1.2.1 Number of received SNDCP N-PDUs

A. This measurement provides the number of incoming N-PDUs received by the SNDCP protocol.

B. CC

C. Receipt of the "SN-DATA.ind" or "SN-UNITDATA.ind" primitive, GSM TS 04.65 [25].

D. uplinkSndcpNpduReceived

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.2.2 Number of received SNDCP N-PDU octets

A. This measurement provides the number of octets in incoming N-PDUs received by the SNDCP protocol layer.

B. CC

C. Receipt of the "SN-DATA.ind" or "SN-UNITDATA.ind" primitive,GSM TS 04.65 [25].

D. uplinkSndcpOctetReceivedMode

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.2.3 Number of sent SNDCP N-PDUs

A. This measurement provides the number of outgoing N-PDUs sent by the SNDCP protocol layer.

B. CC

C. Sent of the "SN-DATA.req" and "SN-UNITDATA.ind" primitive(GSM TS 04.65).

D. downlinkSndcpNpduSent

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.2.4 Number of sent SNDCP N-PDU octets

A. This measurement provides the number of octets in outgoing N-PDUs sent by the SNDCP protocol layer.

B. CC

C. Sent of the "SN-DATA.req" and "SN-UNITDATA.ind" primitive(GSM TS 04.65).

D. downlinkSndcpOctetSent

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.3 BSSGP Measurements

FFS, to be defined.

B.8.1.4 MM Measurements

B.8.1.4.1 Attempted GPRS attach procedures

A. This measurement provides the number of attempted GPRS attach procedures initiated within this SGSN area.

B. CC

C. Receipt of "ATTACH REQUEST" message from the MS, indicating a GPRS attach(GSM 04.08).

D. attGprsAttach

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.2 Successful GPRS attach procedures

A. This measurement provides the number of successfully performed GPRS attach procedures within this SGSN area.

B. CC

C. Transmission of a "ATTACH ACCEPT" message to the MS, indicating a GPRS only attached (GSM 04.08).

D. succGprsAttach

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.3 Attempt of combined GPRS/IMSI attach procedures

A. This measurement provides the number of attempt of combined GPRS/IMSI attach procedures initiated within this SGSN area.

B. CC

C. Receipt of "ATTACH REQUEST" message from the MS, indicating combined GPRS/IMSI attach(GSM 04.08).

D. attCombiAttach

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.4 Successfully combined GPRS/IMSI attach procedures

A. This measurement provides the number of successfully completed of Combined GPRS/IMSI attach procedures initiated within this SGSN area.

B. CC

C. Transmission of "ATTACH ACCEPT" message to the MS, indicating combined GPRS/IMSI attach(GSM 04.08).

D. succCombiAttach

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.5 Attempted GPRS attach procedures with IMSI already attached

A. This measurement provides the number of attempted GPRS attach procedures,while IMSI is already attached. The attempts initiated within this SGSN area are counted.

B. CC

C. Receipt of "ATTACH REQUEST" Message from the MS, indicating GPRS attach while IMSI attached(GSM 04.08).

D. attImsiAttach

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.6 Successful GPRS attach procedures with IMSI already attached

A. This measurement provides the number of successfully performed GPRS attach procedures,while IMSI is already attached. The attempts initiated within this SGSN area are counted.

B. CC

C Transmission of a "ATTACH ACCEPT" message to the MS, indicating a GPRS attach while IMSI attached (GSM 04.08).

D succImsiAttach

E A single integer value.

F. SGSN Measurement Function

G. Valid for packet switching.

B.8.1.4.7 Number of attached subscriber

A. This measurement provides the number of attached subscriber within this SGSN area.

B. GAUGE

C. The gauge will be incremented at transmission of a "ATTACH ACCEPT" message to the MS and will be decremented at transmission of a "DETACH ACCEPT" message to the MS (GSM 04.08).

D. nbrOfAttachedSub

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.8 Mean number of attached subscriber

A. This measurement provides the arithmetic mean of the number of attached subscriber within this SGSN area.

B. GAUGE

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of subscribers which are attached and then taking the arithmetic mean (GSM 04.08).

D. meanNbrOfAttachedSub

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.9 Maximum number of attached subscriber

A. This measurement provides the highest recorded value for the number of attached subscriber within this SGSN area.

B. GAUGE

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of subscriber which are "attached", and then taking the maximum of all such values at the end of the granularity period, (GSM 04.08).

D. maxNbrOfAttachedSub

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.10 Attempted GPRS detach procedures initiated by MS

A. This measurement provides the number of attempted GPRS detach procedures within this SGSN area.

B. CC

C. Receipt of "DETACH REQUEST" message from the MS, indicating a GPRS

detach(GSM 04.08).

D. attGprsDetachMs

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.11 Attempt of Combined GPRS/IMSI detach procedures initiated by MS

A. This measurement provides the number of attempted Combined GPRS/IMSI detach procedures MS-initiated within this SGSN area.

B. CC

C. Receipt of "DETACH REQUEST" message from the MS, indicating a Combined GPRS/IMSI detach(GSM 04.08).

D. attCombiDetachMs

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.12 Attempt of IMSI detach procedures initiated by MS

A. This measurement provides the number of attempted IMSI detach procedures MS-initiated within this SGSN area.

B. CC

C Receipt of "DETACH REQUEST" message from the MS, indicating a IMSI detach(GSM 04.08).

D. attImsiDetachMS

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.13 Attempted GPRS detach procedures initiated by SGSN

A. This measurement provides the number of attempted GPRS detach procedures initiated by SGSN.

B. CC

C. Transmission of a "DETACH REQUEST" message to the MS(GSM 04.08).

D. attGprsDetachSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.14 Successful GPRS detach procedures initiated by SGSN

A. This measurement provides the number of successfully completed GPRS detach procedures SGSN-initiated within this SGSN area.

B. CC

C. Receipt of "DETACH ACCEPT" message from the MS(GSM 04.08).

D. succGprsDetachSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.15 Attempted intra-SGSN Routing Area Update procedures initiated in this SGSN

A. This measurement provides the number of attempted intra-SGSN Routing Area Update procedures initiated within this SGSN area.

B. CC

C. Receipt of a "ROUTING AREA UPDATE REQUEST" message from the MS, where the old RA and the new RA are served by this SGSN(GSM 04.08).

D. attIntraSgsnRaUpdate

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.16 Successful intra-SGSN Routing Area Update procedures initiated in this SGSN

A. This measurement provides the number of successfully performed intra-SGSN Routing Area Update procedures initiated in this SGSN.

B. CC

C. Transmission of "ROUTING AREA UPDATE ACCEPT" message to the MS, GSM 04.08 [2].

D. succIntraSgsnRaUpdate

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.17 Attempted inter-SGSN Routing Area Update procedures initiated in this SGSN

A. This measurement provides the number of attempted inter-SGSN Routing Area Update procedures initiated in this SGSN, where the old RA is served by another SGSN, GSM 04.08 [2].

B. CC

C. Receipt of an "ROUTING AREA UPDATE REQUEST" message from the MS,GSM 04.08 [2].

D. attInterSgsnRaUpdate

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.4.18 Successful inter-SGSN Routing Area Update procedures initiated in this SGSN

A. This measurement provides the number of successfully completed inter-SGSN Routing Area Update procedures in this SGSN.

B CC

C. Receipt of a "ROUTING AREA UPDATE COMPLETE" message from the MS, GSM 04.08 [2]..

D. succInterSgsnRaUpdate

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5 Security

B.8.1.5.1 Attempted P-TMSI reallocation procedures

A. This measurement provides the number of attempted P-TMSI reallocation, or implicitly as part of the Location Updating, procedures in this SGSN.

B. CC

C. Transmission of "P-TMSI REALLOCATION COMMAND" message by the SGSN, GSM 04.08 [2].

D. attPTMSIRealloc

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.2 Successful P-TMSI reallocation procedures

A. This measurement provides the number of successfully performed P-TMSI reallocation procedures in this SGSN.

B. CC

C. Receipt of "P-TMSI REALLOCATION COMPLETE" message by the SGSN, GSM 04.08 [2].

D. succPTMSIRealloc

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.3 Attempted requests for authentication sets sent to HLR by SGSN

A. This measurement provides the number of number of attempted requests for authentication sets, sent to the HLR by SGSN, these are counted as attempts.

B. CC

C. Transmission of a "MAP SEND_AUTHENTICATION_INFO" service request, requesting authentication sets parameter "AuthenticationSetKind" present, GSM 09.02 [7] .

D. attReqAuthSetsSentToHlrBySgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.4 Successful requests for authentication sets to HLR

A. This measurement provides the number of successful requests for authentication sets that were sent from the HLR to the SGSN.

B. CC

C. Receipt of a "MAP SEND_AUTHENTICATION_INFO" service confirmation, containing requested authentication sets (parameter "AuthenticationSetList" present GSM 09.02 [7]

D. succReqAuthSetsHlr

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.5 Empty responses to the request for authentication sets to the HLR

A. This measurement provides the number of empty responses to the request for authentication sets that were sent to the HLR.

B: CC

C. Receipt of a "MAP_SEND_AUTHENTICATION_INFO " service confirmation, no Authentication sets present, GSM 09.02 [7]

D. emptyResponsesForAuthSetsFromHlr

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.6 Attempt of authentication procedures started by SGSN

A. This measurement provides the number of authentication procedures that are started within this SGSN area.

B. CC

C. Transmission of an "AUTHENTICATION AND CIPHERING REQUEST" message to the MS (GSM 04.08).

D. attAuthInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.7 Successful authentication procedures started by the SGSN

A. This measurement provides the number of successful authentication procedures within this SGSN area.

B. CC

C. Receipt of an "AUTHENTICATION AND CIPHERING RESPONSE" message from the MS, where the receipt SRES parameter value matches the value stored in the SGSN (GSM 04.08).

D. succAuthInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.8 Attempted Identity Request procedures

A. This measurement provides the number of attempted Identity Request procedures initiated by this SGSN.

B. CC

C. Transmission of an "IDENTITY REQUEST" message to the MS (GSM 04.08).

D. attIdentityReq

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.9 Successful Identity Request procedures

A. This measurement provides the number of successfully completed Identity Request procedures initiated by this SGSN.

B. CC

C. Receipt of an "IDENTITY RESPONSE" message with IMSI by the SGSN from the MS(GSM 04.08).

D. succIdentityReq

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.10 Attempted ciphering mode control procedures

A. This measurements provides the number of ciphering mode control procedures initiated in the SGSN.

B. CC

C. Transmission of "CIPHER MODE COMMAND" (GSM 08.08).

D. attCipheringModeControlPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.5.11 Successful ciphering mode control procedures

A. This measurement provides the number of successfully completed ciphering mode control procedures that were initiated in this SGSN.

B. CC

C. Receipt of "CIPHER MODE COMPLETE" Message (GSM 08.08).

D. succCipheringModeControlPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.6 State

B.8.1.6.1 Number of subscribers in the SGSN in STANDBY state.

A. This measurement provides the number of subscribers in 'STANDBY' state within this SGSN area.

B. GAUGE

C. Transition of a GPRS subscriber registered in the SGSN into / from the operational state 'STANDBY'.

D. nbrOfSubStandby

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.6.2 Mean number of subscribers in the SGSN in STANDBY state.

A. This measurement provides the arithmetic mean of the number of subscriber in 'STANDBY' state within this SGSN area.

B. SI

C. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of subscribers in the STANDBY state, and then taking the arithmetic mean.

D. meanNbrOfSubStandby

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.6.3 Maximum number of subscribers in the SGSN in STANDBY state.

A. This measurement provides the highest recorded value for number of subscribers in 'STANDBY' state within this SGSN area.

B. GAUGE

C. This measurement is obtained by comparing on an update of the actual number of subscribers in the STANDBY state, this value with the currently maximal value within the actual granularity period.

D. maxNbrOfSubStandby

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.6.4 Number of subscribers in the SGSN in READY state

A. This measurement provides the number of subscribers in 'READY' state within this

SGSN area.

B. GAUGE

C. Transition of a GPRS subscriber registered in the SGSN into / from the operational state 'READY'.

D. nbrOfSubReady

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.6.5 Mean number of subscribers in the SGSN in READY state

A. This measurement provides the arithmetic mean of the number of subscriber in 'READY' state within this SGSN area.

B. SI

C. This measurement is obtained by sampling at a pre-defined interval (System design), the number of subscribers in the READY state, and then taking the arithmetic mean.

D. meanNbrOfSubReady

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.6.6 Maximum number of subscribers in the SGSN in READY state

A. This measurement provides the highest recorded value for number of subscribers in 'READY' state within this SGSN area.

B. GAUGE

C. This measurement is obtained by comparing on an update of the actual number of subscribers in the READY state, this value with the currently maximal value within the actual granularity period.

D. maxNbrOfSubReady

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.7 Equipment

B.8.1.7.1 Number of transmitted check IMEI requests

A. This measurement provides the number of check IMEI requests sent to the EIR.

B. CC

C. Transmission of "MAP_IMEI_CHECK" service request (GSM 09.02 [7])

D. nbrOfCheckIMEIRequest

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.7.2 Number of white answers in SGSN

A. This measurement provides the number of white list answers received from the EIR.

B. CC

C. Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to the white listed equipment.(GSM 09.02, and GSM 02.16).

D. nbrOfWhiteAnswerInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.7.3 Number of grey answers in SGSN

A. This measurement provides the number of grey list answers received from the EIR.

B. CC

C. Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to the grey listed equipment.(GSM 09.02, and GSM 02.16)

D. nbrGreyAnswerInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.7.4 Number of black answers in SGSN

A. This measurement provides the number of black list answers received from the EIR.

B. CC

C. Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to the black listed equipment.(GSM 09.02, and GSM 02.16)

D. nbrOfBlackAnswerInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.7.5 Number of unknown IMEI answers

A. This measurement provides the number of unknown IMEI answers received from the EIR.

B. CC

C. Receipt of "MAP_IMEI_CHECK" service confirmation with parameter "equipment status" referring to unknown equipment.(GSM 09.02)

D. nbrOfUnknownAnswerInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.8 RRM Measurements

B.8.1.8.1 Attempt of packet switched paging procedures

A. This measurement provides the number of attempted packet switched paging procedures, for GPRS services, within this SGSN area. The initial paging procedures as well the repeated paging procedures are counted.

B. CC

C. Transmission of "GMM-PAGING.req" message (GSM 08.18).

D. attPacketSwitchingPaging

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.8.2 Unsuccessful packet switched paging procedures

A. This measurement provides the number of unsuccessfull packet switched paging (GPRS) procedures within this SGSN area, i.e. packed switching paging procedures that are re-started when the previous attempt has timed out.

B. CC

C. Receipt of timeout for the "GMM-PAGING.req" message (GSM TS 08.18).

D. unsuccPacketSwitchingPaging

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.8.3 Attempt of packet switched paging procedures per Routing Area

A. This measurement provides the number of attempted packet switched paging procedures, for GPRS services, within this Routing Area. The initial paging procedures as well the repeated paging procedures are counted.

B. CC

C. Transmission of "GMM-PAGING.req" message (GSM 08.18).

D. attPsPagingPerRoutingArea

E. A single integer value per Routing Area.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.8.4 Unsuccessful packet switched paging procedures per Routing Area

A. This measurement provides the number of unsuccessfull packet switched paging (GPRS) procedures within this Routing Area, i.e. packed switching paging procedures that are re-started when the previous attempt has timed out.

B. CC

C. Receipt of timeout for the "GMM-PAGING.req" message (GSM TS 08.18).

D. unsuccPsPagingPerRoutingArea

E. A single integer value per Routing Area.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9 SM Measurements

B.8.1.9.1 Attempted PDP context activation procedures initiated by MS

A. This measurement provides the number of attempted PDP context activation procedures. These include the static as well as the dynamic PDP addresses.

B. CC

C. Receipt of a "Activate PDP Context Request" message from the MS (GSM TS 04.08).

D. attActPdpContextMSPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.2 Successful PDP context activation procedures initiated by MS

A. This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully.

B. CC

C. Transmission of a "Activate PDP Context Accept" message to the MS (GSM TS 04.08).

D. succActPdpContextMSPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.3 Attempted dynamic PDP context activation procedures initiated by MS

A. This measurement provides the number of attempted PDP context activation requests where a dynamic PDP address is required to be used.

B. CC

C. Receipt of a "Activate PDP Context Request" message from the MS with an empty PDP address (GSM TS 04.08).

D. attActPdpContextDynMSPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.4 Successful dynamic PDP context activation procedures initiated by MS

A. This measurement provides the number of successfully completed PDP context activations where a dynamic PDP address is used.

B. CC

C. Transmission of a "Activate PDP Context Accept" message to the MS (GSM TS 04.08) when the PDP address has been dynamically assigned.

D. succActPdpDynContextDynMsPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.5 Attempted PDP context deactivation procedures initiated by the MS

A. This measurement provides the number of PDP context deactivation procedures.

B. CC

C. Receipt of a "Deactivate PDP Context Request" message from the MS (GSM TS 04.08)

D. attDeactPdpContextMsPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.6 Successful PDP context deactivation procedures initiated by the MS

A. This measurement provides the number of successfully completed PDP context deactivations. For these context deactivations, the GGSN is updated successfully (i.e. deletion of the PDP context).

B. CC

C. Transmission of a "Deactivate PDP Context Accept" message to the MS (GSM TS 04.08).

D. succDeactPdpContextMsPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.7 Attempted PDP context deactivation procedures initiated by the GGSN

A. This measurement provides the number of PDP context deactivation procedures initiated by the GGSN.

B. CC

C. Receipt of a "Delete PDP Context Request" message from the GGSN (GSM TS 09.60).

D. attDeactPdpContextGgsnPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.8 Successful PDP context deactivation procedures initiated by the GGSN

A. This measurement provides the number of successfully handled PDP context deactivations initiated by the GGSN. For these context deactivations, the MS has accepted the PDP context deactivation.

B. CC

C. Transmission of a "Delete PDP Context Response" message to the GGSN (GSM TS 09.60).

D. succDeactPdpContextGgsnPerSgsn

E. A single integer value.

F. SGSN Measurement Function.

G Valid for packet switching.

B.8.1.9.9 Number of subscribers with activated PDP context in SGSN

A. This measurement provides the number of mobile subscribers with activated PDP

context (i.e. subscribers that can send/receive GPRS packet data).

B. GAUGE

C. Addition of first PDP context or removal of last PDP context in SGSN location register for a perticular subscriber.

D. nbrSubsWithActivePdpInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.10 Mean number of subscribers with activated PDP context in SGSN

A. This measurement provides the arithmetic mean number value of subscribers that have activated PDP context (i.e. subscribers that can send/receive GPRS packet data).

B. SI

C. This measurement is obtained by sampling at a pre-defined interval (System design), the number of subscribers with activated PDP context in SGSN, and then taking the arithmetic mean.

D. meanSubsWithActivePdpInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.8.1.9.11 Maximum number of subscribers with activated PDP context in SGSN

A. This measurement provides the highest recorded value for number of subscribers with activated PDP contexts (i.e. subscribers that can send/receive GPRS packet data).

B. GAUGE

C. This measurement is obtained by comparing on an update of the actual number of subscribers with activated PDP context in SGSN, this value with the currently maximal value within the actual granularity period.

D. maxSubsWithActivePdpInSgsn

E. A single integer value.

F. SGSN Measurement Function.

G. Valid for packet switching.

B.9 Measurements Related to the GGSN

B.9.1 GGSN Measurement Function

B.9.1.1 Number of PDP context activation procedures initiated by the MS Per APN

A. This measurement provides the number of PDP context activation procedures initiated by the MS on a per APN of the GGSN.

B. CC

C. Receipt of a "Create PDP Context Request" message from the SGSN(GSM TS 09.60).

D. attActPdpContextPerApnOfGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.2 Successful PDP context activation procedures initiated by the MS Per APN

A. This measurement provides the number of successfully completed activation PDP context procedures initiated by the MS on a per APN of the GGSN.

B. CC

C. Transmission of "Create PDP Context Response" from GGSN (GSM TS 09.60).

D. succActPdpContextPerApnOfGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.3 Number of dynamic PDP context activation procedures initiated by the MS Per APN

A. This measurement provides the number of dynamic PDP context activation procedures initiated by the MS where a dynamic PDP address is requested on a per APN of the GGSN.

B. CC

C. Receipt of a "Create PDP Context Request" message MS with an empty PDP address (GSM TS 09.60).

D. attActPdpContextDynPerApnOfGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.4 Successful +dynamic PDP context activation procedures initiated by the MS Per APN

A. This measurement provides the number of successfully attempted dynamic PDP context activation procedures initiated by the MS where a dynamic PDP address is requested on a per APN of the GGSN.

B. CC

C. Transmission of "Create PDP Context Response" from GGSN (GSM TS 09.60) , the PDP address has been dynamically assigned.

D. succActPdpContextDynPerApnOfGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.5 Number of PDP context deactivation procedures initiated by the MS Per APN

A. This measurement provides the number of PDP context deactivation procedures initiated by the MS on a per APN of the GGSN.

B. CC

C. Receipt of a "Delete PDP Context Request" message from the SGSN (GSM TS 09.60)

D. attDeactPdpContextPerApnOfGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.6 Successful PDP context deactivation procedures initiated by the MS Per APN

A. This measurement provides the number of successfully completed PDP context deactivation procedures initiated by the MS on a per APN of the GGSN.

B. CC

C. Transmission of a "Delete PDP Context Response" message to the SGSN (GSM TS 09.60).

D. succDeactPdpContextPerApnOfGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.7 Number of PDP context deactivation procedures initiated by the GGSN Per APN

A. This measurement provides the number of PDP context deactivation procedures initiated by the GGSN, on a per APN of the GGSN.

B. CC

C. Transmission of a "Deactivate PDP Context Request" message to the SGSN (GSM TS 09.60).

D. attDeactPdpContextByGgsnPerApn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.8 Successful PDP context deactivation procedures initiated by the GGSN Per APN

A. This measurement provides the number of successfully completed PDP context deactivation procedures initiated by the GGSN, on a per APN of the GGSN.

B. CC

C. Receipt of "Delete PDP Context Response" message from the SGSN (GSM TS 09.60).

D. succDeactPdpContextByGgsnPerApn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.9 Number of active PDP context in GGSN Per APN

A. This measurement provides the number of active PDP context in this GGSN.

B. GAUGE

C. Addition or removal of a PDP context in GGSN.

D. nbrOfActivePdpContextsPerApnAtGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.10 Mean number of active PDP context in GGSN Per APN

A. This measurement is obtained by sampling at a pre-defined interval (System designed), the number of active PDP context in GGSN per APN, and then taking the arithmetic mean.

B. SI

C. Addition or removal of a PDP context in GGSN.

D. meanNbrOfActivePdpContextsPerApnAtGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

B.9.1.11 Maximum number of PDP context in GGSN Per APN

A. This measurement is obtained by comparing on an update of the actual number of active PDP context in GGSN per APN, this value with the currently maximal value within the actual granularity period.

B. GAUGE

C. Addition a PDP context in GGSN.

D. maxnbrOfActivePdpContextsPerApnAtGgsn

E. A single integer value.

F. GGSN Measurement Function.

G. Valid for packet switching.

Annex C (normative): Performance Measurement Object Model

This annex to GSM 12.04 comprises the Object Model for Performance Measurement to complement the high level Object Model in GSM 12.00 [8].

The whole management approach defined in GSM 12.00 [8] defines all entities of GSM network as managed functions. These are BSS, MSC, HLR etc. and one or more of these can be contained in managed element and each of these functions can contain it's own measurement function.

The SGSN and GGSN detailed, are additional to GSM 12.00 [8] due to the introduction of GPRS.

Model Structure and Content

The following measurement function model takes its basis from the proposed GSM 12.00 [8] high level model. Figure C.1: below shows the containment tree of all the measurement Object Classes. The formal GDMO definitions of the Managed Object Classes concerning measurement functions are described in this subclause, except the "log", which is described in annex D under data transfer requirements.

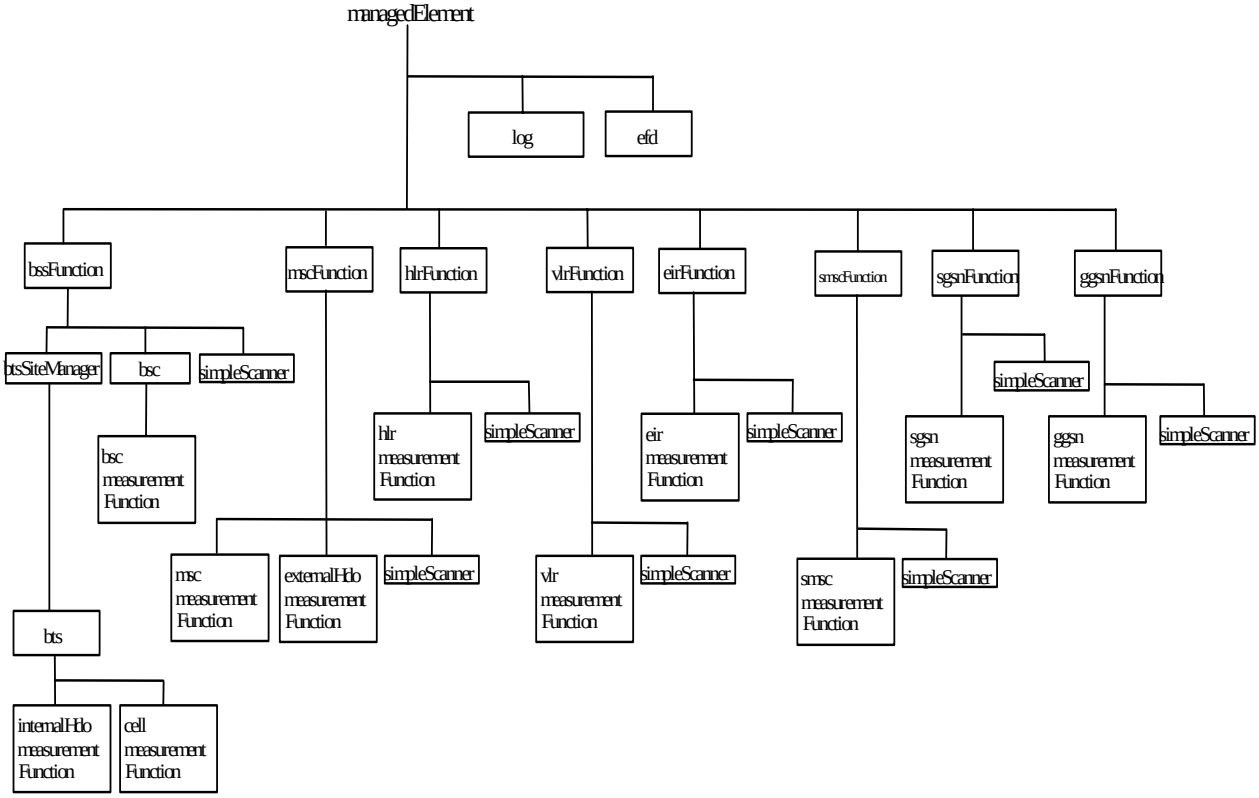


Figure C.1: GSM 12.04 Performance Measurement Object Class Containment

C.1 Measurement Managed Object Classes

C.1.1 object class from CCITT ISO

The object class used by the present document is the simple scanner, as defined in [ISO 10164-13]. Within the realm of the present document, each "simpleScanner" instance is only required to scan attributes of "measurementFunction" objects that are contained in the same "xxxFunction" object as the "simpleScanner" itself, where "xxx" stands for "bss", "msc", "hlr", "vlr", "eir", "sgsn", "ggsn" or "smsc", respectively (see containment tree diagram on previous page).

C.1.2 bscMeasurementFunction

bscMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
requestForServicePackage **PRESENT IF** "an instance supports it",
requestForServicePerCausePackage **PRESENT IF** "an instance supports it",
interArrivalTimePackage **PRESENT IF** "an instance supports it",
pagingMessagePerBSCPackage **PRESENT IF** "an instance supports it",
immediateAssignmentProceduresPerBSCPackage **PRESENT IF** "an instance supports it",
internalHandoversIntraCellPerBSCPackage **PRESENT IF** "an instance supports it",
internalHandoversPerBSCPackage **PRESENT IF** "an instance supports it",
internalHandoversPerCausePackage **PRESENT IF** "an instance supports it",
internalHandoverFailuresPerBSCPackage **PRESENT IF** "an instance supports it",
gprsPDUFlushReqPackage **PRESENT IF** "an instance supports it",
gprsPagingRequestPackage **PRESENT IF** "an instance
supports it",
gprsInterArrivalPackage **PRESENT IF** "an instance supports it";
REGISTERED AS {gsm1204managedobjectClass 121};

C.1.3 cellMeasurementFunction

cellMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
pchagchQueuePackage **PRESENT IF** "an instance supports it",
pagingMess
agePackage **PRESENT IF** "an instance supports it",
immediateAssignmentProceduresPackage **PRESENT IF** "an instance supports it",
immediateAssignmentProceduresPerCausePackage **PRESENT IF** "an instance supports it",
pageDiscardPackage **PRESENT IF** "an instance supports it",
durationOfPagingProceduresPackage **PRESENT IF** "an instance supports it",

tchAvailablePackage **PRESENT IF** "an instance supports it",
tchBusyPackage **PRESENT IF** "an instance supports it",
idleTCHsPerInterferenceBandPackage **PRESENT IF** "an instance supports it",
tchSeizuresPackage **PRESENT IF** "an instance supports it",
tchAllocatedTimePackage **PRESENT IF** "an instance supports it",
tchBusyTimePackage **PRESENT IF** "an instance supports it",
tchQueuePackage **PRESENT IF** "an instance supports it",
lostRadioLinksPerTCHPackage **PRESENT IF** "an instance supports it",
sdcchAvailablePackage **PRESENT IF** "an instance supports it",
sdcchBusyPackage **PRESENT IF** "an instance supports it",
sdcchSeizuresPackage **PRESENT IF** "an instance supports it",
sdcchAllocatedTimePackage **PRESENT IF** "an instance supports it",
sdcchQueuePackage **PRESENT IF** "an instance supports it",
lostRadioLinksPerSDCCHPackage **PRESENT IF** "an instance supports it",
downlinkPowerControlPackage **PRESENT IF** "an instance supports it",
uplinkPowerControlPackage **PRESENT IF** "an instance supports it",
internalHandoversIntraCellPackage **PRESENT IF** "an instance supports it",
incomingInternalInterCellHandoversPackage **PRESENT IF** "an instance supports it",
outgoingInternalInterCellHandoversPackage **PRESENT IF** "an instance supports it",
internalHandoverFailurePackage **PRESENT IF** "an instance supports it",
gprsPDCHAvailablePackage **PRESENT IF** "an instance supports it",
gprsPDCHOccupiedPackage **PRESENT IF** "an instance supports it",
gprsPDCHAllocatedPackage **PRESENT IF** "an instance supports it",
gprsPCCCHPagingPackage **PRESENT IF** "an instance supports it",
gprsPPCHQueueOnPCCCHPackage **PRESENT IF** "an instance supports it",
gprsPDTCHAssignmentPackage **PRESENT IF** "an instance supports it",
gprsPDTCHQueuePackage **PRESENT IF** "an instance supports it",
gprsCSChangePackage **PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 131};

C.1.4 internalHdoMeasurementFunction

internalHdoMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage,
internalHdoMeasurementFunctionPackage;
CONDITIONAL PACKAGES
incomingInternalInterCellPerCellHandoversPackage **PRESENT IF** "an instance supports it",
outgoingInternalInterCellPerCellHandoversPackage **PRESENT IF** "an instance supports it";
REGISTERED AS {gsm1204managedobjectClass 140};

internalHdoMeasurementFunctionPackage **PACKAGE**
BEHAVIOUR
internalHdoMeasurementFunctionBehaviour;
ATTRIBUTES
"gsm1220: 1993": adjacentCellId **GET;**
REGISTERED AS {gsm1204package 140};

internalHdoMeasurementFunctionBehaviour **BEHAVIOUR**
DEFINED AS
"This object is defined to contain the various optional measurement packages and will exist in multiple instances. Creation is only allowed if the value of the adjacent cell attribute is identical to the value of the adjacent cell attribute in one of the <HDO adjacent Cell> objects. There can be one or more instance(s) of the HDO measurement function for each created instance of <HDO adjacent cell> MOC. If the adjacent Cell Object is re-named or deleted during the lifetime of the internalHdoMeasurementFunction of its associated internalHdoMeasurementFunction then the corresponding internalHdoMeasurementFunction(s) is/are automatically deleted, as the adjacent Cell Attribute of the mesurementFunction shall not be changeable. The scanner may scan attributes of the object class in various combinations and permutations of packages, and further may scan simultaneously as many times as necessary within the processing limits of the network."
;

C.1.5 mscMeasurementFunction

mscMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
classMarkPackage **PRESENT IF** "an instance supports it",
mobileOriginatingCallsPackage **PRESENT IF** "an instance supports it",
mobileTerminatingCallsPackage **PRESENT IF** "an instance supports it",
mobileEmergencyCallsPackage **PRESENT IF** "an instance supports it",
cipheringModePackage **PRESENT IF** "an instance supports it",

interrogatingHLRPackage **PRESENT IF** "an instance supports it",
mobileOriginatingPointToPointSMPackage **PRESENT IF** "an instance supports it",
mobileTerminatingPointToPointSMPackage **PRESENT IF** "an instance supports it",
imeiRequestPackage **PRESENT IF** "an instance supports it",
whiteAnswersInMSCPackage **PRESENT IF** "an instance supports it",
greyAnswersInMSCPackage **PRESENT IF** "an instance supports it",
blackAnswersInMSCPackage **PRESENT IF** "an instance supports it",
unknownIMEIAnswersInMSCPackage **PRESENT IF** "an instance supports it",
callSetupServicePackage **PRESENT IF** "an instance supports it",
locationUpdatingServicePackage **PRESENT IF** "an instance supports it",
subscriberIdentifiedWithTMSIPackage **PRESENT IF** "an instance supports it",
subscriberIdentifiedWithIMSIPackage **PRESENT IF** "an instance supports it",
tmsiReallocationsPackage **PRESENT IF** "an instance supports it",
imsiDetachAttachProceduresPackage **PRESENT IF** "an instance supports it",
incomingExternalIntraMSCHandoversPackage **PRESENT IF** "an instance supports it",
outgoingExternalIntraMSCHandoversPackage **PRESENT IF** "an instance supports it",
incomingInterMSCHandoversPackage **PRESENT IF** "an instance supports it",
outgoingInterMSCHandoversPackage **PRESENT IF** "an instance supports it",
subsequentInterMSCHandoversToMACaPackage **PRESENT IF** "an instance supports it",
subsequentInterMSCHandoversToMACcPackage **PRESENT IF** "an instance supports it",
externalHandoversPackage **PRESENT IF** "an instance supports it",
externalHandoversPerCausePackage **PRESENT IF** "an instance supports it",
externalHandoverFailurePerMSCPackage **PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 150};

C.1.6 externalHdoMeasurementFunction

externalHdoMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage,
externalHdoMeasurementFunctionPackage;
CONDITIONAL PACKAGES

incomingExternalIntraMSCHandoversPerCellPackage **PRESENT IF** "an instance supports it",
outgoingExternalIntraMSCHandoversPerCellPackage **PRESENT IF** "an instance supports it",
incomingExternalInterMSCHandoversPerCellPackage **PRESENT IF** "an instance supports it",
outgoingExternalInterMSCHandoversPerCellPackage **PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 160};

externalHdoMeasurementFunctionPackage **PACKAGE**
BEHAVIOUR
externalHdoMeasurementFunctionBehaviour;
ATTRIBUTES
observedCell **GET,**
adjacentCell **GET;**
REGISTERED AS {gsm1204package 160} ;

externalHdoMeasurementFunctionBehaviour **BEHAVIOUR**
DEFINED AS
"This object is defined to contain the various optional measurement packages and will exist in multiple instances. It can only be instantiated if the cell attribute belongs to the msc area which is served by the msc function that contain the external HDO measurement function. The scanner may scan attributes of the object class in various combinations and permutations of packages, and further may scan simultaneously as many times as necessary within the processing limits of the network.";

C.1.7 hlrMeasurementFunction

hlrMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
msRoamingOutsideHPLMNPackage **PRESENT IF** "an instance supports it",
authenticationSetsHLRToVLRPackage **PRESENT IF** "an instance supports it",
insertSubscriberDataServicePackage **PRESENT IF** "an instance supports it",
locationUpdatePackage **PRESENT IF** "an instance supports it",
ssRelatedOperationsInHLRPackage **PRESENT IF** "an instance supports it",
requestForSMRoutingPackage **PRESENT IF** "an instance supports it",
smDeliveryStatusReportProceduresPackage **PRESENT IF** "an instance supports it",
sendAlertsPackage **PRESENT IF** "an instance supports it",
requestForMSRNPackage **PRESENT IF** "an instance supports it";
REGISTERED AS {gsm1204managedobjectClass 170};

C.1.8 vlrMeasurementFunction

vlrMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
msMemoryAvailableNotificationsPackage **PRESENT IF** "an instance supports it",
identificationRequestToPVLRPackage **PRESENT IF** "an instance supports it",
pageRequestPackage **PRESENT IF** "an instance supports it",
pageRequestPerLocationAreaPackage **PRESENT IF** "an instance supports it",
authenticationSetsVLRToHLRPackage **PRESENT IF** "an instance supports it",
authenticationInVLRPackage **PRESENT IF** "an instance supports it",
intraVLRLocationUpdatePackage **PRESENT IF** "an instance supports it",
interVLRLocationUpdatePackage **PRESENT IF** "an instance supports it",
visitorsFromOtherPLMNPackage **PRESENT IF** "an instance supports it";
REGISTERED AS {gsm1204managedobjectClass 180};

C.1.9 eirMeasurementFunction

eirMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
receivedIMEIcheckRequestPackage **PRESENT IF** "an instance supports it",
whiteAnswersInEIRPackage **PRESENT IF** "an instance supports it",
greyAnswersInEIRPackage **PRESENT IF** "an instance supports it",
blackAnswersInEIRPackage **PRESENT IF** "an instance supports it",
unknownIMEIAnswersInEIRPackage **PRESENT IF** "an instance supports it";
REGISTERED AS {gsm1204managedobjectClass 190};

C.1.10 smsMeasurementFunction

smsMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
mobileOriginatingSMForwardingPackage **PRESENT IF** "an instance supports it",

mobileTerminatingSMForwardingPackage **PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 1101};

C.1.11 sgsnMeasurementFunction

sgsnMeasurementFunction **MANAGED OBJECT CLASS**

DERIVED FROM

"Recommendation X.721: 1992": top;

CHARACTERIZED BY

basicMeasurementFunctionPackage;

CONDITIONAL PACKAGES

sgsnLLCPackage **PRESENT IF** "an instance supports it",

sgsnSNDCPPackage **PRESENT IF** "an instance supports it",

gprsAttachPackage **PRESENT IF** "an instance supports it",

gprsIMSIAttachPackage **PRESENT IF** "an instance supports it",

gprsIMSIAlreadyAttachedPackage **PRESENT IF** "an instance supports it",

gprsAttachedSubscribersPackage **PRESENT IF** "an instance supports it",

gprsMSDetachPackage **PRESENT IF** "an instance supports it",

gprsSGSNDetachPackage **PRESENT IF** "an instance supports it",

gprsRouting AreaUpdatePackage **PRESENT IF** "an instance supports it",

pTMSIReallocationPackage **PRESENT IF** "an instance supports it",

sgsnHLRAuthenticationPackage **PRESENT IF** "an instance supports it",

sgsnAuthenticationProcPackage **PRESENT IF** "an instance supports it",

sgsnIdentityRequestPackage **PRESENT IF** "an instance supports it",

sgsnCipheringModePackage **PRESENT IF** "an instance supports it",

gprsSubsStandbyStatePackage **PRESENT IF** "an instance supports it",

gprsSubsReadyStatePackage **PRESENT IF** "an instance supports it",

sgsnIMEICheckRequestsPackage **PRESENT IF** "an instance supports it",

whiteAnswersInSGSNPackage **PRESENT IF** "an instance supports it",

greyAnswersInSGSNPackage **PRESENT IF** "an instance supports it",

blackAnswersInSGSNPackage **PRESENT IF** "an instance supports it",

unknownIMEIAnswersInSGSNPackage **PRESENT IF** "an instance supports it",

sgsnPacketSwitched PagingPackage **PRESENT IF** "an instance supports it",

sgsnPacketSwitched PagingPerRAPackage **PRESENT IF** "an instance supports it",
sgsnPDPContextActivationByMSPackage **PRESENT IF** "an instance supports it",
sgsnDynamicPDPContextActivationByMSPackage **PRESENT IF** "an instance supports it",
sgsnPDPContextDeactivationByMSPackage **PRESENT IF** "an instance supports it",
sgsnPDPContextDeactivationByGGSNPackage **PRESENT IF** "an instance supports it",
subscriberPDPContextsInSGSNPackage **PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 1110};

C.1.12 ggsnMeasurementFunction

ggsnMeasurementFunction **MANAGED OBJECT CLASS**
DERIVED FROM
"Recommendation X.721: 1992": top;
CHARACTERIZED BY
basicMeasurementFunctionPackage;
CONDITIONAL PACKAGES
ggsnPDPContextActivationByMSPackage **PRESENT IF** "an instance supports it",
ggsnDynamicPDPContextActivationByMSPackage **PRESENT IF** "an instance supports it",
ggsnPDPContextDeactivationByMSPackage **PRESENT IF** "an instance supports it",
ggsnPDPContextDeactivationByGGSNPackage **PRESENT IF** "an instance supports it",
ActivePDPContextsAtGGSNPackage **PRESENT IF** "an instance supports it";

REGISTERED AS {gsm1204managedobjectClass 1120}

C.2 Measurement Package Definitions

The following describes the individual measurements defined in GSM 12.04, annex B, as packages of attributes to be referenced by the appropriate managed object class.

C.2.1 General Measurement Function Packages

C.2.1.1 basicMeasurementFunctionPackage

basicMeasurementFunctionPackage **PACKAGE**
BEHAVIOUR
generalMeasurementFunctionBehaviour;
ATTRIBUTES
measurementFunctionId **GET;**
NOTIFICATIONS
"Recommendation X.721: 1992": objectCreation,
"Recommendation X.721: 1992": objectDeletion;
REGISTERED AS {gsm1204package 211};

C.2.2 BSC Measurement Function Related Packages

C.2.2.1 requestForServicePackage

requestForServicePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
unsuccReqsForService **GET**;
REGISTERED AS {gsm1204package 221};

C.2.2.2 requestForServicePerCausePackage

requestForServicePerCausePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
unsuccReqsForServicePerCause **GET**;
REGISTERED AS {gsm1204package 222};

C.2.2.3 interArrivalTimePackage

interArrivalTimePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanInterArrivalTime **GET**;
REGISTERED AS {gsm1204package 223};

C.2.2.4 pagingMessagePerBSCPackage

pagingMessagePerBSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attTransOfPagingMessagesPerBSC **GET**,
unsuccTransOfPagingMessagesPerBSC **GET**;
REGISTERED AS {gsm1204package 224};

C.2.2.5 immediateAssignmentProceduresPerBSCPackage

immediateAssignmentProceduresPerBSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attImmediateAssingProcsPerBSC **GET**,
succImmediateAssingProcsPerBSC **GET**;
REGISTERED AS {gsm1204package 225};

C.2.2.6 internalHandoversIntraCellPerBSCPackage

internalHandoversIntraCellPerBSCPackage **PACKAGE**

BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
succInternalHDOsIntraCellPerBSC **GET**,
unsuccInternalHDOsIntraCellPerBSC **GET**;
REGISTERED AS {gsm1204package 226};

C.2.2.7 internalHandoversPerBSCPackage

internalHandoversPerBSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
succInternalHDOsPerBSC **GET**;
REGISTERED AS {gsm1204package 227};

C.2.2.8 internalHandoversPerCausePackage

internalHandoversPerCausePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
succInternalHDOsPerCause **GET**;
REGISTERED AS {gsm1204package 228};

C.2.2.9 internalHandoverFailuresPerBSCPackage

internalHandoverFailuresPerBSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
unsuccInternalHDOsWithReconnectionPerBSC **GET**,
unsuccInternalHDOsWithLossOfConnectionPerBSC **GET**;
REGISTERED AS {gsm1204package 229};

C.2.2.10 gprsPDUFlushReqPackage

gprsPDUFlushReqPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
FlushReqReceived **GET**;
REGISTERED AS {gsm1204package 2210};

C.2.2.11 gprsPagingRequestPackage

gprsPagingRequestPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
pagingReqReceivedfromSGSN **GET**;
REGISTERED AS {gsm1204package 2211};

C.2.2.12 gprsInterArrivalPackage

```
gprsInterArrivalPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanPSInterArrivalTime          GET;
REGISTERED AS {gsm1204package 2212};
```

C.2.3 CELL Measurement Function Related Packages

C.2.3.1 pchagchQueuePackage

```
pchagchQueuePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        meanPCHAGCHQueueLength                  GET;
REGISTERED AS {gsm1204package 231};
```

C.2.3.2 pagingMessagePackage

```
pagingMessagePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attTransOfPagingMessagesThePCH          GET,
        unsuccTransOfPagingMessagesThePCH       GET;
REGISTERED AS {gsm1204package 232};
```

C.2.3.3 immediateAssignmentProceduresPackage

```
immediateAssignmentProceduresPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attImmediateAssingProcs                 GET,
        succImmediateAssingProcs                GET;
REGISTERED AS {gsm1204package 233};
```

C.2.3.4 immediateAssignmentProceduresPerCausePackage

```
immediateAssignmentProceduresPerCausePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attImmediateAssingProcsPerCause         GET,
        succImmediateAssingProcsPerCause        GET;
REGISTERED AS {gsm1204package 234};
```

C.2.3.5 pageDiscardPackage

pageDiscardPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfPagesDiscardedFromPCHQueue **GET**;
REGISTERED AS {gsm1204package 235};

C.2.3.6 durationOfPagingProceduresPackage

durationOfPagingProceduresPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanDurationOfSuccPagingProcs **GET**;
REGISTERED AS {gsm1204package 236};

C.2.3.7 tchAvailablePackage

tchAvailablePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfAvailableTCHs **GET**;
REGISTERED AS {gsm1204package 237};

C.2.3.8 tchBusyPackage

tchBusyPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanNbrOfBusyTCHs **GET**,
maxNbrOfBusyTCHs **GET**;
REGISTERED AS {gsm1204package 238};

C.2.3.9 idleTCHsPerInterferenceBandPackage

idleTCHPerInterferenceBandPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanNbrOfIdleTCHsPerInterferenceBand **GET**;
REGISTERED AS {gsm1204package 239};

C.2.3.10 tchSeizuresPackage

tchSeizuresPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attTCHSeizures **GET**,

succTCHSeizures **GET**,
attTCHSeizuresMeetingTCHBlockedState **GET**;
REGISTERED AS {gsm1204package 2310};

C.2.3.11 tchAllocatedTimePackage

tchAllocatedTimePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
allAvailableTCHAllocatedTime **GET**;
REGISTERED AS {gsm1204package 2311};

C.2.3.12 tchBusyTimePackage

tchBusyTimePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanTCHBusyTime **GET**;
REGISTERED AS {gsm1204package 2312};

C.2.3.13 tchQueuePackage

tchQueuePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanTCHQueueLength **GET**;
REGISTERED AS {gsm1204package 2313};

C.2.3.14 lostRadioLinksPerTCHPackage

lostRadioLinksPerTCHPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfLostRadioLinksTCH **GET**;
REGISTERED AS {gsm1204package 2314};

C.2.3.15 sdcchAvailablePackage

sdcchAvailablePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfAvailableSDCCHs **GET**;
REGISTERED AS {gsm1204package 2315};

C.2.3.16 sdcchBusyPackage

sdcchBusyPackage **PACKAGE**

BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanNbrOfBusySDCCHs **GET**,
maxNbrOfBusySDCCHs **GET**;
REGISTERED AS {gsm1204package 2316};

C.2.3.17 sdcchSeizuresPackage

sdcchSeizuresPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attSDCCHSeizuresMeetingSDCCHBlockedState **GET**;
REGISTERED AS {gsm1204package 2317};

C.2.3.18 sdcchAllocatedTimePackage

sdcchAllocatedTimePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
allAvailableSDCCHAllocatedTime **GET**;
REGISTERED AS {gsm1204package 2318};

C.2.3.19 sdcchQueuePackage

sdcchQueuePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanSDCCHQueueLength **GET**;
REGISTERED AS {gsm1204package 2319};

C.2.3.20 lostRadioLinksPerSDCCHPackage

lostRadioLinksPerSDCCHPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfLostRadioLinksSDCCH **GET**;
REGISTERED AS {gsm1204package 2320};

C.2.3.21 downlinkPowerControlPackage

downlinkPowerControlPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
relativeTimeDLPowerControlAtMax **GET**;
REGISTERED AS {gsm1204package 2321};

C.2.3.22 uplinkPowerControlPackage

uplinkPowerControlPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
relativeTimeULPowerControlAtMax **GET**;
REGISTERED AS {gsm1204package 2322};

C.2.3.23 internalHandoversIntraCellPackage

internalHandoversIntraCellPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
succInternalHDOsIntraCell **GET**,
unsuccInternalHDOsIntraCell **GET**;
REGISTERED AS {gsm1204package 2323};

C.2.3.24 incomingInternalInterCellHandoversPackage

incomingInternalInterCellHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIncomingInternalInterCellHDOs **GET**,
succIncomingInternalInterCellHDOs **GET**;
REGISTERED AS {gsm1204package 2324};

C.2.3.25 outgoingInternalInterCellHandoversPackage

outgoingInternalInterCellHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOutgoingInternalInterCellHDOs **GET**,
succOutgoingInternalInterCellHDOs **GET**;
REGISTERED AS {gsm1204package 2325};

C.2.3.26 internalHandoverFailurePackage

internalHandoverFailurePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
unsuccHDOsWithReconnection **GET**,
unsuccHDOsWithLossOfConnection **GET**;
REGISTERED AS {gsm1204package 2326};

C.2.3.27 gprsPDCHAvailablePackage

gprsPDCHAvailablePackage **PACKAGE**
BEHAVIOUR

generalMeasurementPackageBehaviour;
ATTRIBUTES
availablePDCH **GET**,
meanNbrAvailablePDCH **GET,**
maxNbrAvailablePDCH **GET**,
minNbrAvailablePDCH **GET;**
REGISTERED AS {gsm1204package 2327};

C.2.3.28 gprsPDCHOccupiedPackage

gprsPDCHOccupiedPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanNbrOfOccPDCH **GET**,
maxNbrOfOccPDCH **GET,**
minNbrOfOccPDCH **GET;**
REGISTERED AS {gsm1204package 2328};

C.2.3.29 gprsPDCHAllocatedPackage

gprsPDCHAllocatedPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
availablePDCH AllocatedTime **GET;**
REGISTERED AS {gsm1204package 2329};

C.2.3.30 gprsPCCCHPagingPackage

gprsPCCCHPagingPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrPacketPagingMessagesPCHOnPCCCH **GET;**
REGISTERED AS {gsm1204package 2330};

C.2.3.31 gprsPPCHQueueOnPCCCHPackage

gprsPPCHQueueOnPCCCHPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanPPCHPAGCHQueueLengthOnPCCCH **GET,**
nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH **GET;**
REGISTERED AS {gsm1204package 2331};

C.2.3.32 gprsPDTCHAssignmentPackage

gprsPDTCHAssignmentPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES

attPCReqAssPerCause **GET,**
succPDTCHAssProcsPerCause **GET,**
succPDTCHSeizures **GET;**
REGISTERED AS {gsm1204package 2332};

C.2.3.33 gprsPDTCHQueuePackage

gprsPDTCHQueuePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanPacketQueueLength **GET;**
REGISTERED AS {gsm1204package 2333};

C.2.3.34 gprsCSChangePackage

gprsCSChangePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfServiceChanges **GET;**
REGISTERED AS {gsm1204package 2334};

C.2.4 internal HDO Measurement Function Related Packages

C.2.4.1 incomingInternalInterCellPerCellHandoversPackage

incomingInternalInterCellPerCellHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIncomingInternalInterCellHDOsPerOriginatingCell **GET**,
succIncomingInternalInterCellHDOsPerOriginatingCell **GET**;
REGISTERED AS {gsm1204package 241};

C.2.4.2 outgoingInternalInterCellPerCellHandoversPackage

outgoingInternalInterCellPerCellHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOutgoingInternalInterCellHDOsPerTargetCell**GET**,
succOutgoingInternalInterCellHDOsPerTargetCell **GET**;
REGISTERED AS {gsm1204package 242};

C.2.5 MSC Measurement Function Related Packages

C.2.5.1 classMarkPackage

classMarkPackage **PACKAGE**
BEHAVIOUR

```
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfClassMarkUpdates                    GET;
REGISTERED AS {gsm1204package 251};
```

C.2.5.2 mobileOriginatingCallsPackage

```
mobileOriginatingCallsPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attMobileOriginatingCalls                GET,
        succMobileOriginatingCalls               GET,
        ansMobileOriginatingCalls                GET;
REGISTERED AS {gsm1204package 252};
```

C.2.5.3 mobileTerminatingCallsPackage

```
mobileTerminatingCallsPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attMobileTerminatingCalls                GET,
        succMobileTerminatingCalls               GET,
        ansMobileTerminatingCalls                GET;
REGISTERED AS {gsm1204package 253};
```

C.2.5.4 mobileEmergencyCallsPackage

```
mobileEmergencyCallsPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attMobileEmergencyCalls                  GET,
        succMobileEmergencyCalls                 GET,
        ansMobileEmergencyCalls                  GET;
REGISTERED AS {gsm1204package 254};
```

C.2.5.5 cipheringModePackage

```
cipheringModePackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attCipheringModeControlProcs             GET,
        succCipheringModeControlProcs            GET;
REGISTERED AS {gsm1204package 255};
```

C.2.5.6 interrogatingHLRPackage

```
interrogatingHLRPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
```

ATTRIBUTES
attInterrogationOfHLRsForRouting **GET**,
succInterrogationOfHLRsMSRNObtained **GET**,
succInterrogationOfHLRsCallForwarding **GET**;
REGISTERED AS {gsm1204package 256};

C.2.5.7 mobileOriginatingPointToPointSMPackage

mobileOriginatingPointToPointSMPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOpForMobileOriginatingPointToPointSMs **GET**,
succOpForMobileOriginatingPointToPointSMs **GET**;
REGISTERED AS {gsm1204package 257};

C.2.5.8 mobileTerminatingPointToPointSMPackage

mobileTerminatingPointToPointSMPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOpForMobileTerminatingPointToPointSMs **GET**,
succOpForMobileTerminatingPointToPointSMs **GET**;
REGISTERED AS {gsm1204package 258};

C.2.5.9 imeiRequestPackage

imeiRequestPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfTransCheckIMEIRequests **GET**;
REGISTERED AS {gsm1204package 259};

C.2.5.10 whiteAnswersInMSCPackage

whiteAnswersInMSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfWhiteAnsInMSC **GET**;
REGISTERED AS {gsm1204package 2510};

C.2.5.11 greyAnswersInMSCPackage

greyAnswersInMSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfGreyAnsInMSC **GET**;
REGISTERED AS {gsm1204package 2511};

C.2.5.12 blackAnswersInMSCPackage

blackAnswersInMSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfBlackAnsInMSC **GET**;
REGISTERED AS {gsm1204package 2512};

C.2.5.13 unknownIMEIAnswersInMSCPackage

unknownIMEIAnswersInMSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfUnknownIMEIAnsInMSC **GET**;
REGISTERED AS {gsm1204package 2513};

C.2.5.14 callSetupServicePackage

callSetupServicePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanTimeToCallSetupService **GET**;
REGISTERED AS {gsm1204package 2514};

C.2.5.15 locationUpdatingServicePackage

locationUpdatingServicePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
meanTimeToLocationUpdateService **GET**;
REGISTERED AS {gsm1204package 2515};

C.2.5.16 subscriberIdentifiedWithTMSIPackage

subscriberIdentifiedWithTMSIPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
transSubIdentifiedWithTMSI **GET**;
REGISTERED AS {gsm1204package 2516};

C.2.5.17 subscriberIdentifiedWithIMSIPackage

subscriberIdentifiedWithIMSIPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
transSubIdentifiedWithIMSI **GET**;
REGISTERED AS {gsm1204package 2517};

C.2.5.18 tmsiReallocationsPackage

tmsiReallocationsPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attTMSIReallocations **GET**,
succTMSIReallocations **GET**;
REGISTERED AS {gsm1204package 2518};

C.2.5.19 imsiDetachProceduresPackage

imsiDetachProceduresPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
imsiDetachProcs **GET**,
imsiAttachProcs **GET**;
REGISTERED AS {gsm1204package 2519};

C.2.5.20 incomingExternalIntraMSCHandoversPackage

incomingExternalIntraMSCHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIncomingExternalIntraMSCHDOs **GET**,
succIncomingExternalIntraMSCHDOs **GET**;
REGISTERED AS {gsm1204package 2520};

C.2.5.21 outgoingExternalIntraMSCHandoversPackage

outgoingExternalIntraMSCHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOutgoingExternalIntraMSCHDOs **GET**,
succOutgoingExternalIntraMSCHDOs **GET**;
REGISTERED AS {gsm1204package 2521};

C.2.5.22 incomingInterMSCHandoversPackage

incomingInterMSCHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIncomingInterMSCHDOs **GET**,
succIncomingInterMSCHDOs **GET**;
REGISTERED AS {gsm1204package 2522};

C.2.5.23 outgoingInterMSCHandoversPackage

outgoingInterMSCHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOutgoingInterMSCHDOs **GET**,
succOutgoingInterMSCHDOs **GET**;
REGISTERED AS {gsm1204package 2523};

C.2.5.24 subsequentInterMSCHandoversToMACaPackage

subsequentInterMSCHandoversToMACaPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attSubsequentInterMSCHDOsMSCa **GET**,
succSubsequentInterMSCHDOsMSCa **GET**;
REGISTERED AS {gsm1204package 2524};

C.2.5.25 subsequentInterMSCHandoversToMACcPackage

subsequentInterMSCHandoversToMACcPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attSubsequentInterMSCHDOsMSCc **GET**,
succSubsequentInterMSCHDOsMSCc **GET**;
REGISTERED AS {gsm1204package 2525};

C.2.5.26 externalHandoversPackage

externalHandoversPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
externalHDOs **GET**;
REGISTERED AS {gsm1204package 2526};

C.2.5.27 externalHandoversPerCausePackage

externalHandoversPerCausePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
externalHDOsPerCause **GET**;
REGISTERED AS {gsm1204package 2527};

C.2.5.28 externalHandoverFailurePerMSCPackage

externalHandoverFailurePerMSCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;

ATTRIBUTES
unsuccExternHDOsWithReconnectionPerMSC **GET**,
unsuccExternHDOsWithLossOfConnectionPerMSC **GET**;
REGISTERED AS {gsm1204package 2528};

C.2.6 external HDO Measurement Function Related Packages

C.2.6.1 incomingExternalIntraMSCHandoversPerCellPackage

incomingExternalIntraMSCHandoversPerCellPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIncomingExternalIntraMSCHDOsPerOriginatingCell **GET**,
succIncomingExternalIntraMSCHDOsPerOriginatingCell **GET**;
REGISTERED AS {gsm1204package 261};

C.2.6.2 outgoingExternalIntraMSCHandoversPerCellPackage

outgoingExternalIntraMSCHandoversPerCellPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOutgoingExternalIntraMSCHDOsPerTargetCell **GET**,
succOutgoingExternalIntraMSCHDOsPerTargetCell **GET**;
REGISTERED AS {gsm1204package 262};

C.2.6.3 incomingExternalInterMSCHandoversPerCellPackage

incomingExternalInterMSCHandoversPerCellPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIncomingInterMSCHDOsPerOriginatingCell **GET**,
succIncomingInterMSCHDOsPerOriginatingCell **GET**;
REGISTERED AS {gsm1204package 263};

C.2.6.4 outgoingExternalInterMSCHandoversPerCellPackage

outgoingExternalInterMSCHandoversPerCellPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attOutgoingInterMSCHDOsPerTargetCell **GET**,
succOutgoingInterMSCHDOsPerTargetCell **GET**;
REGISTERED AS {gsm1204package 264};

C.2.7 HLR Measurement Function Related Packages

C.2.7.1 msRoamingOutsideHPLMNPackage

msRoamingOutsideHPLMNPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfCurrentMSsRoamingOutsideHPLMN **GET**;
REGISTERED AS {gsm1204package 271};

C.2.7.2 authenticationSetsHLRToVLRPackage

authenticationSetsHLRToVLRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attReqForAuthSetsReceivedByHLRFromVLRs **GET**,
succReturnedAuthSetsFromHLRToVLRs **GET**,
emptyResponsesForAuthSetsFromHLRToVLRs **GET**;
REGISTERED AS {gsm1204package 272};

C.2.7.3 insertSubscriberDataServicePackage

insertSubscriberDataServicePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attInsertSubDataService **GET**,
succInsertSubDataService **GET**;
REGISTERED AS {gsm1204package 273};

C.2.7.4 locationUpdatePackage

locationUpdatePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attLocationUpdate **GET**,
succLocationUpdate **GET**;
REGISTERED AS {gsm1204package 274};

C.2.7.5 ssRelatedOperationsInHLRPackage

ssRelatedOperationsInHLRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attSSRelatedOperationsInHLR **GET**,
succSSRelatedOperationsInHLR **GET**;
REGISTERED AS {gsm1204package 275};

C.2.7.6 requestForSMRoutingPackage

requestForSMRoutingPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attReqForSMRoutingInfo **GET**,
succReqForSMRoutingInfo **GET**;
REGISTERED AS {gsm1204package 276};

C.2.7.7 smDeliveryStatusReportProceduresPackage

smDeliveryStatusReportProceduresPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attSMDeliveryStatusReportProcs **GET**,
succSMDeliveryStatusReportProcs **GET**;
REGISTERED AS {gsm1204package 277};

C.2.7.8 sendAlertsPackage

sendAlertsPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attNbrOfSendAlerts **GET**,
succNbrOfSendAlerts **GET**;
REGISTERED AS {gsm1204package 278};

C.2.7.9 requestForMSRNPackage

requestForMSRNPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attReqForMSRN **GET**,
succReqForMSRN **GET**;
REGISTERED AS {gsm1204package 279};

C.2.8 VLR Measurement Function Related Packages

C.2.8.1 msMemoryAvailableNotificationsPackage

msMemoryAvailableNotificationsPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attMSMemoryAvailableNotifications **GET**,
succMSMemoryAvailableNotifications **GET**;
REGISTERED AS {gsm1204package 281};

C.2.8.2 identificationRequestToPVLRPackage

identificationRequestToPVLRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIdentificationReqToPVLRs **GET**,
succIdentificationReqToPVLRs **GET**;
REGISTERED AS {gsm1204package 282};

C.2.8.3 pageRequestPackage

pageRequestPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attPageReqs **GET**,
succPageReqs **GET**;
REGISTERED AS {gsm1204package 283};

C.2.8.4 pageRequestPerLocationAreaPackage

pageRequestPerLocationAreaPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attPageReqsPerLocationArea **GET**,
succPageReqsPerLocationArea **GET**;
REGISTERED AS {gsm1204package 284};

C.2.8.5 authenticationSetsVLRToHLRPackage

authenticationSetsVLRToHLRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attReqForAuthSetsSentToHLR **GET**,
succReceivedAuthSetsFromHLR **GET**,
emptyResponsesForAuthFromHLR **GET**;
REGISTERED AS {gsm1204package 285};

C.2.8.6 authenticationInVLRPackage

authenticationInVLRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attAuthProcsInVLR **GET**,
succAuthProcsInVLR **GET**;
REGISTERED AS {gsm1204package 286};

C.2.8.7 intraVLRLocationUpdatePackage

intraVLRLocationUpdatePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attIntraVLRLocationUpdates **GET**,
succIntraVLRLocationUpdates **GET**;
REGISTERED AS {gsm1204package 287};

C.2.8.8 interVLRLocationUpdatePackage

interVLRLocationUpdatePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attInterVLRLocationUpdates **GET**,
succInterVLRLocationUpdates **GET**;
REGISTERED AS {gsm1204package 288};

C.2.8.9 visitorsFromOtherPLMNPackage

visitorsFromOtherPLMNPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
arrivalOfVisitorsFromOtherPLMNs **GET**;
REGISTERED AS {gsm1204package 289};

C.2.9 EIR Measurement Function Related Packages

C.2.9.1 receivedIMEIcheckRequestPackage

receivedIMEIcheckRequestPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfReceivedIMEICheckReqs **GET**;
REGISTERED AS {gsm1204package 291};

C.2.9.2 whiteAnswersInEIRPackage

whiteAnswersInEIRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfWhiteAnsInEIR **GET**;
REGISTERED AS {gsm1204package 292};

C.2.9.3 greyAnswersInEIRPackage

greyAnswersInEIRPackage **PACKAGE**
BEHAVIOUR

generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfGreyAnsInEIR **GET**;
REGISTERED AS {gsm1204package 293};

C.2.9.4 blackAnswersInEIRPackage

blackAnswersInEIRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfBlackAnsInEIR **GET**;
REGISTERED AS {gsm1204package 294};

C.2.9.5 unknownIMEIAnswersInEIRPackage

unknownIMEIAnswersInEIRPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfUnknownIMEIAnsInEIR **GET**;
REGISTERED AS {gsm1204package 295};

C.2.10 SMS Measurement Function Related Packages

C.2.10.1 mobileOriginatingSMForwardingPackage

mobileOriginatingSMForwardingPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attMobileOriginatingSMForwardings **GET**,
succMobileOriginatingSMForwardings **GET**;
REGISTERED AS {gsm1204package 2101};

C.2.10.2 mobileTerminatingSMForwardingPackage

mobileTerminatingSMForwardingPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attMobileTerminatingSMForwardings **GET**,
succMobileTerminatingSMForwardings **GET**;
REGISTERED AS {gsm1204package 2102};

C.2.11 SGSN Measurement Function Related Packages

C.2.11.1 sgsnLLCPackage

sgsnLLCPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;

ATTRIBUTES
nbrLlcFramesSent **GET**,
nbrllcFramesReceived **GET**,
errLlcFramesDetectedBySgsn **GET**,
retransmittedLlcFramestoMs **GET**;
REGISTERED AS {gsm1204package 2111};

C.2.11.2 sgsnSNDCPPackage

sgsnSNDCPPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
uplinkSndcpNpduReceived **GET**,
uplinkSndcpOctetReceivedMode **GET**,
downlinkSndcpNpdusent **GET**,
downlinkSndcpOctetSent **GET**;
REGISTERED AS {gsm1204package 2112};

C.2.11.3 gprsAttachPackage

gprsAttachPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attGprsAttach **GET**,
succGprsAttach **GET**;
REGISTERED AS {gsm1204package 2113};

C.2.11.4 gprsIMSIAttachPackage

gprsIMSIAttachPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attCombiAttach **GET**,
succCombiAttach **GET**;
REGISTERED AS {gsm1204package 2114};

C.2.11.5 gprsIMSIAlreadyAttachedPackage

gprsIMSIAlreadyAttachedPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attImsiAttach **GET,**
succImsiAttach **GET;**
REGISTERED AS {gsm1204package 2115};

C.2.11.6 gprsAttachedSubscribersPackage

gprsAttachedSubscribersPackage **PACKAGE**
BEHAVIOUR

generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrOfAttachedSub **GET**,
meanNbrOfAttachedSub **GET**,
maxNbrOfAttachedSub **GET**;
REGISTERED AS {gsm1204package 2116};

C.2.11.7 gprsMSDetachPackage

gprsMSDetachPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attGprsDetachMs **GET**,
attCombiDetachMs **GET**,
attImsiDetachMs **GET**;
REGISTERED AS {gsm1204package 2117};

C.2.11.8 gprsSGSNDetachPackage

gprsSGSNDetachPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attGprsdetachSgsn **GET**,
succGprsdetachSgsn **GET**;
REGISTERED AS {gsm1204package 2118};

C.2.11.9 gprsRouting AreaUpdatePackage

gprsRouting AreaUpdatePackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attItraSgsnRaUpdate **GET**,
succIntraSgsnRaUpdate **GET**,
attInterSgsnRaUpdate **GET,**
succInterSgsnRaUpdate **GET**;
REGISTERED AS {gsm1204package 2119};

C.2.11.10 pTMSIReallocationPackage

pTMSIReallocationPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attPTMSIRealloc **GET**,
succPTMSIrealloc **GET**;
REGISTERED AS {gsm1204package 21110};

C.2.11.11 sgsnHLRAuthenticationPackage

sgsnHLRAuthenticationPackage **PACKAGE**

```
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            attreqAuthSetsSentToHlrBySgsn       GET,
            succReqAuthSetsHlr                  GET,
            emptyResponsesForAuthSetsFromHlr    GET;
    REGISTERED AS {gsm1204package 21111};
```

C.2.11.12 sgsnAuthenticationProcPackage

```
    sgsnAuthenticationProcPackage  PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            attAuthInSgsn           GET,
            succAuthInSgsn          GET;
    REGISTERED AS {gsm1204package 21112};
```

C.2.11.13 sgsnIdentityRequestPackage

```
    sgsnIdentityRequestPackage  PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            attIdentityReq          GET,
            succIdentityReq         GET;
    REGISTERED AS {gsm1204package 21113};
```

C.2.11.14 sgsnCipheringModePackage

```
    sgsnCipheringModePackage  PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            attCipheringModeControlPerSgsn      GET,
            succCipheringModeControlPerSgsn     GET;
    REGISTERED AS {gsm1204package 21114};
```

C.2.11.15 gprsSubsStandbyStatePackage

```
    gprsSubsStandbyStatePackage  PACKAGE
        BEHAVIOUR
            generalMeasurementPackageBehaviour;
        ATTRIBUTES
            nbrOfSubStandby             GET,
            meanNbrOfSubStandby         GET,
            maxNbrOfSubStandby          GET;
    REGISTERED AS {gsm1204package 21115};
```

C.2.11.16 gprsSubsReadyStatePackage

```
    gprsSubsReadyStatePackage PACKAGE
        BEHAVIOUR
```

```
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfSubReady                GET,
        meanNbrOfSubReady            GET,
        maxNbrOfSubReady             GET;
REGISTERED AS {gsm1204package 21116};
```

C.2.11.17 sgsnIMEICheckRequestsPackage

```
sgsnIMEICheckRequestsPackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfCheckIMEIRequests       GET;
REGISTERED AS {gsm1204package 21117};
```

C.2.11.18 whiteAnswersInSGSNPackage

```
whiteAnswersInSGSNPackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfWhiteAnswerInSgsn       GET;
REGISTERED AS {gsm1204package 21118};
```

C.2.11.19 greyAnswersInSGSNPackage

```
greyAnswersInSGSNPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfGreyAnswerInSgsn        GET;
REGISTERED AS {gsm1204package 21119};
```

C.2.11.20 blackAnswersInSGSNPackage

```
blackAnswersInSGSNPackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfBlackAnswerInSgsn       GET;
REGISTERED AS {gsm1204package 21120};
```

C.2.11.21 unknownIMEIAnswersInSGSNPackage

```
unknownIMEIAnswersInSGSNPackage  PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfUnknownAnswerInSgsn     GET;
REGISTERED AS {gsm1204package 21121};
```

C.2.11.22 sgsnPacketSwitched PagingPackage

```
sgsnPacketSwitched PagingPackage    PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attPacketSwitchedPaging              GET,
        unsuccPacketSwitchedPaging           GET;
REGISTERED AS {gsm1204package 21122};
```

C.2.11.23 sgsnPacketSwitched PagingPerRAPackage

```
sgsnPacketSwitched PagingPerRAPackage    PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attPsPagingPerRoutingArea            GET,
        unsuccPsPagingPerRoutingArea         GET;
REGISTERED AS {gsm1204package 21123};
```

C.2.11.24 sgsnPDPContextActivationByMSPackage

```
sgsnPDPContextActivationByMSPackage   PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attActPdpContextMSPerSgsn            GET,
        succActPdpContextMSPerSgsn           GET;
REGISTERED AS {gsm1204package 21124};
```

C.2.11.25 sgsnDynamicPDPContextActivationByMSPackage

```
sgsnDynamicPDPContextActivationByMSPackage    PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attActPdpContextDynMSPerSgsn         GET,
        succActPdpContextDynMSPerSgsn        GET;
REGISTERED AS {gsm1204package 21125};
```

C.2.11.26 sgsnPDPContextDeactivationByMSPackage

```
sgsnPDPContextDeactivationByMSPackage   PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attDeactPdpContextMsPerSgsn          GET,
        succDeactPdpContextMsPerSgsn         GET;
REGISTERED AS {gsm1204package 21126};
```

C.2.11.27 sgsnPDPContextDeactivationByGGSNPackage

```
sgsnPDPContextDeactivationByGGSNPackage   PACKAGE
```

BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attDeactPdpContextGgsnPerSgsn **GET**,
succDeactPdpContextGgsnPerSgsn **GET**;
REGISTERED AS {gsm1204package 21127};

C.2.11.28 subscriberPDPContextsAtSGSNPackage

subscriberPDPContextsAtSGSNPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
nbrSubsWithActivePdpInSgsn **GET**,
meanSubsWithActivePdpInSgsn **GET**,
nmaxSubsWithActivePdpInSgsn **GET**;
REGISTERED AS {gsm1204package 21128};

C.2.12 GGSN Measurement Function Related Packages

C.2.12.1 ggsnPDPContextActivationByMSPackage

ggsnPDPContextActivationByMSPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attActPdpContextPerApnOfGgsn **GET**,
succActPdpContextPerApnOfGgsn **GET**;
REGISTERED AS {gsm1204package 2121}

C.2.12.2 ggsnDynamicPDPContextActivationByMSPackage

ggsnDynamicPDPContextActivationByMSPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attActPdpContextDnyPerApnOfGgsn **GET**,
succActPdpContextDnyPerApnOfGgsn **GET**;
REGISTERED AS {gsm1204package 2122};

C.2.12.3 ggsnPDPContextDeactivationByMSPackage

ggsnPDPContextDeactivationByMSPackage **PACKAGE**
BEHAVIOUR
generalMeasurementPackageBehaviour;
ATTRIBUTES
attDeactPdpContextMsPerApnOfGgsn **GET**,
succDeactPdpContextMsPerApnOfGgsn **GET**;
REGISTERED AS {gsm1204package 2123};

C.2.12.4 ggsnPDPContextDeactivationByGGSNPackage

```
ggsnPDPContextDeactivationByGGSNPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        attDeactPdpContextByGgsnPerApn          GET,
        succDeactPdpContextByGgsnMsPerApn       GET;
REGISTERED AS {gsm1204package 2124};
```

C.2.12.5 ActivePDPContextsAtGGSNPackage

```
ActivePDPContextsAtGGSNPackage PACKAGE
    BEHAVIOUR
        generalMeasurementPackageBehaviour;
    ATTRIBUTES
        nbrOfActivePdpContextsPerApnAtGgsn          GET,
        meanNbrOfActivePdpContextsPerApnAtGgsn          GET,
        maxNbrOfActivePdpContextsPerApnAtGgsn           GET;
REGISTERED AS {gsm1204package 2125};
```

C.3 Measurement Attribute Definitions

C.3.1 General Measurement Function Related Attributes

C.3.1.1 measurementFunctionId

```
measurementFunctionId ATTRIBUTE
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMMeasurementFunctionId;
    BEHAVIOUR
        measurementFunctionIdBehaviour;
REGISTERED AS {gsm1204attribute 311};

measurementFunctionIdBehaviour BEHAVIOUR
    DEFINED AS
      "This is the identity of the measurement function";
```

C.3.1.2 observedCell

```
observedCell ATTRIBUTE
    WITH ATTRIBUTE SYNTAX
        GSM1204TypeModule.GSMCellName;
    BEHAVIOUR
        observedCellBehaviour;
REGISTERED AS {gsm1204attribute 312};

observedCellBehaviour BEHAVIOUR
    DEFINED AS
```

"This is the Cell that is to be observed for this measurement";

C.3.1.3 adjacentCell

adjacentCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMCellName;
BEHAVIOUR
adjacentCellBehaviour;
REGISTERED AS {gsm1204attribute 313};

adjacentCellBehaviour **BEHAVIOUR**
DEFINED AS
"This is the Cell that is adjacent to the observed cell for this measurement";

C.3.2 BSC Measurement Function Related Attributes

C.3.2.1 unsuccReqsForService

unsuccReqsForService **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 321};

C.3.2.2 unsuccReqsForServicePerCause

unsuccReqsForServicePerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType3;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 322};

C.3.2.3 meanInterArrivalTime

meanInterArrivalTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 323};

C.3.2.4 attTransOfPagingMessagesPerBSC

attTransOfPagingMessagesPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 324};

C.3.2.5 unsuccTransOfPagingMessagesPerBSC

unsuccTransOfPagingMessagesPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 325};

C.3.2.6 attImmediateAssingProcsPerBSC

attImmediateAssingProcsPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 326};

C.3.2.7 succImmediateAssingProcsPerBSC

succImmediateAssingProcsPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 327};

C.3.2.8 succInternalHDOsIntraCellPerBSC

succInternalHDOsIntraCellPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 328};

C.3.2.9 unsuccInternalHDOsIntraCellPerBSC

unsuccInternalHDOsIntraCellPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 329};

C.3.2.10 succInternalHDOsPerBSC

succInternalHDOsPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3210};

C.3.2.11 succInternalHDOsPerCause

succInternalHDOsPerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType3;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3211};

C.3.2.12 unsuccInternalHDOsWithReconnectionPerBSC

unsuccInternalHDOsWithReconnectionPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3212};

C.3.2.13 unsuccInternalHDOsWithLossOfConnectionPerBSC

unsuccInternalHDOsWithLossOfConnectionPerBSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3213};

C.3.2.14 flushRequestReceived

flushRequestReceived **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3214};

C.3.2.15 pagingReqReceivedfromSgsn

pagingReqReceivedfromSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3215};

C.3.2.16 meanPSInterArrivalTime

meanPSInterArrivalTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3216};

C.3.3 CELL Measurement Function Related Attributes

C.3.3.1 meanPCHAGCHQueueLength

meanPCHAGCHQueueLength **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 331};

C.3.3.2 attTransOfPagingMessagesThePCH

attTransOfPagingMessagesThePCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 332};

C.3.3.3 unsuccTransOfPagingMessagesThePCH

unsuccTransOfPagingMessagesThePCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 333};

C.3.3.4 attImmediateAssingProcs

attImmediateAssingProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 334};

C.3.3.5 succImmediateAssingProcs

succImmediateAssingProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 335};

C.3.3.6 attImmediateAssingProcsPerCause

attImmediateAssingProcsPerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType3;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 336};

C.3.3.7 succImmediateAssingProcsPerCause

succImmediateAssingProcsPerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType3;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 337};

C.3.3.8 nbrOfPagesDiscardedFromPCHQueue

nbrOfPagesDiscardedFromPCHQueue **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 338};

C.3.3.9 meanDurationOfSuccPagingProcs

meanDurationOfSuccPagingProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 339};

C.3.3.10 nbrOfAvailableTCHs

nbrOfAvailableTCHs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3310};

C.3.3.11 meanNbrOfBusyTCHs

meanNbrOfBusyTCHs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3311};

C.3.3.12 maxNbrOfBusyTCHs

maxNbrOfBusyTCHs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3312};

C.3.3.13 meanNbrOfIdleTCHsPerInterferenceBand

meanNbrOfIdleTCHsPerInterferenceBand **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType4;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3313};

C.3.3.14 attTCHSeizures

attTCHSeizures **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3314};

C.3.3.15 succTCHSeizures

succTCHSeizures **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3315};

C.3.3.16 attTCHSeizuresMeetingTCHBlockedState

attTCHSeizuresMeetingTCHBlockedState **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3316};

C.3.3.17 allAvailableTCHAllocatedTime

allAvailableTCHAllocatedTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3317};

C.3.3.18 meanTCHBusyTime

meanTCHBusyTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3318};

C.3.3.19 meanTCHQueueLength

meanTCHQueueLength **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3319};

C.3.3.20 nbrOfLostRadioLinksTCH

nbrOfLostRadioLinksTCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3320};

C.3.3.21 nbrOfAvailableSDCCHs

nbrOfAvailableSDCCHs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3321};

C.3.3.22 meanNbrOfBusySDCCHs

meanNbrOfBusySDCCHs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3322};

C.3.3.23 maxNbrOfBusySDCCHs

maxNbrOfBusySDCCHs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3323};

C.3.3.24 attSDCCHSeizuresMeetingSDCCHBlockedState

attSDCCHSeizuresMeetingSDCCHBlockedState **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3324};

C.3.3.25 allAvailableSDCCHAllocatedTime

allAvailableSDCCHAllocatedTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3325};

C.3.3.26 meanSDCCHQueueLength

meanSDCCHQueueLength **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3326};

C.3.3.27 nbrOfLostRadioLinksSDCCH

nbrOfLostRadioLinksSDCCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3327};

C.3.3.28 relativeTimeDLPowerControlAtMax

relativeTimeDLPowerControlAtMax **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3328};

C.3.3.29 relativeTimeULPowerControlAtMax

relativeTimeULPowerControlAtMax **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3329};

C.3.3.30 succInternalHDOsIntraCell

succInternalHDOsIntraCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3330};

C.3.3.31 unsuccInternalHDOsIntraCell

unsuccInternalHDOsIntraCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3331};

C.3.3.32 attIncomingInternalInterCellHDOs

attIncomingInternalInterCellHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3332};

C.3.3.33 succIncomingInternalInterCellHDOs

succIncomingInternalInterCellHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3333};

C.3.3.34 attOutgoingInternalInterCellHDOs

attOutgoingInternalInterCellHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3334};

C.3.3.35 succOutgoingInternalInterCellHDOs

succOutgoingInternalInterCellHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3335};

C.3.3.36 unsuccHDOsWithReconnection

unsuccHDOsWithReconnection **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3336};

C.3.3.37 unsuccHDOsWithLossOfConnection

unsuccHDOsWithLossOfConnection **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3337};

C.3.3.38 availablePDCH

availablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3338};

C.3.3.39 meanNbrAvailablePDCH

meanNbrAvailablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3339};

C.3.3.40 maxNbrAvailablePDCH

maxNbrAvailablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3340};

C.3.3.41 minNbrAvailablePDCH

minNbrAvailablePDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3341};

C.3.3.42 meanNbrOfOccPDCH

meanNbrOfOccPDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3342};

C.3.3.43 maxNbrOfOccPDCH

maxNbrOfOccPDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3343};

C.3.3.44 minNbrOfOccPDCH

minNbrOfOccPDCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3344};

C.3.3.45 availablePDCHAllocatedTime

availablePDCHAllocatedTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3345};

C.3.3.46 nbrPacketPagingMessagesPCHOnPCCCH

nbrPacketPagingMessagesPCHOnPCCCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3346};

C.3.3.47 meanPPCHPAGCHQueueLengthOnPCCCH

meanPPCHPAGCHQueueLengthOnPCCCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3347};

C.3.3.48 nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH

nbrOfPSPagesDiscardedFromPPCHQueueOnPCCCH **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3348};

C.3.3.49 attPCReqAssPerCause

attPCReqAssPerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3349};

C.3.3.50 succPDTCHAssProcsPerCause

succPDTCHAssProcsPerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3350};

C.3.3.51 succPDTCHSeizures

succPDTCHSeizures **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3351};

C.3.3.52 meanPacketQueueLength

meanPacketQueueLength **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3352};

C.3.3.53 nbrOfServiceChanges

nbrOfServiceChanges **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3353};

C.3.4 internal HDO Measurement Function Related Attributes

C.3.4.1 attIncomingInternalInterCellHDOsPerOriginatingCell

attIncomingInternalInterCellHDOsPerOriginatingCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 341};

C.3.4.2 succIncomingInternalInterCellHDOsPerOriginatingCell

succIncomingInternalInterCellHDOsPerOriginatingCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 342};

C.3.4.3 attOutgoingInternalInterCellHDOsPerTargetCell

attOutgoingInternalInterCellHDOsPerTargetCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 343};

C.3.4.4 succOutgoingInternalInterCellHDOsPerTargetCell

succOutgoingInternalInterCellHDOsPerTargetCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 344};

C.3.5 MSC Measurement Function Related Attributes

C.3.5.1 nbrOfClassMarkUpdates

nbrOfClassMarkUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 351};

C.3.5.2 attMobileOriginatingCalls

attMobileOriginatingCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 352};

C.3.5.3 succMobileOriginatingCalls

succMobileOriginatingCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 353};

C.3.5.4 ansMobileOriginatingCalls

ansMobileOriginatingCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 354};

C.3.5.5 attMobileTerminatingCalls

attMobileTerminatingCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 355};

C.3.5.6 succMobileTerminatingCalls

succMobileTerminatingCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 356};

C.3.5.7 ansMobileTerminatingCalls

ansMobileTerminatingCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 357};

C.3.5.8 attMobileEmergencyCalls

attMobileEmergencyCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 358};

C.3.5.9 succMobileEmergencyCalls

succMobileEmergencyCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 359};

C.3.5.10 ansMobileEmergencyCalls

ansMobileEmergencyCalls **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3510};

C.3.5.11 attCipheringModeControlProcs

attCipheringModeControlProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3511};

C.3.5.12 succCipheringModeControlProcs

succCipheringModeControlProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3512};

C.3.5.13 attInterrogationOfHLRsForRouting

attInterrogationOfHLRsForRouting **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3513};

C.3.5.14 succInterrogationOfHLRsMSRNObtained

succInterrogationOfHLRsMSRNObtained **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3514};

C.3.5.15 succInterrogationOfHLRsCallForwarding

succInterrogationOfHLRsCallForwarding **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3515};

C.3.5.16 attOpForMobileOriginatingPointToPointSMs

attOpForMobileOriginatingPointToPointSMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3516};

C.3.5.17 succOpForMobileOriginatingPointToPointSMs

succOpForMobileOriginatingPointToPointSMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3517};

C.3.5.18 attOpForMobileTerminatingPointToPointSMs

attOpForMobileTerminatingPointToPointSMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3518};

C.3.5.19 succOpForMobileTerminatingPointToPointSMs

succOpForMobileTerminatingPointToPointSMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3519};

C.3.5.20 nbrOfTransCheckIMEIRequests

nbrOfTransCheckIMEIRequests **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3520};

C.3.5.21 nbrOfWhiteAnsInMSC

nbrOfWhiteAnsInMSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3521};

C.3.5.22 nbrOfGreyAnsInMSC

nbrOfGreyAnsInMSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3522};

C.3.5.23 nbrOfBlackAnsInMSC

nbrOfBlackAnsInMSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3523};

C.3.5.24 nbrOfUnknownIMEIAnsInMSC

nbrOfUnknownIMEIAnsInMSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3524};

C.3.5.25 meanTimeToCallSetupService

meanTimeToCallSetupService **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3525};

C.3.5.26 meanTimeToLocationUpdateService

meanTimeToLocationUpdateService **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType2;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3526};

C.3.5.27 transSubIdentifiedWithTMSI

transSubIdentifiedWithTMSI **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3527};

C.3.5.28 transSubIdentifiedWithIMSI

transSubIdentifiedWithIMSI **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3528};

C.3.5.29 attTMSIReallocations

attTMSIReallocations **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3529};

C.3.5.30 succTMSIReallocations

succTMSIReallocations **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3530};

C.3.5.31 imsiDetachProcs

imsiDetachProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3531};

C.3.5.32 imsiAttachProcs

imsiAttachProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3532};

C.3.5.33 attIncomingExternalIntraMSCHDOs

attIncomingExternalIntraMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3533};

C.3.5.34 succIncomingExternalIntraMSCHDOs

succIncomingExternalIntraMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3534};

C.3.5.35 attOutgoingExternalIntraMSCHDOs

attOutgoingExternalIntraMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3535};

C.3.5.36 succOutgoingExternalIntraMSCHDOs

succOutgoingExternalIntraMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3536};

C.3.5.37 attIncomingInterMSCHDOs

attIncomingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3537};

C.3.5.38 succIncomingInterMSCHDOs

succIncomingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3538};

C.3.5.39 attOutgoingInterMSCHDOs

attOutgoingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3539};

C.3.5.40 succOutgoingInterMSCHDOs

succOutgoingInterMSCHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3540};

C.3.5.41 attSubsequentInterMSCHDOsMSCa

attSubsequentInterMSCHDOsMSCa **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3541};

C.3.5.42 succSubsequentInterMSCHDOsMSCa

succSubsequentInterMSCHDOsMSCa **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3542};

C.3.5.43 attSubsequentInterMSCHDOsMSCc

attSubsequentInterMSCHDOsMSCc **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3543};

C.3.5.44 succSubsequentInterMSCHDOsMSCc

succSubsequentInterMSCHDOsMSCc **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3544};

C.3.5.45 externalHDOs

externalHDOs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3545};

C.3.5.46 externalHDOsPerCause

externalHDOsPerCause **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType3;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3546};

C.3.5.47 unsuccExternHDOsWithReconnectionPerMSC

unsuccExternHDOsWithReconnectionPerMSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3547};

C.3.5.48 unsuccExternHDOsWithLossOfConnectionPerMSC

unsuccExternHDOsWithLossOfConnectionPerMSC **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3548};

C.3.6 external HDO Measurement Function Related Attributes

C.3.6.1 attIncomingExternalIntraMSCHDOsPerOriginatingCell

attIncomingExternalIntraMSCHDOsPerOriginatingCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 361};

C.3.6.2 succIncomingExternalIntraMSCHDOsPerOriginatingCell

succIncomingExternalIntraMSCHDOsPerOriginatingCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 362};

C.3.6.3 attOutgoingExternalIntraMSCHDOsPerTargetCell

attOutgoingExternalIntraMSCHDOsPerTargetCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 363};

C.3.6.4 succOutgoingExternalIntraMSCHDOsPerTargetCell

succOutgoingExternalIntraMSCHDOsPerTargetCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 364};

C.3.6.5 attIncomingInterMSCHDOsPerOriginatingCell

attIncomingInterMSCHDOsPerOriginatingCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 365};

C.3.6.6 succIncomingInterMSCHDOsPerOriginatingCell

succIncomingInterMSCHDOsPerOriginatingCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 366};

C.3.6.7 attOutgoingInterMSCHDOsPerTargetCell

attOutgoingInterMSCHDOsPerTargetCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 367};

C.3.6.8 succOutgoingInterMSCHDOsPerTargetCell

succOutgoingInterMSCHDOsPerTargetCell **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 368};

C.3.7 HLR Measurement Function Related Attributes

C.3.7.1 nbrOfCurrentMSsRoamingOutsideHPLMN

nbrOfCurrentMSsRoamingOutsideHPLMN **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 371};

C.3.7.2 attReqForAuthSetsReceivedByHLRFromVLRs

attReqForAuthSetsReceivedByHLRFromVLRs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 372};

C.3.7.3 succReturnedAuthSetsFromHLRToVLRs

succReturnedAuthSetsFromHLRToVLRs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 373};

C.3.7.4 emptyResponsesForAuthSetsFromHLRToVLRs

emptyResponsesForAuthSetsFromHLRToVLRs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 374};

C.3.7.5 attInsertSubDataService

attInsertSubDataService **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 375};

C.3.7.6 succInsertSubDataService

succInsertSubDataService **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 376};

C.3.7.7 attLocationUpdate

attLocationUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 377};

C.3.7.8 succLocationUpdate

succLocationUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 378};

C.3.7.9 attSSRelatedOperationsInHLR

attSSRelatedOperationsInHLR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType5;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 379};

C.3.7.10 succSSRelatedOperationsInHLR

succSSRelatedOperationsInHLR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType5;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3710};

C.3.7.11 attReqForSMRoutingInfo

attReqForSMRoutingInfo **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3711};

C.3.7.12 succReqForSMRoutingInfo

succReqForSMRoutingInfo **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3712};

C.3.7.13 attSMDeliveryStatusReportProcs

attSMDeliveryStatusReportProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3713};

C.3.7.14 succSMDeliveryStatusReportProcs

succSMDeliveryStatusReportProcs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3714};

C.3.7.15 attNbrOfSendAlerts

attNbrOfSendAlerts **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3715};

C.3.7.16 succNbrOfSendAlerts

succNbrOfSendAlerts **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3716};

C.3.7.17 attReqForMSRN

attReqForMSRN **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3717};

C.3.7.18 succReqForMSRN

succReqForMSRN **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3718};

C.3.8 VLR Measurement Function Related Attributes

C.3.8.1 attMSMemoryAvailableNotifications

attMSMemoryAvailableNotifications **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 381};

C.3.8.2 succMSMemoryAvailableNotifications

succMSMemoryAvailableNotifications **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 382};

C.3.8.3 attIdentificationReqToPVLRs

attIdentificationReqToPVLRs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 383};

C.3.8.4 succIdentificationReqToPVLRs

succIdentificationReqToPVLRs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 384};

C.3.8.5 attPageReqs

attPageReqs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 385};

C.3.8.6 succPageReqs

succPageReqs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 386};

C.3.8.7 attPageReqsPerLocationArea

attPageReqsPerLocationArea **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType6;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 387};

C.3.8.8 succPageReqsPerLocationArea

succPageReqsPerLocationArea **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType6;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 388};

C.3.8.9 attReqForAuthSetsSentToHLR

attReqForAuthSetsSentToHLR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 389};

C.3.8.10 succReceivedAuthSetsFromHLR

succReceivedAuthSetsFromHLR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3810};

C.3.8.11 emptyResponsesForAuthFromHLR

emptyResponsesForAuthFromHLR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3811};

C.3.8.12 attAuthProcsInVLR

attAuthProcsInVLR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3812};

C.3.8.13 succAuthProcsInVLR

succAuthProcsInVLR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3813};

C.3.8.14 attIntraVLRLocationUpdates

attIntraVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3814};

C.3.8.15 succIntraVLRLocationUpdates

succIntraVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3815};

C.3.8.16 attInterVLRLocationUpdates

attInterVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3816};

C.3.8.17 succInterVLRLocationUpdates

succInterVLRLocationUpdates **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3817};

C.3.8.18 arrivalOfVisitorsFromOtherPLMNs

arrivalOfVisitorsFromOtherPLMNs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3818};

C.3.9 EIR Measurement Function Related Attributes

C.3.9.1 nbrOfReceivedIMEICheckReqs

nbrOfReceivedIMEICheckReqs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 391};

C.3.9.2 nbrOfWhiteAnsInEIR

nbrOfWhiteAnsInEIR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 392};

C.3.9.3 nbrOfGreyAnsInEIR

nbrOfGreyAnsInEIR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 393};

C.3.9.4 nbrOfBlackAnsInEIR

nbrOfBlackAnsInEIR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 394};

C.3.9.5 nbrOfUnknownIMEIAnsInEIR

nbrOfUnknownIMEIAnsInEIR **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 395};

C.3.10 SMS Measurement Function Related Attributes

C.3.10.1 attMobileOriginatingSMForwardings

attMobileOriginatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3101};

C.3.10.2 succMobileOriginatingSMForwardings

succMobileOriginatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3102};

C.3.10.3 attMobileTerminatingSMForwardings

attMobileTerminatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3103};

C.3.10.4 succMobileTerminatingSMForwardings

succMobileTerminatingSMForwardings **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3104};

C.3.10.5 attMobileTerminatingSMForwardingsSgsn

attMobileTerminatingSMForwardingsSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3104};

C.3.10.6 succMobileTerminatingSMForwardingsSgsn

succMobileTerminatingSMForwardingsSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3106};

C.3.11 SGSN Measurement Function Related Attributes

C.3.11.1 nbrLlcFramesSent

nbrLlcFramesSent **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3111};

C.3.11.2 nbrllcFramesReceived

nbrllcFramesReceived **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3112};

C.3.11.3 errLlcFramesDetectedBySgsn

errLlcFramesDetectedBySgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3113};

C.3.11.4 retransmittedLlcFramestoMs

retransmittedLlcFramestoMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3114};

C.3.11.5 uplinkSndcpNpduReceived

uplinkSndcpNpduReceived **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;

BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3115};

C.3.11.6 uplinkSndcpOctetReceivedMode

uplinkSndcpOctetReceivedMode **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3116};

C.3.11.7 downlinkSndcpNpdusent

downlinkSndcpNpdusent **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3117};

C.3.11.8 downlinkSndcpOctetSent

downlinkSndcpOctetSent **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3118};

C.3.11.9 attGprsAttach

attGprsAttach **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3119};

C.3.11.10 succGprsAttach

succGprsAttach **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31110};

C.3.11.11 attCombiAttach

attCombiAttach **ATTRIBUTE**

WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31111};

C.3.11.12 succCombiAttach

succCombiAttach **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31112};

C.3.11.13 attImsiAttach

attImsiAttach **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31113};

C.3.11.14 succImsiAttach

succImsiAttach **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31114};

C.3.11.15 nbrOfAttachedSub

nbrOfAttachedSub **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31115};

C.3.11.16 meanNbrOfAttachedSub

meanNbrOfAttachedSub **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31116};

C.3.11.17 maxNbrOfAttachedSub

maxNbrOfAttachedSub **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31117};

C.3.11.18 attGprsDetachMs

attGprsDetachMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31118};

C.3.11.19 attCombiDetachMs

attCombiDetachMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31119};

C.3.11.20 attImsiDetachMs

attImsiDetachMs **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31120};

C.3.11.21 attGprsdetachSgsn

attGprsdetachSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31121};

C.3.11.22 succGprsdetachSgsn

succGprsdetachSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31122};

C.3.11.23 attItraSgsnRaUpdate

attItraSgsnRaUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31123};

C.3.11.24 succIntraSgsnRaUpdate

succIntraSgsnRaUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31124};

C.3.11.25 attInterSgsnRaUpdate

attInterSgsnRaUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31125};

C.3.11.26 succInterSgsnRaUpdate

succInterSgsnRaUpdate **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31126};

C.3.11.27 attPTMSIRealloc

attPTMSIRealloc **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31127};

C.3.11.28 succPTMSIrealloc

succPTMSIrealloc **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31128};

C.3.11.29 attreqAuthSetsSentToHlrBySgsn

attreqAuthSetsSentToHlrBySgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31129};

C.3.11.30 succReqAuthSetsHlr

SuccReqAuthSetsHlr **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31130};

C.3.11.31 emptyResponsesForAuthSetsFromHlr

emptyResponsesForAuthSetsFromHlr **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31131};

C.3.11.32 attAuthInSgsn

attAuthInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31132};

C.3.11.33 succAuthInSgsn

succAuthInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31133};

C.3.11.34 attIdentityReq

attIdentityReq **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31134};

C.3.11.35 succIdentityReq

succIdentityReq **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31135};

C.3.11.36 attCipheringModeControlPerSgsn

attCipheringModeControlPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31136};

C.3.11.37 succCipheringModeControlPerSgsn

succCipheringModeControlPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31138};

C.3.11.38 nbrOfSubStandby

nbrOfSubStandby **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31138};

C.3.11.39 meanNbrOfSubStandby

meanNbrOfSubStandby **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31139};

C.3.11.40 maxNbrOfSubStandby

maxNbrOfSubStandby **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31140};

C.3.11.41 nbrOfSubReady

nbrOfSubReady **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31141};

C.3.11.42 meanNbrOfSubReady

meanNbrOfSubReady **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31142};

C.3.11.43 maxNbrOfSubReady

maxNbrOfSubReady **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31143};

C.3.11.44 nbrOfCheckIMEIRequests

nbrOfCheckIMEIRequests **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31144};

C.3.11.45 nbrOfWhiteAnswerInSgsn

nbrOfWhiteAnswerInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31145};

C.3.11.46 nbrOfGreyAnswerInSgsn

nbrOfGreyAnswerInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31146};

C.3.11.47 nbrOfBlackAnswerInSgsn

nbrOfBlackAnswerInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31147};

C.3.11.48 nbrOfUnknownAnswerInSgsn

nbrOfUnknownAnswerInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31148};

C.3.11.49 attPacketSwitchedPaging

attPacketSwitchedPaging **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31149};

C.3.11.50 unsuccPacketSwitchedPaging

unsuccPacketSwitchedPaging **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31150};

C.3.11.51 attPsPagingPerRoutingArea

attPsPagingPerRoutingArea **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType7;
BEHAVIOUR

generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31151};

C.3.11.52 unsuccPsPagingPerRoutingArea

unsuccPsPagingPerRoutingArea **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType7;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31152};

C.3.11.53 attActPdpContextMSPerSgsn

attActPdpContextMSPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31153};

C.3.11.54 succActPdpContextMSPerSgsn

succActPdpContextMSPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31154};

C.3.11.55 attActPdpContextDynMSPerSgsn

attActPdpContextDynMSPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31155};

C.3.11.56 succActPdpContextDynMSPerSgsn

succActPdpContextDynMSPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31156};

C.3.11.57 attDeactPdpContextMsPerSgsn

attDeactPdpContextMsPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX

GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31157};

C.3.11.58 succDeactPdpContextMsPerSgsn

succDeactPdpContextMsPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31158};

C.3.11.59 attDeactPdpContextGgsnPerSgsn

attDeactPdpContextGgsnPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31159};

C.3.11.60 succDeactPdpContextGgsnPerSgsn

succDeactPdpContextGgsnPerSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31160};

C.3.11.61 nbrSubsWithActivePdpInSgsn

nbrSubsWithActivePdpInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31161};

C.3.11.62 meanSubsWithActivePdpInSgsn

meanSubsWithActivePdpInSgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31162};

C.3.11.63 nmaxSubsWithActivePdpInSgsn

nmaxSubsWithActivePdpInSgsn **ATTRIBUTE**

WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31163};

C.3.12 GGSN Measurement Function Related Attributes

C.3.12.1 attActPdpContextPerApnOfGgsn

attActPdpContextPerApnOfGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3121};

C.3.12.2 succActPdpContextPerApnOfGgsn

succActPdpContextPerApnOfGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3122};

C.3.12.3 attActPdpContextDnyPerApnOfGgsn

attActPdpContextDnyPerApnOfGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3123};

C.3.12.4 succActPdpContextDnyPerApnOfGgsn

succActPdpContextDnyPerApnOfGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3124};

C.3.12.5 attDeactPdpContextMsPerApnOfGgsn

attDeactPdpContextMsPerApnOfGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3125};

C.3.12.6 succDeactPdpContextMsPerApnOfGgsn

succDeactPdpContextMsPerApnOfGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3126};

C.3.12.7 attDeactPdpContextByGgsnPerApn

attDeactPdpContextByGgsnPerApn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3127};

C.3.12.8 succDeactPdpContextByGgsnMsPerApn

succDeactPdpContextByGgsnMsPerApn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3128};

C.3.12.9 nbrOfActivePdpContextsPerApnAtGgsn

nbrOfActivePdpContextsPerApnAtGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType1;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 3129};

C.3.12.10 meanNbrOfActivePdpContextsPerApnAtGgsn

meanNbrOfActivePdpContextsPerApnAtGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31210};

C.3.12.11 maxNbrOfActivePdpContextsPerApnAtGgsn

maxNbrOfActivePdpContextsPerApnAtGgsn **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX
GSM1204TypeModule.GSMMeasurementType8;
BEHAVIOUR
generalMeasurementAttributeBehaviour;
REGISTERED AS {gsm1204attribute 31211};

C.4 Name Bindings

C.4.1 BSS Name Binding

C.4.1.1 simpleScanner-bssFunction

simpleScanner-bssFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": bssFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 411};

C.4.2 BSC Name Binding

C.4.2.1 bscMeasurementFunction-bsc

bscMeasurementFunction-bsc **NAME BINDING**
SUBORDINATE OBJECT CLASS bscMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1220: 1993": bsc;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 421};

C.4.3 BTS Name Binding

C.4.3.1 cellMeasurementFunction-bts

cellMeasurementFunction-bts **NAME BINDING**
SUBORDINATE OBJECT CLASS cellMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1220: 1993": bts;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 431};

C.4.3.2 internalHdoMeasurementFunction-bts

internalHdoMeasurementFunction-bts **NAME BINDING**
SUBORDINATE OBJECT CLASS internalHdoMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1220: 1993": bts;
WITH ATTRIBUTE measurementFunctionId;

CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 432};

C.4.4 MSC Name Binding

C.4.4.1 mscMeasurementFunction-mscFunction

mscMeasurementFunction-mscFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS mscMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": mscFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 441};

C.4.4.2 externalHdoMeasurementFunction-mscFunction

externalHdoMeasurementFunction-mscFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS externalHdoMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": mscFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 442};

C.4.4.3 simpleScanner-mscFunction

simpleScanner mscFunction-**NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": mscFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 443};

C.4.5 HLR Name Binding

C.4.5.1 hlrMeasurementFunction-hlrFunction

hlrMeasurementFunction-hlrFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS hlrMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": hlrFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 451};

C.4.5.2 simpleScanner-hlrFunction

simpleScanner-hlrFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": hlrFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 452};

C.4.6 VLR Name Binding

C.4.6.1 vlrMeasurementFunction-vlrFunction

vlrMeasurementFunction-vlrFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS vlrMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": vlrFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 461};

C.4.6.2 simpleScanner-vlrFunction

simpleScanner-vlrFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": vlrFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 462};

C.4.7 EIR Name Binding

C.4.7.1 eirMeasurementFunction-eirFunction

eirMeasurementFunction-eirFunction **NAME BINDING**

SUBORDINATE OBJECT CLASS eirMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": eirFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 471};

C.4.7.2 simpleScanner-eirFunction

simpleScanner-eirFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": eirFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 472};

C.4.8 SMS Name Binding

C.4.8.1 smsMeasurementFunction-smsGIWFunction

smsMeasurementFunction-smsGIWFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS smsMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": smsGIWFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 481};

C.4.8.2 simpleScanner-smsGIWFunction

simpleScanner-smsGIWFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": smsGIWFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 482};

C.4.9 SGSN Name Binding

Enter sgsn Name binding to network element function

C.4.9.1 sgsnMeasurementFunction-sgsnFunction

sgsnMeasurementFunction-sgsnFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS sgsnMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": sgsnFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 491};

C.4.9.2 simpleScanner-sgsnFunction

simpleScanner-sgsnFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": sgsnFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 492};

C.4.10 GGSN Name Binding

Enter ggsn Name binding to network element function

C.4.10.1 ggsnMeasurementFunction-vlrFunction

ggsnMeasurementFunction-ggsnFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS ggsnMeasurementFunction;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": vlrFunction;
WITH ATTRIBUTE measurementFunctionId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 4101};

C.4.10.2 simpleScanner-ggsnFunction

simpleScanner-ggsnFunction **NAME BINDING**
SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": simpleScanner;
NAMED BY SUPERIOR OBJECT CLASS "gsm1200: 1993": ggsnFunction;
WITH ATTRIBUTE scannerId;
CREATE;
DELETE;

REGISTERED AS {gsm1204nameBinding 4102};

C.5 Behaviour Definitions

C.5.1 simple scanner behaviour

The behaviour of the simple scanner is defined in [ISO 10164-13] section 8.1.1.3.

C.5.2 general measurement function behaviour

generalMeasurementFunctionBehaviour **BEHAVIOUR**
DEFINED AS
"This object is defined to contain the various optional measurement packages, and one or more instances of this class may exist in the scope of the containing object. The scanner may scan the attributes of the object class in various combinations and

permutations of packages, and further may scan simultaneously as many times as necessary within the processing limits of the network."
;

C.5.3 general measurement package behaviour

generalMeasurementPackageBehaviour **BEHAVIOUR**
DEFINED AS
"Measurement packages are present in the Measurement Function Object (e.g. BSC Measurement Function), if the Network Element Function (e.g. BSC) containing the Measurement Function Object supports the required number of instances of the measurement included in the package according to the number of instances of the Measurement Function. The simple scanner has been designed to read the values of the attributes according to a given schedule."
;

C.5.4 general measurement attribute behaviour

generalMeasurementAttributeBehaviour **BEHAVIOUR**
DEFINED AS
"The measurement that corresponds to this attribute, is described in annex B. The name of this attribute is given in the description part (D) of each measurement definition contained in annex B."

Note: to enable this attribute to be easily located, an index of these attributes is listed at the end of the present document.
;

C.6Abstract syntax definitions

This clause contains the ASN.1 module defining the attribute, Action and notification syntax's referenced by the attribute, Action and notification templates.

```
GSM1204TypeModule{
                        ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
                        gsm-Operation-Maintenance (3)
                        gsm-12-04 (4) informationModel (0) asn1Module (2)
                        asn1TypeModule (0) }

    DEFINITIONS IMPLICIT TAGS ::=

BEGIN

     IMPORTS
              gsm-12-04
       FROM GSM-DomainDefinitions{
       ccitt (0) identified-organisation (4) etsi (0) mobileDomain (0)
       gsm-Operation-Maintenance (3) gsm-12-30 (30) informationModel (0)
       asn1Module (2) gsm-OM-DomainDefinitions (0) version1 (1)}
    ;

    -- Object Identifiers.

    -- Abstract Syntax

    gsm1204abstractSyntax          OBJECT IDENTIFIER ::= {gsm-12-04 protocolSupport (1)
    abstractSyntax (1)}
    --
```

```
    -- Information Model Related Identifiers
    gsm1204informationModel          OBJECT IDENTIFIER ::= {gsm-12-04 informationModel (0)}
    gsm1204managedObjectClass        OBJECT IDENTIFIER ::= {gsm1204informationModel
    managedObjectClass (3)}
    gsm1204package                   OBJECT IDENTIFIER ::= {gsm1204informationModel package (4)}
    gsm1204nameBinding               OBJECT IDENTIFIER ::= {gsm1204informationModel nameBinding
    (6)}
    gsm1204attribute                 OBJECT IDENTIFIER ::= {gsm1204informationModel attribute (7)}

    -- Application Contexts
    gsm1204ApplicationContext        OBJECT IDENTIFIER ::= {gsm-12-04 protocolSupport (1)
    applicationContext (0) gsm-Management (0)}
```

-- The following measurement types are defined.

```
GSMMeasurementType1 ::= INTEGER
GSMMeasurementType2 ::= REAL

GSMMeasurementType3 ::= SET OF SEQUENCE{
                                        cause       Cause,
                                        value       INTEGER }

            Cause ::= INTEGER{

-- CM_SERVICE REJECT causes (GSM 04.08 [2]):

                        imsiUnknownInHlr                                    ( 1),
                        illegalMs                                           ( 2),
                        imsiUnknownInVlr                                    ( 3),
                        imeiNotAccepted                                     ( 4),
                        illegalMe                                           ( 5),
                        plmnNotAllowed                                      ( 6),
                        locationAreaNotAllowed                              ( 7),
                        nationalRoamingNotAllowedInLocationArea             ( 8),
                        networkFailure                                      ( 9),
                        congestion                                          (10),
                        serviceOptionNotSupported                           (11),
                        requestedServiceOptionNotSubscribed                 (12),
                        serviceOptionTemporarilyOutOfOrder                  (13),
                        callCannotBeIdentified                              (14),
                        semanticallyIncorrectMessage                        (15),
                        invalidMandatoryInformation                         (16),
                        messageTypeNonExistentOrNotImplemented              (17),
                        messageTypeNotCompatibleWithProtocolState           (18),
                        informationElementNonExistentOrNotImplemented       (19),
                        conditionalIeError                                  (20),
                        messageNotCompatibleWithProtocolState               (21),
                        protocolError                                       (22),
                        reservedRejectCause                                 (23),

-- Internal and external Handover causes (GSM 08.08 [5]):

                        uplinkQuality                                       (24),
                        uplinkStrength                                      (25),
                        downlinkQuality                                     (26),
                        downlinkStrenght                                    (27),
                        distance                                            (28),
                        betterCell                                          (29),
                        operationAndMaintenanceIntervention                 (30),
                        directedRetry                                       (31),
```

```
                                -- valid for external handovers only:
                                responseToMscInvocation                 (32),

-- Immediate assignment procedure causes (GSM 04.08 [2]):

                                emergencyCall                           (33),
                                callReEstablishment                     (34),
                                answerToPaging                          (35),
                                originatingCall                         (36),
                                locationUpdating                        (37),
                                otherProcedures                         (38),
                                reservedEstablishmentCause              (39) }

-- Interference band definitions (GSM 04.08 [2]):

GSMMeasurementType4 ::= SEQUENCE{
                                channelsPerInterferenceBand1            REAL,
                                channelsPerInterferenceBand2            REAL,
                                channelsPerInterferenceBand3            REAL,
                                channelsPerInterferenceBand4            REAL,
                                channelsPerInterferenceBand5            REAL }

GSMMeasurementType5 ::= SET OF SEQUENCE{
                                ssOperation             SSOperation,
                                value                   INTEGER
                                }


-- SS operation definitions(GSM 09.02 [7]):

        SSOperation ::= INTEGER{
                                register                                (0),
                                erase                                   (1),
                                activate                                (2),
                                deactivate                              (3),
                                registerPassword                        (4),
                                interrogateSSOperation                  (5),
                                processRequest                          (6) }

GSMMeasurementType6 ::= SET OF SEQUENCE{
                                locationAreaCode        LAC,
                                value                   INTEGER }


LAC                             ::= INTEGER (0..65535)
GSMMeasurementFunctionId        ::= INTEGER


GSMCellName ::= SEQUENCE{
                        cellId                  INTEGER(0..65535),
                        locatioAreaCode         LAC }

GSMMeasurementType7 ::= SET OF SEQUENCE{
                                routingAreaCode         RAC,
                                value                   INTEGER }


RAC                             ::= INTEGER (0..255)

GSMMeasurementType8 ::= SET OF SEQUENCE{
                                AccessPoint NameLogicalLinkID  APNID,
                                value                          INTEGER }
```

APNID ::= INTEGER (0..65535)

Editors Note: The APN Logical Link ID, is a numeric value for the assigned to each APN link in the GGSN. The ID is only unique when presented together with thew GGSN address.

END

Annex D (normative): Data Transfer Requirements

This annex defines the data transfer requirements from the NE to the OS for this specification. This specification makes use of the generic approach to EFD, Log and File transfer facility as defined in GSM 12.00 [8].

D.1 Data Transfer Requirements

D.1.1 General

The GSM 12.04 defines how statistical information concerning various aspects of the NE's can be collected. Once this data is collected and available in the NE, it shall be possible to transfer it to the OS. The way in which this can be achieved is described in GSM 12.00 [8].

GSM 12.00 [8] describes the generic solutions to data transfer requirements which are used by GSM 12.04. This annex describes the additional information required to fully satisfy the data transfer requirements of GSM 12.04, containment of which is described in annex C.

Of the data transfer functions described in GSM 12.00 [8], GSM 12.04 requires the upload function, i.e. OS controlled data transfer from NE to OS.

D.2 Object Model

D.2.1 Managed Object Classes

D.2.1.1 "Recommendation X.721: 1992": log

Object instances of this class are used to store incoming event reports. An instance of this class can be created to store specifically scan report notifications (in form of "scanReportRecords" managed objects). This is achieved by using the discriminator construct and filtering on the event type information.

D.2.1.2 "Recommendation X.738: 1993": scanReportRecord

Objects of this class are used to represent logged information that resulted from Attribute Value Change Notifications and are contained in a 'log' instance.

D.2.2 Name Bindings

D.2.2.1 log-managedElement

log-managedElement **NAME BINDING**

SUBORDINATE OBJECT CLASS "Recommendation X.721: 1992": log;

NAMED BY SUPERIOR OBJECT CLASS "Recommendation M.3100: 1992": managedElement;

WITH ATTRIBUTE "Recommendation X.721: 1992": logId;

CREATE;

DELETE;

REGISTERED AS { gsm1204NameBinding 221 };

D.2.2.2 scanReportRecord-log

scanReportRecord-log **NAME BINDING**

SUBORDINATE OBJECT CLASS "Recommendation X.738: 1993": scanReportRecord;

NAMED BY SUPERIOR OBJECT CLASS "Recommendation X.721: 1992": log;

WITH ATTRIBUTE "Recommendation X.721: 1992": logRecordId;

DELETE;

REGISTERED AS { gsm1204NameBinding 222 };

Annex E (informative): Non Standardised Measurements of Interest to PLMN Management

Following is the template used to describe the measurements contained in this annex.

A. **Description**

A short explanation of the measurement operation.

B. **Collection Method**

The form in which this measurement data is obtained:

- CC (Cumulative Counter).
- GAUGE (dynamic variable), used when data being measured can vary up or down during the period of measurement.
- DER (Discrete Event Registration), when data related to a particular event are captured every nth event is registered, where n can be 1 or larger.
- SI (Status Inspection).

Inception of annex E

The annex E has been created to contain all the measurements that are **NOT** candidates for standardisation, (indication that they have been considered).

At the end of the annex there are also references to the Fixed Network measurements, which have been included for completeness.

NOTE: The measurements in this annex are for information only and as a consequence are **NOT** included in the Object Model (annex C).

E.1 Measurement Related to the BSC

E.1.1 BSC Measurement Function

None.

E.2 Measurement Related to the BTS

E.2.1 BTS Measurement Function

None.

E.2.2 CELL Measurement Function

None.

E.2.3 Internal HDO Measurement Function

None.

E.3 Measurement Related to the MSC

E.3.1 MSC Measurement Function

E.3.1.1 Attempted Mobile to Mobile Calls

A. This measurement provides the number of mobile to mobile call attempts received by the MSC.

B. CC.

E.3.1.2 Successful Mobile to Mobile Calls

A. This measurement provides the number of successful mobile to mobile calls.

B. CC.

E.3.1.3 Answered Mobile to Mobile Calls

A. This measurement counts the number of answered mobile to mobile calls.

B. CC.

E.3.1.4 Attempted Mobile to Land Calls

A. This measurement provides the number of mobile to land call attempts received by the MSC.

B. CC.

E.3.1.5 Successful Mobile to Land Calls

A. This measurement provides the number of successful mobile to land calls.

B. CC.

E.3.1.6 Answered Mobile to Land Calls

A. This measurement provides the number of answered mobile to land calls.

B. CC.

E.3.1.7 Attempted Land to Mobile Calls

A. This measurement provides the number of land to mobile call attempts received by the MSC.

B. CC.

E.3.1.8 Successful Land to Mobile Calls

A. This measurement provides the number of successful land to mobile calls.

B. CC.

E.3.1.9 Answered Land to Mobile Calls

A. This measurement indicates the number of answered land to mobile calls.

B. CC.

E.3.1.10 Mean Holding Time of Calls

A. This measurement provides the mean holding time of calls.

B. CC.

E.3.2 External HDO Measurement Function

None.

E.4 Measurements related to the HLR

E.4.1 HLR Measurement Function

E.4.1.1 Instantaneous number of HLR subscribers

A. This measurement provides a running total of the number of subscribers for whom information is currently held the HLR.

B. SI.

E.4.1.2 Barred subscribers in the HLR

A. This measurement provides the number of barred subscribers in the HLR.

B. SI.

E.4.1.3 Bearer service indication

A. This measurement provides the number of subscribers with the specified bearer service.

B. CC.

E.4.1.4 SS operation indication

A. This measurement provides the number of subscribers with the specified SS operation.

B. CC.

E.4.1.5 Attempted requests for Authentication sets from the AUC by the HLR

A. This measurement counts the number of triplets requested from the AUC by the HLR.

B. CC.

E.4.1.6 Successful returned Authentication sets from the AUC to the HLR

A. This measurement counts the successfully returned triplets from the AUC to the HLR.

B. CC.

E.5 Measurements related to the VLR

E.5.1 VLR Measurement Function

E.5.1.1 Subscribers from other PLMNs registered in the VLR

A. This measurement provides the number of subscribers of other PLMNs registered in the VLR.

B. SI.

E.5.1.2 Number of roamers in the VLR

A. This measurement provides the number of roamers which are registered in the VLR.

B. SI.

E.6 Measurements related to the EIR

None.

E.7 Measurements related to the SMS-IWMSC/GMSC

None.

E.8 Performance Measurements on non-specific GSM Objects

E.8.1 Measurements related to a PCM system

According to CCITT Recommendation Q.79x.

E.8.2 Measurements related to MTP

According to CCITT Recommendation Q.79x.

E.8.3 Measurements related to SCCP and TCAP

According to CCITT Recommendation Q.79x.

E.8.4 Measurements related to ISUP

According to CCITT Recommendation Q.79x.

E.8.5 Measurements related to Internet Protocols

According to IETF RFC Recommendations.

Annex F (informative): Index of Measurement Attribute Names

The measurement description (part D of annex B) provides for each measurement the equivalent measurement attribute name. This clause provides an index of all the attribute names which are used in annex B. This index is provided to enable the reader to forward or backward reference, these attributes in annex C.

Measurement Attribute Name: Page

Annex G (informative): Bibliography

This subclause provides references to documents which are not directly referenced by the present document, but nevertheless are useful for back ground information on this subject.

- CCITT Recommendation. E.500 - E.600: "Traffic Engineering".
- CCITT Recommendation M.3010: "Principles for Telecommunications Management Network".
- CCITT Recommendation M.3200: "TMN Management Services: Overview".
- CCITT Recommendation M.3400: "TMN Management Functions".
- CCITT Recommendation M.251: "Maintenance functions to be implemented in CCITT-MML".
- CCITT Recommendation Q.542: "Design objectives - Operations and Maintenance".
- CCITT Recommendation Q.544: "Exchange measurements".
- CCITT Recommendation Q.822: "Stage 1, stage 2 and stage 3 description for the Q3 interface - Performance management".
- CCITT Recommendation Z.336: "Traffic Measurement Administration".

Annex (H) (informative): Change history

This annex lists all change requests approved for this document since the specification was first approved by 3GPP TSG-SA.

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Jun 2001	S_12	SP-010237	-		Submitted to TSG SA #12 for Information (this part maintains the relevant sections of GSM 12.04 for the future in 3GP)		1.0.0

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Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

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

The present document is part 3 of a multi-TS covering the 3rd Generation Partnership Project: Technical Specification Group Services and System Aspects; Telecommunication Management; Performance Management, as identified below:

Part 1: Performance Management Concept and Requirements

Part 2: Performance Measurements - GSM

Part 3: Performance Measurements - UMTS and combined UMTS/GSM

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part of a set of specifications, which describe the requirements and information model necessary for the standardised Operation, Administration and Maintenance (OA&M) of a multi-vendor 3G-system.

During the lifetime of a 3G network, its logical and physical configuration will undergo changes of varying degrees and frequencies in order to optimise the utilisation of the network resources. These changes will be executed through network configuration management activities and/or network engineering, see 3GPP TS 32.600 [3].

Many of the activities involved in the daily operation and future network planning of a 3G network require data on which to base decisions. This data refers to the load carried by the network and the grade of service offered. In order to produce this data performance measurements are executed in the NEs, which comprise the network. The data can then be transferred to an external system, e.g. an Operations System (OS) in TMN terminology, for further evaluation. The purpose of the present document is to describe the mechanisms involved in the collection of the data and the definition of the data itself.

1 Scope

The present document describes the measurements for UMTS and combined UMTS/GSM.

The TS 32.104-1 describe Performance Management concepts and requirements.

The present document is valid for all measurement types provided by an implementation of a UMTS network and combined UMTS/GSM network. These may be measurement types defined within this TS, measurements defined within other standards bodies, or vendor specific measurement types.

Only measurement types that are specific to UMTS or combined UMTS/GSM networks are defined within this documents. I.e. vendor specific measurement types and measurements related to "external" technologies used in UMTS and combined UMTS/GSM networks, such as ATM or IP, are not covered. Instead, these could be applied as described by the other, "external" standards bodies (e.g. ITU-T or IETF) or according to manufacturer's documentation.

The definition of the standard measurements is intended to result in comparability of measurement data produced in a multi-vendor network, for those measurement types that can be standardised across all vendors' implementations.

The structure of this document is as follows:

Header 1: Network Element (e.g. RNC related measurements)

Header 2: Measurement function (e.g. soft handover measurements)

Header 3: Measurements

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 TS 32.101: "3G Telecom Management principles and high level requirements".

[2] 3GPP TS 32.102: "3G Telecom Management architecture".

[3] 3GPP TS 32.600: "3G Configuration Management: Concept and High-level Requirements".

[4] 3GPP TS 25.331: "RRC Protocol Specification".

[5] 3GPP TS 25.413: "UTRAN Iu Interface RANAP Signalling ".

[6] 3GPP TS 25.423: "UTRAN Iur Interface RNSAP Signalling".

[7] 3GPP TS 25.433: "UTRAN Iub Interface NBAP Signalling ".

[8] 3GPP TS 23.107: "QoS Concept and Architecture".

[9] 3GPP TS 32.620-2: "Generic Network Resources IRP: Network Resource Model"

[10] 3GPP TS 32.621-2: "Core Network Resources IRP: Network Resource Model"

[11] 3GPP TS 32.622-2: "UTRAN Network Resources IRP: Network Resource Model"

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

"*(n-1)* out of *n*" approach

The measurements result values generated by a NE can be obtained in a number of different ways. Therefore, the "*(n-1)* out of *n* approach" has been defined in order to avoid redundancy in the measurements.

The "*(n-1)* out of *n* approach" allows a vendor to choose any (n-1) out of the n defined counters for implementation but some choices can offer more detailed information than others. The missing n^{th} value can be calculated in post-processing.

If multiple measurements are included in one template, then the applicability of the "(n-1) out of n" scenario are mentioned in template item A with the following sentence "The *n* measurement types defined in item E are subject to the "*(n-1)* out of *n* approach"". The item D will specify the measurement result per measurement type specified in template item E.

- If the measurements that are applicable to the "*(n-1)* out of *n*" scenario are defined in separate templates, then they will be grouped together into a common section of the TS, and the applicability of the approach will be mentioned in the supersection that groups the measurements.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3G	3rd Generation
3GPP	3G Partnership Project
ASN.1	Abstract Syntax Notation 1
BER	Basic Encoding Rules
DTD	Document Type Definition
EM	(Network) Element Manager
ETS	European Telecommunication Standard
FTAM	File Transfer Access and Management
FTP	File Transfer Protocol
Itf	Interface
ITU-T	International Telecommunication Union - Telecommunications Standardisation Sector
MSC	Mobile Services Switching Centre
NE	Network Element
NM	Network Manager
OA&M	Operation, Administration and Maintenance
OS	Operations System (EM, NM)
OSI	Open Systems Interconnection
PM	Performance Management
QoS	Quality of Service
RNC	Radio Network Controller
TFTP	Trivial FTP
UMTS	Universal Mobile Telecommunications System
UTRAN	UMTS Terrestrial Radio Access Network

In the following table you can find a list of abbreviations used within the measurement types for field E of the measurement template (see section 3.3).

Assn	Assign(ment,ed)
Att	Attempt(s,ed)
Aut	Authentication
Bgrd	Background
Call	Call
Conn	Connection
CS	Circuit switched
Ctrl	Controlled
Conv	Conversational
Del	Deletion
Drop	Drop(ped)
Estab	Establish (ed,ment)
Fail	Fail(ed, ure)
HHO	Hard Handover
HO	Handover
Inc	Incoming
Intact	Interactive
Inter	Inter
Intra	Intra
MM	Mobility Management
Netw	Network
NodeB	NodeB
Oct	Octet(s)
Out	Outgoing
Pkt	Packet(s)
Prep	Preparation
PS	Packet switched
RAB	Radio Access Bearer
RAT	Radio Access Technologie
ReEstab	Re-establish (ed,ment)
Rel	Released
Reloc	Relocation
Req	Request(s,ed)
RAT	Radio Access Technology
RL	Radio Link
RNC	RNC
RRC	Radio Resource Control
Setup	Setup
SGSN	SGSN
SHO	Soft Handover
Sig	Signalling
Strm	Streaming
Succ	Success(es,ful)
UE	User Equipement
UTRAN	UTRAN

3.3 Measurement definition template

Following is the template used to describe the measurements contained in this annex.

C.x.y. Measurement Name (section header)

This is a descriptive name of the measurement type that is specified as clause C.x.y of the present document.

The measurement name shall be written in lower-case characters except abbreviations (e.g. RNC).

A measurement name can apply to one or more measurements. If the measurement name applies to several measurements then all fields of the template will take this into account.

a) **Description**

This section contains an explanation of the measurement operation;

b) **Collection Method**

This section contains the form in which this measurement data is obtained:

- CC (Cumulative Counter);
- GAUGE (dynamic variable), used when data being measured can vary up or down during the period of measurement;
- DER (Discrete Event Registration), when data related to a particular event are captured every n^{th} event is registered, where n can be 1 or larger;
- SI (Status Inspection).

c) **Condition**

This section contains the condition which causes the measurement result data to be updated;
This will be defined by identifying protocol related trigger events for starting and stopping measurement processes, or updating the current measurement result value. Where it is not possible to give a precise condition, then the conditional circumstances leading to the update are stated.

If a measurement is not available for FDD or TDD, then the measurement description shall contain a statement.

d) **Measurement Result** (measured value(s), Units)

This section contains a description of expected result value(s) (e.g. a single integer value).

The definition applies for each measurement result.

e) **Measurement Type**

This section contains a short form of the measurement name specified in the header, which is used to identify the measurement type in the result files.

The measurement names are dotted sequences of items. The sequence of elements identifying a measurement is organised from the general to the particular.

- The first item identifies the measurement family (e.g. HHO, RAB, SMS). Note that this family may also be used for measurement administration purpose.
- The second item identifies the name of the measurement itself.
- Depending on the measurement type, additional items may be present to specify sub-counters (failure causes, traffic classes, min, max, avg, G, U ...). When available, the template will describe to which standard it is referring to for these additional items (e.g. cause, traffic class). Otherwise, the additional item semantics must be described in details in this document. Standardised causes will be a number. (e.g. RRC.ConnEstab.1) but non standardised causes should be a string (e.g. RRC.ConnEstab.NoReply).

It is to be noted that the set of values issued for a measurement does not depend on the associated collection method (CC, SI, Gauge, DER). For instance, a gauge collected counter does not necessarily provide min, max, average values.

In addition, it is recommended that a prefix is added for non-UMTS measurements:

- VS for vendor-specific measurements
- Q3 for Q3 measurements
- MIB for IETF measurements (ATM, IP)
- OS for other standards measurements

Note that the 3GPP standardised measurements name must not commence with the above prefixes.

Examples of valid measurement names are:

- VS.HO.InterSGSNReject.NoResource
- HHO.SuccOutIntraCell
- MM.AttachedSubs.Max
- RAB.EstabAttCS.Conversational
- RRC.ConnEstab.*Cause*
  where *Cause* identifies the failure cause.

Abbreviations to be used within measurement types can be found in chapter 3.2 of this document.

f) **Measurement Object Class**

This section describes the measured object class (e.g. UtranCell, RncFunction, SgsnFunction). The object class used for this purpose shall be in accordance with the Network Resource Model defined in 3GPP TSs 32.620-2 [9], 32.621-2 [10], 32.622-2 [11].

For object classes currently not defined in CM, this TS defines its own nomenclature (e.g. RA, LAC).

g) **Switching Technology**

This section contains the Switching domain(s) this measurement is applicable to i.e. Circuit Switched and/or Packet Switched.

h) Generation

The generation determines if it concerns a GSM , UMTS , or combined (GSM+UMTS) measurement.

- GSM : pure GSM measurement; it only counts GSM events.In a combined (GSM+UMTS) NE the count would be exactly the same as in a pure GSM NE. In a pure UMTS NE this counter does not exist;

- UMTS : pure UMTS measurement; it only counts UMTS events.In a combined (GSM+UMTS) NE the count would be exactly the same as in a pure UMTS NE. In a pure GSM NE this counter does not exist;

- GSM/UMTS : measurement applicable to both GSM and UMTS systems; in a combined (GSM+UMTS) NE separate subcounts for GSM and/or UMTS events can be obtained;

- COMB : measurement applicable to combined GSM and UMTS systems, but regardless of whether the measured event occurred on the GSM or UMTS part of the system. This means that in a combined NE only one total (i.e. GSM+UMTS) count is obtained for the measured event;

The above aspects are also reflected in the measurement type name in template item E by adding a “G” to the GSM measurements and “U” to the UMTS measurements.

Note: The 2G component of a combined 2G/3G equipment may actually choose to implement GSM measurements according to TS 32.104-3 (3GPP) or GSM12.04/TS32.104-2, based on GSM standards.

3.4 Definition of private Object Classes

Private Object Classes are Object Classes which are needed for PM purposes, but that are not yet defined by CM.

3.4.1 Neighbour Cell

The Object Class Neighbour Cell is needed to measure cell-cell relations such as Handover. For the purpose of this document the Neighbour Cell should be encoded in the file format as the concatenation of 2 UtranCell moid's, separated by a comma. If the neighbouring cell belongs to another RNC than the measured one, then for the second UtranCell moid the complete DN is to be specified.

Examples :

1. both cells belong to the same RNC

nedn = "G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-1,RncFunction=RF-1"

moid = "UtranCell=Gbg-997,UtranCell=Gbg-998"

2. both cells belong to different RNC

nedn = "G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-1,RncFunction=RF-1"

moid = "UtranCell=Gbg-997,G3SubNetwork=Sweden,MeContext=MEC-Gbg-1,G3ManagedElement=RNC-Gbg-2,RncFunction=RF-2,UtranCell=Gbg-998"

3.4.2 Routing Area

The Object Class Routing Area (RA) is needed to conduct measurements on RA level. For the purpose of this document the Neighbour Cell should be encoded in the file format as the concatenation of the LAC and the RAC, in decimal notation. Since LAC is a 2 byte number (00000-65535) 5 characters are needed in the moid PrintableString. Since RAC is a 1 byte number (000-255) 3 characters are needed in the moid PrintableString. Hence concatenated moid PrintableString will always contain 8 characters.

Example :

LAC = Hexadecimal 4E20 = Decimal 20000

RAC = Hexadecimal BE = Decimal 190

moid = "20000190"

4 Measurements related to the RNC

4.1 RAB assignment

The five measurement types defined in the sections 4.1.n for CS domain (respectively PS domain) are subject to the "4 out of 5 approach".

4.1.1 Attempted RAB establishments for CS domain

A. This measurement provides the number of RAB assignment attempts for CS domain. The measurement is pegged by traffic class.

B. CC

C. On receipt by the RNC of a RANAP RAB ASSIGNMENT REQUEST message for CS domain, each RAB assignment request is added to the relevant measurement according to the traffic class requested. See TS 25.413 and TS 23.107.

D. Four integer values.

E. RAB.AttEstabCS.Conv
RAB.AttEstabCS.Strm
RAB.AttEstabCS.Intact
RAB.AttEstabCS.Bgrd

F. RNCFunction

G. Valid for circuit switched traffic.

H. UMTS

4.1.2 Successful RAB establishments without queuing for CS domain

A. This measurement provides the number of successfully established RABs for CS domain in which a queuing process has not been involved. The measurement is pegged by traffic class.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for CS domain, each successfully established RAB is added to the relevant measurement according to the traffic class requested in the RAB ASSIGNMENT REQUEST message. See TS 25.413 and TS 23.107.

Note: The addition is performed with the condition the RAB has not been mentioned as queued in a previous RANAP RAB ASSIGNMENT RESPONSE.

D. Four integer values.

E. RAB.SuccEstabCSNoQueuing.Conv
RAB.SuccEstabCSNoQueuing.Strm
RAB.SuccEstabCSNoQueuing.Intact
RAB.SuccEstabCSNoQueuing.Bgrd

F. RNCFunction

G. Valid for circuit switched traffic.

H. UMTS

4.1.3 Failed RAB establishments without queuing for CS domain

A. This measurement provides the number of RAB establishment failures for CS domain in which a queuing process has not been involved. The measurement is pegged by failure cause.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for CS domain, each RAB failed to establish is added to the relevant measurement according to the failure cause. Possible causes are included in TS 25.413. The sum of all supported per cause measurements should equal the total number of RAB Establishment Failures.

   Note: The addition is performed with the condition the RAB has not been mentioned as queued in a previous RANAP RAB ASSIGNMENT RESPONSE.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form RAB.FailEstabCSNoQueuing.*Cause*
where *Cause* identifies the failure cause.

F. RNCFunction

G. Valid for circuit switched traffic.

H. UMTS

4.1.4 Successful RAB establishments with queuing for CS domain

A. This measurement provides the number of successfully established RABs for CS domain in which a queuing process has been involved. The measurement is pegged by traffic class.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for CS domain, each successfully established RAB is added to the relevant measurement according to the traffic class. See TS 25.413 and TS 23.107.

   Note: The addition is performed with the condition the RAB has been mentioned as queued in a previous RANAP RAB ASSIGNMENT RESPONSE.

D. Four integer values.

E. RAB.SuccEstabCSQueuing.Conv
RAB.SuccEstabCSQueuing.Strm
RAB.SuccEstabCSQueuing.Intact
RAB.SuccEstabCSQueuing.Bgrd

F. RNCFunction

G. Valid for circuit switched traffic.

H. UMTS

4.1.5 Failed RAB establishments with queuing for CS domain

A. This measurement provides the number of RAB establishment failures for CS domain in which a queuing process has been involved. The measurement is pegged by failure cause.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for CS domain, each RAB failed to establish is added to the relevant measurement according to the cause. Possible causes are included in TS 25.413. The sum of all supported per cause measurements should equal the total number of RAB Establishment Failures.

Note: The addition is performed with the condition the RAB has been mentioned as queued in a previous RANAP RAB ASSIGNMENT RESPONSE.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RAB.FailEstabCSQueuing.*Cause*
where *Cause* identifies the failure cause.

F. RNCFunction

G. Valid for circuit switched traffic.

H. UMTS

4.1.6 Attempted RAB establishments for PS domain

A. This measurement provides the number of RAB assignment attempts for PS domain. The measurement is pegged by traffic class.

B. CC

C. On receipt by the RNC of a RANAP RAB ASSIGNMENT REQUEST message for PS domain, each RAB assignment request is added to the relevant measurement according to the traffic class requested. See TS 25.413 and TS 23.107.

D. Four integer values.

E. RAB.AttEstabPS.Conv
RAB.AttEstabPS.Strm
RAB.AttEstabPS.Intact
RAB.AttEstabPS.Bgrd

F. RNCFunction

G. Valid for packet switched traffic.

H. UMTS

4.1.7 Successful RAB establishments without queuing for PS domain

A. This measurement provides the number of successfully established RABs for PS domain in which a queuing process has not been involved. The measurement is pegged by traffic class.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for PS domain, each successfully established RAB is added to the relevant measurement according to the traffic class. See TS 25.413 and TS 23.107.

Note: The addition is performed with the condition the RAB has not been mentioned as queued in a previous RANAP RAB ASSIGNMENT RESPONSE.

D. Four integer values.

E. RAB.SuccEstabPSNoQueuing.Conv
RAB.SuccEstabPSNoQueuing.Strm
RAB.SuccEstabPSNoQueuing.Intact
RAB.SuccEstabPSNoQueuing.Bgrd

F. RNCFunction

G. Valid for packet switched traffic.

H. UMTS

4.1.8 Failed RAB establishments without queuing for PS domain

A. This measurement provides the number of RAB establishment failures for PS in which a queuing process has not been involved. The measurement is pegged by failure cause.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for PS domain, each RAB failed to establish is added to the relevant measurement according to the failure cause. Possible causes are included in TS 25.413. The sum of all supported per cause measurements should equal the total number of RAB Establishment Failures.

Note: The addition is performed with the condition the RAB has not been mentioned as queued in a previous RANAP RAB ASSIGNMENT RESPONSE.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RAB.FailEstabPSNoQueuing.*Cause*
where *Cause* identifies the failure cause.

F. RNCFunction

G. Valid for packet switched traffic.

H. UMTS

4.1.9 Successful RAB establishments with queuing for PS domain

A. This measurement provides the number of successfully established RABs for PS domain in which a queuing process has been involved. The measurement is pegged by traffic class.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for PS domain, each successfully established RAB is added to the relevant measurement according to the traffic class. See TS 25.413 and TS 23.107.

Note: The addition is performed with the condition the RAB has been mentioned as queued in a previous RANAP RAB ASSIGNMENT RESPONSE.

D. Four integer values.

E. RAB.SuccEstabPSQueuing.Conv
RAB.SuccEstabPSQueuing.Strm
RAB.SuccEstabPSQueuing.Intact
RAB.SuccEstabPSQueuing.Bgrd

F. RNCFunction

G. Valid for packet switched traffic.

H. UMTS

4.1.10 Failed RAB establishments with queuing for PS domain

A. This measurement provides the number of RAB establishment failures for PS domain in which a queuing process has been involved. The measurement is pegged by failure cause.

B. CC

C. On transmission by the RNC of a RANAP RAB ASSIGNMENT RESPONSE message for PS domain, each RAB failed to establish is added to the relevant measurement according to the cause. Possible causes are included in TS 25.413. The sum of all supported per cause measurements should equal the total number of RAB Establishment Failures.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RAB.FailEstabPSQueuing.*Cause*
where *Cause* identifies the failure cause.

F. RNCFunction

G. Valid for packet switched traffic.

H. UMTS

4.2 RAB release

4.2.1 RAB releases for CS domain

A. This measurement provides the number of RAB releases for CS domain pegged by cause.

B. CC

C. On transmission by the RNC of a RANAP RAB RELEASE REQUEST message for CS domain, each RAB requested to be released is added to the relevant per cause measurement. Possible causes are included in TS 25.413. The sum of all supported per cause measurements should equal the total number of RAB Releases for the CS domain.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RAB.RelCS.*Cause*
where *Cause* identifies the release cause.

F. RNCFunction

G. Valid for circuit switched traffic.

H. UMTS

4.2.2 RAB releases for PS domain

A. This measurement provides the number of RAB releases for PS domain pegged by cause.

B. CC

C. On transmission by the RNC of a RANAP RAB RELEASE REQUEST message for PS domain, each RAB requested to be released is added to the relevant per cause measurement. Possible causes are included in TS 25.413. The sum of all supported per cause measurements should equal the total number of RAB Releases for the PS domain.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RAB.RelPS.*Cause*
where *Cause* identifies the release cause.

F. RNCFunction

G. Valid for packet switched traffic.

H. UMTS

4.3 Signalling connection establishment

4.3.1 Attempted signalling connection establishments for CS domain

A. This measurement provides the number of attempts by RNC to establish an Iu control plane connection between the RNC and a CS CN.

Note: There is no confirmation in response to this message to indicate that the CN-RNC connection was successfully setup.

B. CC

C. Transmission of a RANAP Initial UE message by the RNC to the CN. This is sent by the RNC on receipt of an RRC Initial Direct Transfer message from the UE.

D. A single integer value.

E. Sig.AttConnEstabCS

F. RncFunction

G. Valid for circuit switching.

H. UMTS

4.3.2 Attempted signalling connection establishments for PS domain

A. This measurement provides the number of requests by RNC to establish an Iu control plane connection between the RNC and a PS CN.

Note: There is no confirmation in response to this message to indicate that the CN-RNC connection was successfully setup

B. CC

C. Transmission of a RANAP Initial UE message by the RNC to the CN. This is sent by the RNC on receipt of an RRC Initial Direct Transfer message from the UE.

D. A single integer value.

E. Sig.AttConnEstabPS

F. RncFunction

G. Valid for packet switching.

H. UMTS

4.4 RRC connection establishment

The three measurement types defined in the sections 4.4.n are subject to the “2 out of 3 approach”.

4.4.1 Attempted RRC connection establishments

A. This measurement provides the number of RRC connection establishment attempts for each establishment cause.

B. CC

C. Receipt of an RRC Connection Request message by the RNC from the UE. Each RRC Connection Request message received is added to the relevant per cause measurement. The possible causes are included in TS 25.331.

The sum of all supported per cause measurements should equal the total number of RRC Connection Establishment attempts.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RRC.AttConnEstab.*Cause*
where *Cause* identifies the Establishment Cause

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.4.2 Failed RRC connection establishments

A. This measurement provides the number of RRC establishment failures for each rejection cause.

B. CC.

C. Transmission of an RRC Connection Reject message by the RNC to the UE or an expected RRC CONNECTION SETUP COMPLETE message not received by the RNC. Each RRC Connection Reject message received is added to the relevant per cause measurement. The possible causes are included in TS 25.331.

Each expected RRC CONNECTION SETUP COMPLETE not received by the RNC is added to the measurement cause ‘No Reply’ (not specified in TS 25.331).

The sum of all supported per cause measurements should equal the total number of RRC Connection Establishment Failures.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RRC.FailConnEstab.*Cause*
where *Cause* identifies the Rejection Cause

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.4.3 Successful RRC connection establishments

A. This measurement provides the number of successful RRC establishments for each establishment cause.

B. CC

C. Receipt by the RNC of a RRC CONNECTION SETUP COMPLETE message following a RRC establishment attempt. Each RRC Connection Setup Complete message received is added to the relevant per cause measurement. The possible causes are included in TS 25.331. The sum of all supported per cause measurements should equal the total number of RRC Connection Establishments.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RRC.SuccConnEstab.*Cause*
where *Cause* identifies the Establishment Cause

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.5 RRC connection re-establishment

The three measurement types defined in the sections 4.5.n are subject to the “2 out of 3 approach”.

4.5.1 Attempted RRC re-establishments

A. This measurement provides the number of RRC re-establishments attempts.

B. CC

C. Receipt by the RNC of a CELL UPDATE message using the Cell Update cause “Radio link failure”. See TS 25.331.

D. A single integer value.

E. RRC.AttConnReEstab

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.5.2 Failed RRC re-establishments

A. This measurement provides the number of RRC re-establishment failures.

B. CC

C. Transmission of an RRC Connection Release message by RNC to the UE or an expected UTRAN Mobility Information Confirm message not received by RNC from the UE. See TS 25.331.

D. A single integer value.

E. RRC.FailConnReEstab

F. UtranCell

G. Valid for circuit switched and packet switched traffic

H. UMTS

4.5.3 Successful RRC re-establishments

A. This measurement provides the number of successful RRC re-establishments.

B. CC

C. Receipt by the RNC of a UTRAN MOBILITY INFORMATION CONFIRM in a CELL UPDATE procedure using the value cause “Radio link failure”. See TS 25.331.

D. A single integer value.

E. RRC.SuccConnReEstab

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.6 RRC connection release

4.6.1 Attempted RRC connection releases on DCCH

A. This measurement provides the number of RRC connection release attempts per release cause sent from UTRAN to the UE on the DCCH.

B. CC

C. Transmission of an RRC CONNECTION RELEASE message by the RNC to the UE on DCCH. Each RRC Connection Release message sent on DCCH is added to the relevant per cause measurement. The possible causes are included in TS 25.331.

The sum of all supported per cause measurements should equal the total number of RRC Connection Release attempts on DCCH.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RRC.AttConnRelDCCH.*Cause*
where *Cause* identifies the Release Cause

F. UtranCell

G. Valid for circuit switched and packet switched traffic

H. UMTS

4.6.2 Attempted RRC connection releases on CCCH

A. This measurement provides the number of RRC connection release attempts per release cause sent from UTRAN to the UE on the CCCH.

B. CC

C. Transmission by the RNC of an RRC CONNECTION RELEASE message to the UE on CCCH. Each RRC Connection Release message sent on CCCH is added to the relevant per cause measurement. The possible causes are included in TS 25.331.

The sum of all supported per cause measurements should equal the total number of RRC Connection Release attempts on CCCH.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes.

E. The measurement name has the form RRC.AttConnRelCCCH.*Cause*
where *Cause* identifies the Release Cause

F. UtranCell

G. Valid for circuit switched and packet switched traffic

H. UMTS

4.7 Soft handover

4.7.1 Attempted radio link additions to active link set (UE side)

A. This measurement provides the number of attempted radio link additions during active link set update procedure (UE side) for each cell. This measurement shall be increased for each attempted radio link addition (UE side). This measurement is only valid for FDD mode.

B. CC.

C. Transmission of an ACTIVE SET UPDATE message (RRC) by the serving RNC to the UE. Within an ACTIVE SET UPDATE message more than one radio link can be added. Each existing radio link addition information element shall be considered separately. See TS 25.331.

D. A single integer value.

E. SHO.AttRLAddUESide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.7.2 Successful radio link additions to active link set (UE side)

A. This measurement provides the number of successful radio link additions during active link set update procedure (UE side) for each cell. This measurement shall be increased for each successful radio link addition (UE side). This measurement is only valid for FDD mode.

B. CC.

C. Receipt of an ACTIVE SET UPDATE COMPLETE message (RRC), sent by the UE to the SERVING RNC, in response to an ACTIVE SET UPDATE message with one or more existing radio link addition information element. One ACTIVE SET UPDATE COMPLETE message can be related to more than one added radio link. Each successful added radio link shall be considered separately. See TS 25.331.

D. A single integer value.

E. SHO.SuccRLAddUESide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.7.3 Failed radio link additions to active link set (UE side)

A. This measurement provides the number of failed radio link additions during active link set Update procedure (UE side) for each cell per cause. For each failure cause a separate subcounter is defined. Every failed radio link addition (UE side) shall be considered separately. This measurement is only valid for FDD mode.

B. CC.

C. Receipt of an ACTIVE SET UPDATE FAILURE message (RRC) sent by UE to the UTRAN in response to an ACTIVE SET UPDATE message with non-empty radio link addition information element or an expected ACTIVE SET UPDATE COMPLETE message not received by the RNC. Each message can be related to more than one radio link.

Each failed attempt to add a radio link shall be considered separately and added to the relevant per cause measurement. Failure causes are defined within TS 25.331.

Each expected ACTIVE SET UPDATE COMPLETE message not received by the RNC is added to the measurement cause 'No Reply' (not specified in TS 25.331).

The sum of all supported per cause measurements should equal the total number of failures.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form SHO.FailRLAddUESide.*Cause*
where *Cause* identifies the failure cause.

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.7.4 Attempted radio link deletions from active link set (UE side)

A. This measurement provides the number of attempted radio link deletions during active link set update procedure (UE side) for each cell. This measurement shall be increased for each attempted radio link deletion (UE side). This measurement is only valid for FDD mode.

B. CC.

C. Transmission of an ACTIVE SET UPDATE message (RRC) by the SERVING RNC to the UE. Within an ACTIVE SET UPDATE message more than one radio link can be removed. Each existing radio link removal information element shall be considered separately. See TS 25.331.

D. A single integer value.

E. SHO.AttRLDelUESide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.7.5 Successful radio link deletions from active link set (UE side)

A. This measurement provides the number of successful radio link deletions during active link set update procedure (UE side) for each cell. This measurement shall be increased for each successful radio link deletion (UE side). This measurement is only valid for FDD mode.

B. CC.

C. Receipt of an ACTIVE SET UPDATE COMPLETE message (RRC) sent by UE to the Serving RNC in response to an ACTIVE SET UPDATE message with one or more existing radio link removal information element. One ACTIVE SET UPDATE COMPLETE message can be related to more than one deleted radio link. Each successful deleted radio link shall be considered separately. See TS 25.331.

D. A single integer value.

E. SHO.SuccRLDelUESide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.8 Radio link addition procedure (UTRAN side)

4.8.1 Attempted radio link additions (UTRAN side)

A. This measurement provides the number of attempted radio link additions (UTRAN side) for each cell. This measurement shall be increased for each attempted radio link addition (UTRAN side). This measurement is valid for FDD and TDD mode.

B. CC.

C. This measurement is based on two different events:

Transmission of a RADIO LINK SETUP REQUEST message (NBAP) by the serving RNC to the NodeB. Within a RADIO LINK SETUP REQUEST message more than one radio link can be added. Each existing radio link information element shall be considered separately. See TS 25.433.

Transmission of a RADIO LINK ADDITION REQUEST message (RNSAP) by the serving RNC to the drift RNC. Within a RADIO LINK ADDITION REQUEST message more than one radio link can be added. Each existing radio link information element shall be considered separately. See TS 25.423.

D. A single integer value.

E. SHO.AttRLAddUTRANSide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.8.2 Successful radio link additions (UTRAN side)

A. This measurement provides the number of successful radio link additions (UTRAN side) for each cell. This measurement shall be increased for each successful radio link addition (UTRAN side). This measurement is valid for FDD and TDD mode.

B. CC.

C. This measurement is based on two different events:

Receipt of a RADIO LINK SETUP RESPONSE message (NBAP) sent by NodeB to the serving RNC in response to a RADIO LINK SETUP REQUEST message with one or more existing radio link information elements. One RADIO LINK SETUP RESPONSE message can be related to more than one added radio link. Each successful added radio link shall be considered separately. See TS 25.433.

Receipt of a RADIO LINK ADDITION RESPONSE message (RNSAP) sent by drift RNC to the serving RNC in response to a RADIO LINK ADDITION REQUEST message with one or more existing radio link information elements. One RADIO LINK ADDITION RESPONSE message can be related to more than one added radio link. Each successful added radio link shall be considered separately. See TS 25.423.

D. A single integer value.

E. SHO.SuccRLAddUTRANSide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.8.3 Failed radio link additions (UTRAN side)

A. This measurement provides the number of failed radio link additions (UTRAN side) for each cell. This measurement shall be increased for each failed radio link addition (UTRAN side). For each failure cause a separate measurement is defined. Every failed radio link addition shall be considered separately. This measurement is valid for FDD and TDD mode.

B. CC.

C. This measurement is based on two different events:

Receipt of a RADIO LINK SETUP FAILURE message (NBAP) sent by NodeB to the serving RNC in response to a RADIO LINK SETUP REQUEST message with one or more existing radio link information elements. One RADIO LINK SETUP FAILURE message can be related to more than one radio link. Each failed attempt to add a radio link shall be considered separately. Failure causes are defined within 3GPP TS25.443.

Receipt of a RADIO LINK ADDITION FAILURE message (RNSAP) sent by drift RNC to the serving RNC in response to a RADIO LINK ADDITION REQUEST message with one or more existing radio link information elements. One RADIO LINK ADDITION FAILURE message can be related to more than one radio link. Each failed attempt to add a radio link shall be considered separately. Failure causes are defined within 3GPP TS25.423.

The sum of all supported per cause measurements should equal the total number of Failures.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form SHO.FailRLAddUTRANSide.*Cause*
where *Cause* identifies the failure cause.

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.8.4 Attempted radio link deletions (UTRAN side)

A. This measurement provides the number of attempted radio link deletions (UTRAN side) for each cell. This measurement shall be increased for each attempted radio link deletion (UTRAN side). This measurement is valid for FDD and TDD mode.

B. CC.

C. This measurement is based on two different events:

Transmission of a RADIO LINK DELETION REQUEST message (NBAP) by the serving RNC to the NodeB. Within a RADIO LINK DELETION REQUEST message more than one radio link can be removed. Each existing radio link information element shall be considered separately. See TS 25.433.

Transmission of a RADIO LINK DELETION REQUEST message (RNSAP) by the serving RNC to the drift RNC. Within a RADIO LINK DELETION REQUEST message more than one radio link can be removed. Each existing radio link information element shall be considered separately. See TS 25.423.

D. A single integer value.

E. SHO.AttRLDelUTRANSide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.8.5 Successful radio link deletions (UTRAN side)

A. This measurement provides the number of successful radio link deletions (UTRAN side) for each cell. This measurement shall be increased for each successful radio link deletion (UTRAN side). This measurement is valid for FDD and TDD mode.

B. CC.

C. This measurement is based on two different events:

Receipt of a RADIO LINK DELETION RESPONSE message (NBAP) sent by NodeB to the serving RNC in response to a RADIO LINK DELETION REQUEST message with one or more existing radio link removal information element. One RADIO LINK DELETION RESPONSE message can be related to more than one deleted radio link. Each successful deleted radio link shall be considered separately. See TS 25.433.

Receipt of a RADIO LINK DELETION RESPONSE message (RNSAP) sent by drift RNC to the serving RNC in response to a RADIO LINK DELETION REQUEST message with one or more existing radio link removal information element. One RADIO LINK DELETION RESPONSE message can be related to more than one deleted radio link. Each successful deleted radio link shall be considered separately. See TS 25.423.

D. A single integer value.

E. SHO.SuccRLDelUTRANSide

F. UtranCell

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9 Hard handover

4.9.1 Attempted outgoing intra-cell hard handovers

A. This measurement provides the number of attempted outgoing intra-cell hard handovers per neighbour cell relation.

B. CC.

C. Transmission of a RRC message PHYSICAL CHANNEL RECONFIGURATION, RADIO BEARER SETUP, RADIO BEARER RECONFIGURATION, RADIO BEARER RELEASE, or TRANSPORT CHANNEL RECONFIGURATION from the source RNC to the UE, indicating the attempt of an outgoing intra-hell hard handover. See TS 25.331.

D. A single integer value.

E. HHO.AttOutIntraCell

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.2 Successful outgoing intra-cell hard handovers

A. This measurement provides the number of successful outgoing intra-cell hard handovers per neighbour cell relation.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION COMPLETE, RADIO BEARER SETUP COMPLETE, RADIO BEARER RECONFIGURATION COMPLETE, RADIO BEARER RELEASE COMPLETE, or TRANSPORT CHANNEL RECONFIGURATION COMPLETE sent from the UE to the source RNC, indicating a successful outgoing intra-cCell hard handover. See TS 25.331.

D. A single integer value.

E. HHO.SuccOutIntraCell

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.3 Failed outgoing intra-cell hard handovers

A. This measurement provides the number of failed outgoing intra-cell hard handovers per neighbour cell relation per cause, where the UE returned to the original physical channel configuration.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION FAILURE, RADIO BEARER SETUP FAILURE, RADIO BEARER RECONFIGURATION FAILURE, RADIO BEARER RELEASE FAILURE, or TRANSPORT CHANNEL RECONFIGURATION FAILURE sent from the UE to the source RNC, indicating a failed outgoing intra-cell hard handover. Failure causes are defined within TS 25.331. The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form HHO.FailOutIntraCell.*Cause*
where *Cause* identifies the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.4 Attempted outgoing intra-NodeB hard handovers

A. This measurement provides the number of attempted outgoing intra-NodeB hard handovers per neighbour cell relation.

B. CC.

C. Transmission of a RRC message PHYSICAL CHANNEL RECONFIGURATION, RADIO BEARER SETUP, RADIO BEARER RECONFIGURATION, RADIO BEARER RELEASE, or TRANSPORT CHANNEL RECONFIGURATION from the source RNC to the UE, indicating the attempt of an outgoing intra-NodeB hard handover. See TS 25.331.

D. A single integer value.

E. HHO.AttOutIntraNodeB

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.5 Successful outgoing intra-NodeB hard handovers

A. This measurement provides the number of successful outgoing intra-NodeB hard handovers per neighbour cell relation.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION COMPLETE, RADIO BEARER SETUP COMPLETE, RADIO BEARER RECONFIGURATION COMPLETE, RADIO BEARER RELEASE COMPLETE, or TRANSPORT CHANNEL RECONFIGURATION COMPLETE sent from the UE to the source RNC, indicating a successful outgoing intra-NodeB hard handover. See TS 25.331.

D. A single integer value.

E. HHO.SuccOutIntraNodeB

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.6 Failed outgoing intra-NodeB hard handovers

A. This measurement provides the number of failed outgoing intra-NodeB hard handovers per neighbour cell relation per cause, where the UE returned to the original physical channel configuration.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION FAILURE, RADIO BEARER SETUP FAILURE, RADIO BEARER RECONFIGURATION FAILURE, RADIO BEARER RELEASE FAILURE, or TRANSPORT CHANNEL RECONFIGURATION FAILURE sent from the UE to the source RNC, indicating a failed outgoing intra-NodeB hard handover. Failure causes are defined within 3GPP TS25.331.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form HHO.FailOutIntraNodeB.*Cause*
where *Cause* identifies the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.7 Attempted outgoing inter-NodeB, intra-RNC hard handovers

A. This measurement provides the number of attempted outgoing inter-NodeB, intra-RNC hard handovers per neighbour cell relation.

B. CC.

C. Transmission of a RRC message PHYSICAL CHANNEL RECONFIGURATION, RADIO BEARER SETUP, RADIO BEARER RECONFIGURATION, RADIO BEARER RELEASE, or TRANSPORT CHANNEL RECONFIGURATION from the source RNC to the UE, indicating the attempt of an outgoing inter-NodeB, intra-RNC hard handover. See TS 25.331.

D. A single integer value.

E. HHO.AttOutInterNodeBIntraRNC

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.8 Successful outgoing inter-NodeB, intra-RNC hard handovers

A. This measurement provides the number of successful outgoing inter-NodeB, intra-RNC hard handovers per neighbour cell relation.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION COMPLETE, RADIO BEARER SETUP COMPLETE, RADIO BEARER RECONFIGURATION COMPLETE, RADIO BEARER RELEASE COMPLETE, or TRANSPORT CHANNEL RECONFIGURATION COMPLETE sent from the UE to the source RNC, indicating a successful outgoing inter-NodeB, intra-RNC hard handover. See TS 25.331.

D. A single integer value.

E. HHO.SuccOutInterNodeBIntraRNC

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.9 Failed outgoing inter-NodeB, intra-RNC hard handovers

A. This measurement provides the number of failed outgoing inter-NodeB, intra-RNC hard handovers per neighbour cell relation per cause, where the UE returned to the original physical channel configuration.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION FAILURE, RADIO BEARER SETUP FAILURE, RADIO BEARER RECONFIGURATION FAILURE, RADIO BEARER RELEASE FAILURE, or TRANSPORT CHANNEL RECONFIGURATION FAILURE sent from the UE to the source RNC, indicating a failed outgoing inter-NodeB, intra-RNC hard handover. Failure causes are defined within TS 25.331.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form HHO.FailOutInterNodeBIntraRNC.*Cause*
where *Cause* identifies the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.10 Attempted outgoing inter-RNC hard handovers via Iur

A. This measurement provides the number of attempted outgoing inter-RNC hard handovers via Iur per neighbour cell relation.

B. CC.

C. Transmission of a RRC message PHYSICAL CHANNEL RECONFIGURATION, RADIO BEARER SETUP, RADIO BEARER RECONFIGURATION, RADIO BEARER RELEASE, or TRANSPORT CHANNEL RECONFIGURATION from the source RNC to the UE, indicating the attempt of an outgoing inter-RNC hard handover via Iur. See TS 25.331.

D. A single integer value.

E. HHO.AttOutInterRNCIur

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.11 Successful outgoing inter-RNC hard handovers via Iur

A. This measurement provides the number of successful outgoing inter-RNC hard handovers via Iur per neighbour cell relation.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION COMPLETE, RADIO BEARER SETUP COMPLETE, RADIO BEARER RECONFIGURATION COMPLETE, RADIO BEARER RELEASE COMPLETE, or TRANSPORT CHANNEL RECONFIGURATION COMPLETE sent from the UE to the source RNC, indicating a successful outgoing inter-RNC hard handover via Iur. See TS 25.331.

D. A single integer value.

E. HHO.SuccOutInterRNCIur

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.12 Failed outgoing inter-RNC hard handovers via Iur

A. This measurement provides the number of failed outgoing inter-RNC hard handovers via Iur per neighbour cell relation per cause, where the UE returned to the original physical channel configuration.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION FAILURE, RADIO BEARER SETUP FAILURE, RADIO BEARER RECONFIGURATION FAILURE, RADIO BEARER RELEASE FAILURE, or TRANSPORT CHANNEL RECONFIGURATION FAILURE sent from the UE to the source RNC, indicating a failed outgoing inter-RNC hard handover via Iur. Failure causes are defined within TS 25.331.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form HHO.FailOutInterRNCIur.*Cause*
where *Cause* identifies the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.13 Attempted relocation preparation for outgoing inter-RNC hard handovers switching in the CN

A. This measurement provides the number of attempted relocation preparation for outgoing inter-RNC hard handovers switching in the CN per neighbour cell relation.

B. CC.

C. Transmission of a RANAP message RELOCATION REQUIRED from the source RNC to the CN (Source side), indicating an attempted relocation preparation of a outgoing inter-RNC hard handover switching in the CN. See TS 25.413.

D. A single integer value.

E. HHO.AttRelocPrepOutInterRNCCN

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.14 Successful relocation preparation for outgoing inter-RNC hard handovers switching in the CN

A. This measurement provides the number of successful relocation for outgoing inter-RNC hard handovers switching in the CN per neighbour cell relation.

B. CC.

C. Receipt of a RANAP message RELOCATION COMMAND sent from the CN (Source side) to the source RNC, indicating a successful relocation preparation of a outgoing inter-RNC hard handover switching in the CN. See TS 25.413.

D. A single integer value.

E. HHO.SuccAttRelocPrepOutInterRNCCN

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.15 Failed relocation preparation for outgoing inter-RNC hard handovers switching in the CN

A. This measurement provides number of failed relocation for outgoing inter-RNC hard handovers switching in the CN per neighbour cell relation per cause.

B. CC.

C. Receipt of a RANAP message RELOCATION PREPARATION FAILURE sent from the CN (Source side) to the source RNC, indicating a failed relocation preparation for outgoing inter-RNC hard handover switching in the CN. Failure causes are defined within TS 25.413.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form HHO.FailRelocPrepOutInterRNCCN.*Cause*
where *Cause* identifies the name of the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.16 Attempted outgoing inter-RNC hard handovers switching in the CN

A. This measurement provides the number of attempted outgoing -nter-RNC hard handovers switching in the CN per neighbour cell relation related to UEs.

B. CC.

C. Transmission of a RRC message PHYSICAL CHANNEL RECONFIGURATION, RADIO BEARER SETUP, RADIO BEARER RECONFIGURATION, RADIO BEARER RELEASE, or TRANSPORT CHANNEL RECONFIGURATION from the source RNC to the UE, indicating the attempt of an inter-RNC hard handover switching in the CN. See TS 25.331.

D. A single integer value.

E. HHO.AttOutInterRNCCN

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.17 Successful outgoing inter-RNC hard handovers switching in the CN

A. This measurement provides the number of successful outgoing inter-RNC hard handovers switching in the CN per neighbour cell relation related to UEs.

B. CC.

C. Receipt of a RANAP message Iu RELEASE COMMAND sent from the CN (Source side) to the source RNC, indicating a successful inter-RNC hard handover switching in the CN. See TS 25.413.

D. A single integer value.

E. HHO.SuccOutInterRNCCN

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.9.18 Failed outgoing inter-RNC hard handovers switching in the CN

A. This measurement provides the number of failed outgoing inter-RNC hard handovers switching in the CN per neighbour cell relation related to UEs, where the UE returned to the original physical channel configuration.

B. CC.

C. Receipt of a RRC message PHYSICAL CHANNEL RECONFIGURATION FAILURE, RADIO BEARER SETUP FAILURE, RADIO BEARER RECONFIGURATION FAILURE, RADIO BEARER RELEASE FAILURE, or TRANSPORT CHANNEL RECONFIGURATION FAILURE sent from the UE to the source RNC, indicating a failed inter-RNC hard handover switching in the CN. Failure causes are defined within 3GPP TS25.331.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form HHO.FailOutInterRNCCN.*Cause*
where *Cause* identifies the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.10 Relocation

4.10.1 Attempted relocations preparations

A. This measurement provides the number of attempted relocation preparations (‘UE involved’ and ‘UE non involved’ Relocations).

B. CC.

C. Transmission of a RANAP message RELOCATION REQUIRED from the source RNC to the CN (Source side), indicating an attempted relocation preparation. See TS 25.413.

D. A single integer value.

E. Reloc.AttPrep

F. RncFunction

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.10.2 Successful relocation preparations

A. This measurement provides the number of successful relocation preparations (‘UE involved’ and ‘UE non involved’ Relocations).

B. CC.

C. Receipt of a RANAP message RELOCATION COMMAND sent from the CN (Source side) to the source RNC, indicating a successful relocation preparation. See TS 25.413.

D. A single integer value.

E. Reloc.SuccPrep

F. RncFunction

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.10.3 Failed relocation preparations

A. This measurement provides number of failed relocation preparations per cause (‘UE involved’ and ‘UE non involved’ Relocations).

B. CC.

C. Receipt of a RANAP message RELOCATION PREPARATION FAILURE sent from the CN (Source side) to the source RNC, indicating a failed relocation preparation. Failure causes are defined within TS 25.413.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form Reloc.FailPrep.*Cause*
where *Cause* identifies the failure cause.

F. RncFunction

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.10.4 Successful relocations

A. This measurement provides the number of successful relocations (‘UE involved’ and ‘UE non involved’ Relocations).

B. CC.

C. Receipt of a RANAP message Iu RELEASE COMMAND sent from the CN (Source side) to the source RNC in response to a RELOCATION REQUIRED message, indicating a successful relocation. See TS 25.413.

D. A single integer value.

E. Reloc.Succ

F. RncFunction

G. Valid for circuit switched and packet switched traffic.

H. UMTS

4.11 Circuit switched inter-RAT handover

4.11.1 Attempted relocation preparation for outgoing circuit switched inter-RAT handovers

A. This measurement provides the number of attempted relocation preparations for outgoing circuit switched inter-RAT handovers per neighbour cell.

B. CC.

C. Transmission of a RANAP message RELOCATION REQUIRED from the serving RNC to the CN, indicating an attempted relocation preparation of an outgoing inter-RAT handover. See TS 25.413.

D. A single integer value.

E. RATHO.AttRelocPrepOutCS

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched traffic.

H. UMTS

4.11.2 Successful relocation preparation for outgoing circuit switched inter-RAT handovers

A. This measurement provides the number of successful relocation preparations for outgoing circuit switched inter-RAT handovers per neighbour cell.

B. CC.

C. Receipt of a RANAP message RELOCATION COMMAND sent from the CN to the serving RNC, indicating a successful relocation preparation of an inter-RAT handover. See TS 25.413.

D. A single integer value.

E. RATHO.SuccRelocPrepOutCS

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched traffic.

H. UMTS

4.11.3 Failed relocation preparation for outgoing circuit switched inter-RAT handovers

A. This measurement provides number of failed relocation preparations for outgoing circuit switched inter-RAT handovers per neighbour cell per cause.

B. CC.

C. Receipt of a RANAP message RELOCATION PREPARATION FAILURE sent from the CN to the serving RNC, indicating a failed relocation preparation for outgoing inter-RAT handovers. Failure causes are defined within TS 25.413.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form RATHO.FailRelocPrepOutCS.*Cause*
where *Cause* identifies the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched traffic.

H. UMTS

4.11.4 Attempted outgoing circuit switched inter-RAT handovers

A. This measurement provides the number of attempted outgoing circuit switched inter-RAT handovers per neighbour cell from UEs point of view.

B. CC.

C. Transmission of a RRC-message INTER RADIO ACCESS TECHNOLOGY HANDOVER COMMAND from serving RNC to the UE, indicating an attempted outgoing inter-RAT handover. See TS 25.331.

D. A single integer value.

E. RATHO.AttOutCS

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched traffic.

H. UMTS

4.11.5 Successful outgoing circuit switched inter-RAT handovers

A. This measurement provides the number of successful outgoing circuit switched inter-RAT handovers per neighbour cell from UEs point of view.

B. CC.

C. Receipt of a RANAP message Iu RELEASE COMMAND sent from the CN to the serving RNC, indicating a successful inter-RAT handover. See TS 25.413.

D. A single integer value.

E. SuccOutCSInterRATHO
RATHO.SuccOutCS

F. Neighbour Cell (UtranCell-UtranCell)..

G. Valid for circuit switched traffic.

H. UMTS

4.11.6 Failed outgoing circuit switched inter-RAT handovers

A. This measurement provides the number of failed outgoing circuit switched inter-RAT handovers per neighbour cell per cause from UEs point of view, where the UE returned to the original physical channel configuration.

B. CC.

C. Receipt of a RRC message INTER RADIO ACCESS TECHNOLOGY HANDOVER FAILURE sent from the UE to the serving RNC, indicating a failed inter-RAT handover. Failure causes are defined within TS 25.331.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form RATHO.FailOutCS.*Cause*
where *Cause* identifies the failure cause.

F. Neighbour Cell (UtranCell-UtranCell).

G. Valid for circuit switched traffic.

H. UMTS

4.11.7 Attempted incoming circuit switched inter-RAT handovers

A. This measurement provides the number of attempted incoming circuit switched inter-RAT handovers for each cell.

B. CC.

C. Receipt of a RANAP RELOCATION REQUEST message sent from the CN to the target RNC, indicating the attempt of an inter-RAT handover. See TS 25.413.

D. A single integer value.

E. RATHO.AttIncCS

F. UtranCell

G. Valid for circuit switched traffic.

H. UMTS

4.11.8 Successful incoming circuit switched inter-RAT handovers

A. This measurement provides the number of successful incoming circuit switched interRAT handovers for each cell.

B. CC.

C. Receipt of a RRC HANDOVER TO UTRAN COMPLETE message sent from the UE to the target RNC, indicating a successful interRAT handover. See TS 25.331.

D. A single integer value.

E. RATHO.SuccIncCS

F. UtranCell

G. Valid for circuit switched traffic.

H. UMTS

4.11.9 Failed incoming circuit switched inter-RAT handovers

A. This measurement provides the number of failed incoming circuit switched interRAT handovers per cell per cause.

B. CC.

C. Receipt of a RANAP message RELOCATION FAILURE sent from the CN to the target RNC, indicating a failed relocation preparation for incoming inter-RAT handovers. Failure causes are defined within TS 25.413.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form RATHO.FailIncCS.*Cause*
where *Cause* identifies the failure cause.

F. UtranCell

G. Valid for circuit switched traffic.

H. UMTS

4.12 Packet switched inter-RAT handover

4.12.1 Attempted outgoing packet switched inter-RAT handovers, UTRAN controlled

A. This measurement provides the number of attempted outgoing, UTRAN controlled, Packet Switched interRAT handovers per cell.

B. CC.

C. Transmission of a RRC-message, CELL CHANGE ORDER FROM UTRAN, from source RNC to the UE, indicating a attempted outgoing Packet Switched inter-RAT handover. See TS 25.331.

D. A single integer value.

E. RATHO.AttOutPSUTRAN

F. UtranCell

G. Valid for packet switched traffic.

H. UMTS

4.12.2 Successful outgoing packet switched inter-RAT handovers, UTRAN controlled

A. This measurement provides the number of successful outgoing, UTRAN controlled, Packet Switched interRAT handovers per cell.

B. CC.

C. Transmission of a RANAP message, Iu RELEASE COMMAND, from the PS CN to the source RNC, indicating a successful outgoing Packet Switched inter-RAT handover. See TS 25.413.

D. A single integer value.

E. RATHO.SuccOutPSUTRAN

F. UtranCell

G. Valid for packet switched traffic.

H. UMTS

4.12.3 Failed outgoing packet switched inter-RAT handovers UTRAN controlled

A. This measurement provides the number of failed outgoing, UTRAN controlled, Packet Switched interRAT handovers per cause, where the UE resumes the connection to UTRAN using the same resources used before receiving the cell change order. This is measured per cell.

B. CC.

C. Receipt of an RRC message, CELL CHANGE FAILURE FROM UTRAN, sent from the UE to the source RNC, indicating a failed inter-RAT handover. Failure causes are defined within TS 25.331.

The sum of all supported per cause measurements should equal the total number of failed events.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. The measurement name has the form RATHO.FailOutPSUTRAN.*Cause*
where *Cause* identifies the failure cause.

F. UtranCell

G. Valid for packet switched traffic.

H. UMTS

4.12.4 Successful outgoing packet switched inter-RAT handovers, UE controlled

A. This measurement provides the number of successful outgoing, UE controlled, Packet Switched inter-RAT handovers per cell.

B. CC.

C. Receipt of an RANAP message, SRNS CONTEXT REQUEST, sent from the PS CN to the serving RNC, indicating a successful outgoing UE controlled Packet Switched inter-RAT handover. See TS 25.413.

D. Each measurement is an integer value. The number of measurements is equal to the number of causes supported.

E. RATHO.SuccOutPSUE

F. UtranCell

G. Valid for packet switched traffic.

H. UMTS

5 Measurements related to the SGSN

5.1 Mobility Management

5.1.1 Attempted GPRS attach procedures

A. This measurement provides the number of attempted GPRS attach procedures initiated within this SGSN area.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of "ATTACH REQUEST" message from the MS, indicating a GPRS attach(3G TS 24.008; attach type = GPRS attach).

D. A single integer value per measurement type defined in E

E. attGprsAttach

attGprsAttach	COMB (don’t care)
attGprsAttach.G	GSM
attGprsAttach.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.2 Successful GPRS attach procedures

A. This measurement provides the number of successfully performed GPRS attach procedures within this SGSN area.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of a "ATTACH ACCEPT" message to the MS, indicating a GPRS only attached (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succGprsAttach

succGprsAttach	COMB (don’t care)
succGprsAttach.G	GSM
succGprsAttach.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.3 Attempted intra-SGSN Routing Area Update procedures

A. This measurement provides the number of attempted intra-SGSN Routing Area Update procedures initiated within this SGSN area.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of a "ROUTING AREA UPDATE REQUEST" message from the MS, where the old RA and the new RA are served by this SGSN(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attIntraSgsnRaUpdate

attIntraSgsnRaUpdate	COMB (don't care)
attIntraSgsnRaUpdate.G	GSM
attIntraSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.4 Successful intra-SGSN Routing Area Update procedures

A. This measurement provides the number of successfully performed intra-SGSN Routing Area Update procedures initiated in this SGSN.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of "ROUTING AREA UPDATE ACCEPT" message to the MS (3G TS 24.008).

D. A single integer value

E. succIntraSgsnRaUpdate

succIntraSgsnRaUpdate	COMB (don't care)
succIntraSgsnRaUpdate.G	GSM
succIntraSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.5 Attempted GPRS detach procedures initiated by MS

A. This measurement provides the number of MS initiated GPRS detach procedures within this SGSN area.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of a "DETACH REQUEST" message from the MS indicating a GPRS detach(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attGprsDetachMs

attGprsDetachMs	COMB (don't care)
attGprsDetachMs.G	GSM
attGprsDetachMs.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.6 Attempted GPRS detach procedures initiated by SGSN

A. This measurement provides the number of attempted GPRS detach procedures initiated by SGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of a "DETACH REQUEST" message to the MS(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attGprsDetachSgsn

attGprsDetachSgsn	COMB (don’t care)
attGprsDetachSgsn.G	GSM
attGprsDetachSgsn.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.7 Attempted inter-SGSN Routing Area Update procedures

A. This measurement provides the number of attempted inter-SGSN Routing Area Update procedures initiated in this SGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "ROUTING AREA UPDATE REQUEST" message from the MS where the old RA is served by another SGSNs(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attInterSgsnRaUpdate

attInterSgsnRaUpdate	COMB (don’t care)
attInterSgsnRaUpdate.G	GSM
attInterSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.8 Successful inter-SGSN Routing Area Update procedures

A. This measurement provides the number of successfully completed inter-SGSN Routing Area Update procedures in this SGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of a "ROUTING AREA UPDATE COMPLETE" message from the MS (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succInterSgsnRaUpdate

succInterSgsnRaUpdate	COMB (don't care)
succInterSgsnRaUpdate.G	GSM
succInterSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.9 Attempted GPRS attach procedures with IMSI already attached

A. This measurement provides the number of attempted GPRS attach procedures, while IMSI is already attached. We count the attempt initiated within this SGSN area.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of "ATTACH REQUEST" Message from the MS, indicating GPRS attach while IMSI attached(3G TS 24.008; attach type = GPRS attach while IMSI attached).

D. A single integer value per measurement type defined in E

E. attImsiAttach

attImsiAttach	COMB (don't care)
attImsiAttach.G	GSM
attImsiAttach.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.10 Successful GPRS attach procedures with IMSI already attached

A. This measurement provides the number of successfully performed GPRS attach procedures, while IMSI is already attached. We count the attempt initiated within this SGSN area.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of a "ATTACH ACCEPT" message to the MS, indicating a GPRS attach while IMSI attached (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succImsiAttach

succImsiAttach	COMB (don't care)
succImsiAttach.G	GSM
succImsiAttach.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.11 Attempted IMSI detach procedures initiated by MS

A. This measurement provides the number of attempted IMSI detach procedures MS-initiated within this SGSN area. The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of "DETACH REQUEST" message from the MS, indicating a IMSI detach(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attImsiDetachMs

attImsiDetachMs	COMB (don’t care)
attImsiDetachMs.G	GSM
attImsiDetachMs.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.12 Attempted combined GPRS/IMSI attach procedures

A. This measurement provides the number of attempt of combined GPRS/IMSI attach procedures initiated within this SGSN area.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of "ATTACH REQUEST" message from the MS, indicating combined GPRS/IMSI attach(3G TS 24.008; attach type = Combined GPRS/IMSI attach).

D. A single integer value per measurement type defined in E

E. attCombiAttach

attCombiAttach	COMB (don’t care)
attCombiAttach.G	GSM
attCombiAttach.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.13 Successful combined GPRS/IMSI attach procedures

A. This measurement provides the number of success-fully completed of Combined GPRS/IMSI attach pro-cedures initiated within this SGSN area.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of "ATTACH ACCEPT" message to the MS, indicating combined GPRS/IMSI attach(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succCombiAttach

succCombiAttach	COMB (don't care)
succCombiAttach.G	GSM
succCombiAttach.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.14 Attempted combined GPRS/IMSI detach procedures initiated by MS

A. This measurement provides the number of attempted Combined GPRS/IMSI detach procedures MS-initiated within this SGSN area.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of "DETACH REQUEST" message from the MS, indicating a Combined GPRS/IMSI detach(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attCombiDetachMs

attCombiDetachMs	COMB (don't care)
attCombiDetachMs.G	GSM
attCombiDetachMs.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.15 Successful GPRS detach procedures initiated by SGSN

A. This measurement provides the number of successfully completed GPRS detach procedures SGSN-initiated within this SGSN area.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of "DETACH ACCEPT" message from the MS(3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succGprsDetachSgsn

succGprsDetachSgsn	COMB (don't care)
succGprsDetachSgsn.G	GSM
succGprsDetachSgsn.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.16 Attempted combined RA/LA intra-SGSN Routing Area Update procedures

A. This measurement provides the number of combined RA/LA updates (intra-SGSN) procedures initiated in this SGSN. These are counted as attempts
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of "Routing Area Update REQUEST" message from the MS, indicating a combined RA/LA update (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attCombiIntraSgsnRaUpdate

attCombiIntraSgsnRaUpdate	COMB (don’t care)
attCombiIntraSgsnRaUpdate.G	GSM
attCombiIntraSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.17 Attempted "combined RA/LA with IMSI Attach" intra-SGSN Routing Area Update procedures

A. This measurement provides the number of combined RA/LA updates with IMSI attach (intra-SGSN) procedures initiated in this SGSN. These are counted as attempts
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of "Routing Area Update REQUEST" message from the MS, indicating a combined RA/LA update with IMSI attach. (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attImsiCombiIntraSgsnRAUpdate

attImsiCombiIntraSgsnRAUpdate	COMB (don’t care)
attImsiCombiIntraSgsnRAUpdate	GSM
attImsiCombiIntraSgsnRAUpdate	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.18 Succesful combined RA/LA intra-SGSN Routing Area Update procedures

A. This measurement provides the number of success-fully performed combined RA/LA updates (intra-SGSN) procedures initiated in this SGSN
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of "Routing Area Update ACCEPT" message to the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. succCombiIntraSgsnRaUpdate

succCombiIntraSgsnRaUpdate	COMB (don't care)
succCombiIntraSgsnRaUpdate.G	GSM
succCombiIntraSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.19 Attempted combined RA/LA inter-SGSN Routing Area Update procedures

A. This measurement provides the number of combined RA/LA updates (inter-SGSN) procedures initiated in this SGSN. These are counted as attempts
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of "Routing Area Update REQUEST" message from the MS, indicating a combined RA/LA update (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attCombiInterSgsnRaUpdate

attCombiInterSgsnRaUpdate	COMB (don't care)
attCombiInterSgsnRaUpdate.G	GSM
attCombiInterSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.20 Attempted "combined RA/LA with IMSI Attach" inter-SGSN Routing Area Update procedures

A. This measurement provides the number of combined RA/LA updates with IMSI attach (inter-SGSN) procedures initiated in this SGSN. These are counted as attempts
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of "Routing Area Update REQUEST" message from the MS, indicating a combined RA/LA update with IMSI attach.E52

D. A single integer value per measurement type defined in E

E. attImsiCombiInterSgsnRAUpdate

attImsiCombiInterSgsnRAUpdate	COMB (don't care)
attImsiCombiInterSgsnRAUpdate	GSM
attImsiCombiInterSgsnRAUpdate	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.21 Succesful combined RA/LA inter-SGSN Routing Area Update procedures

A. This measurement provides the number of success-fully performed combined RA/LA updates (inter-SGSN) procedures initiated in this SGSN
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of "Routing Area Update ACCEPT" message to the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. succCombiInterSgsnRaUpdate

succCombiInterSgsnRaUpdate	COMB (don’t care)
succCombiInterSgsnRaUpdate.G	GSM
succCombiInterSgsnRaUpdate.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.22 Number of received invalid P-TMSI’s during detach

A. This measurement provides the number of received invalid P-TMSI's during detach
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "DETACH_REQUEST" with invalid P-TMSI (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. nbrPTMSIDetachFail

nbrPTMSIDetachFail	COMB (don’t care)
nbrPTMSIDetachFail.G	GSM
nbrPTMSIDetachFail.U	UMTS

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM/UMTS

5.1.23 Attempted GSM PS paging procedures

A. This measurement provides the total number of PS paging procedures that are initiated at the SGSN, over the Gb interface.

B. CC

C. incremented when a GSM paging procedure is started, i.e. at the transmission of the first BSSGP Paging Request (GSM TS 08.18) from the SGSN to the MS

D. A single integer value

E. attPsPagingProcGb

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM

5.1.24 Attempted UMTS PS paging procedures

A. This measurement provides the total number of PS paging procedures that are initiated at the SGSN, over the Iu interface.

B. CC

C. incremented when a UMTS paging procedure is started i.e. at the transmission of the first “Paging” message (3G TS 25.413) from the SGSN to the MS

D. A single integer value

E. attPsPagingProcIu

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. UMTS

5.1.25 Attempted PS paging procedures with unknown access type

A. This measurement provides the total number of PS paging procedures that are initiated at the SGSN, with access type unknown. In this case the paging will be done both over the Gb and the Iu interface.

B. CC

C. incremented when a paging procedure is started for which MM doesn't know the access type i.e. at the transmission of the first BSSGP Paging Request (GSM TS 08.18) and/or “Paging” message (3G TS 25.413) from the SGSN to the MS

D. A single integer value

E. attPsPagingProcGbIu

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. COMB

5.1.26 Number of PS paging message sends from 2G-SGSN to the MS

A. This measurement provides the Number of PS paging message sends from 2G-SGSN to the MS

B. CC

C. Transmission of "GMM-PAGING.req" (GSM TS 08.18) from the SGSN to the MS. Each paging message will be counted separately, addressed to all BSS in this certain RA.

D. A single integer value

E. nbrPsPagingMesGb

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM

5.1.27 Number of PS paging message sends from 3G-SGSN to the MS

A. This measurement provides the Number of PS paging message sends from 3G-SGSN to the MS

B. CC

C. Transmission of "Paging" message (CN Domain Indicator = PS Domain) from the SGSN to the MS (3G TS 25.413). Each paging message will be counted separately, addressed to all RNC in this certain RA.

D. A single integer value

E. nbrPsPagingMesIu

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. UMTS

5.1.28 Successful GSM PS paging procedures

A. This measurement provides the total number of succesful PS paging procedures that are initiated at the SGSN, over the Gb interface

B. CC

C. when an uplink_trigger (any LLC frame) is received by the SGSN from the MS (over the Gb interface) as response to a GSM paging PS procedure (3G TS 23.060) or during intersystem change UMTS -> GSM

D. A single integer value

E. succPsPagingProcGb

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. GSM

5.1.29 Successful UMTS PS paging procedures

A. This measurement provides the total number of successful PS paging procedures that are initiated at the SGSN, over the Iu interface

B. CC

C. when a paging_response is received by the SGSN from the MS (over the Iu interface) as response to a UMTS paging PS procedure (Receipt of "Service Request" message (with Service Type = Paging Response) to the MS (3G TS 24.008)) or during intersystem change GSM -> UMTS

D. A single integer value

E. succPsPagingProcIu

F. RA, specified by a concatenation of the LAC and the RAC

G. Valid for packet switching

H. UMTS

5.1.30 Number of subscribers in PMM-IDLE state

A. Number of subscribers in PMM-IDLE state

B. CC

C. incremented at PS Signalling Connection Release (Iu Release), decremented at PS Detach or PS Signalling Connection Establish (Service Request)

D. A single integer value

E. nbrSubPmmIdle

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.1.31 Number of subscribers in PMM-CONNECTED state

A. Number of subscribers in PMM-CONNECTED state

B. CC

C. decremented at PS Signalling Connection Release (Iu Release), Detach, PS Attach Reject or RAU Reject, incremented at PS Attach or PS Signalling Connection Establish (Service Request)

D. A single integer value

E. nbrSubPmmConnected

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.1.32 Number of attached subscriber

A. This measurement provides the number of attached subscriber within this SGSN area.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. GAUGE

C. The gauge will be incremented at transmission of a "ATTACH ACCEPT" message to the MS and will be decremented at transmission of a "DETACH ACCEPT" message to the MS (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. nbrActAttachedSub

nbrActAttachedSub	COMB (don’t care)
nbrActAttachedSub.G	GSM
nbrActAttachedSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.33 Number of Home Subscribers

A. This measurement provides the number of GPRS home subscribers located in the SGSN location register. The GPRS MM state of this subscriber is GMM_REGISTERED or GMM_DEREGISTERED. Only GPRS subscribers that are homed in the same GPRS network are considered.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. GAUGE

C. Incremented by one when GPRS subscriber is successfully registered in the SGSN location registered and decremented by one when GPRS subscriber is successfully deregistered out of the SGSN location register (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. nbrHomeSub

nbrHomeSub	COMB (don’t care)
nbrHomeSub.G	GSM
nbrHomeSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.34 Number of Visiting National Subscribers

A. A. This measurement provides the number of visiting national GPRS subscribers located in the SGSN location register. The GPRS MM state of this subscriber is GMM_REGISTERED or GMM_DEREGISTERED. Only GPRS subscribers that are homed in a partner GPRS network of the same country are considered.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. GAUGE

C. C. This measurement provides the number of visiting national GPRS subscribers located in the SGSN location register. The GPRS MM state of this subscriber is GMM_REGISTERED or GMM_DEREGISTERED. Only GPRS subscribers that are homed in a partner GPRS network of the same country are considered.

D. A single integer value per measurement type defined in E

E. nbrVisitingNatSub

nbrVisitingNatSub	COMB (don’t care)
nbrVisitingNatSub.G	GSM
nbrVisitingNatSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.35 Number of Visiting Foreign Subscribers

A. This measurement provides the number of visiting foreign GPRS located in the SGSN location register. The GPRS MM state of this subscriber is GMM_REGISTERED or MM_DEREGISTERED. Only GPRS subscribers that are homed in a GPRS network of a foreign country are considered
The three measurement types defined in E are subject to the "2 out of 3 approach"..

B. GAUGE

C. Incremented by one when GPRS subscriber is successfully registered in the SGSN location registered and decremented by one when GPRS subscriber is successfully deregistered out of the SGSN location register (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. nbrVisitingForeign

nbrVisitingForeign	COMB (don't care)
nbrVisitingForeign.G	GSM
nbrVisitingForeign.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.36 Mean number of attached subscriber

A. This measurment provides the arithmetic mean number of the number of attached subscriber within this SGSN area
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. SI

C. This measurement is obtained by sampling at a pre-defined interval, the number of subscribers which are attached and then taking the arithmetic mean

D. A single integer value per measurement type defined in E

E. meanNbrAttachedSub

meanNbrAttachedSub	COMB (don't care)
meanNbrAttachedSub.G	GSM
meanNbrAttachedSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.37 Mean Number of Home Subscribers

A. This measurement provides the arithmetic mean number of GPRS home subscribers located in the SGSN location register
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. SI

C. This measurement is obtained by sampling at a pre-defined interval, the number of GPRS home subscribers located in the SGSN location register and then taking the arithmetic mean.

D. A single integer value per measurement type defined in E

E. meanNbrHomeSub

meanNbrHomeSub	COMB (don't care)
meanNbrHomeSub.G	GSM
meanNbrHomeSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.38 Mean Number of Visiting National Subscribers

A. A.This measurement provides the arithmetic mean number of visiting national GPRS subscribers located in the SGSN location register.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. SI

C. This measurement is obtained by sampling at a pre-defined interval, the number of visiting national GPRS subscribers located in the SGSN location register and then taking the arithmetic mean

D. A single integer value per measurement type defined in E

E. meanNbrVisitingNatSub

meanNbrVisitingNatSub	COMB (don't care)
meanNbrVisitingNatSub.G	GSM
meanNbrVisitingNatSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.39 Mean Number of Visiting Foreign Subscribers

A. This measurement provides the arithmetic mean number of visiting foreign GPRS located in the SGSN location register.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. SI

C. This measurement is obtained by sampling at a pre-defined interval, the number of visiting foreign GPRS subscribers located in the SGSN location register and then taking the arithmetic mean

D. A single integer value per measurement type defined in E

E. meanNbrVisitingForeign

meanNbrVisitingForeign	COMB (don't care)
meanNbrVisitingForeign.G	GSM
meanNbrVisitingForeign.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.40 Number of CAMEL subscribers

A. This measurement provides the number of attached subscriber within this SGSN area with CAMEL service
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. GAUGE

C. The gauge will be incremented at transmission of a "ATTACH ACCEPT" (with CAMEL service) message to the MS and will be decremented at transmission of a "DETACH ACCEPT" (with CAMEL service) message to the MS .

D. A single integer value per measurement type defined in E

E. nbrCamelSub

nbrCamelSub	COMB (don’t care)
nbrCamelSub.G	GSM
nbrCamelSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.41 Mean Number of CAMEL subcribers

A. This measurement provides the arithmetic mean number value of attached subscribers with CAMEL service
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. SI

C. This measurement is obtained by sampling at a pre-defined interval, the number of subscribers which are attached using CAMEL service and then taking the arithmetic mean

D. A single integer value per measurement type defined in E

E. meanNbrCamelSub

meanNbrCamelSub	COMB (don’t care)
meanNbrCamelSub.G	GSM
meanNbrCamelSub.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.1.42 Attempted InsertSubscriberData requests received from a HLR during GPRS Update Location procedure

A. This measurement provides the number of InsertSubscriberData requests received from a HLR during GPRS Update Location procedure.

B. CC

C. Receipt of a "MAP-INSERT-SUBSCRIBER-DATA" service request (3G TS 29.002) during a GPRS Update Location procedure.

D. A single integer value

E. attInsertSubscrDataHlrUpdLoc

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.1.43 Attempted GPRS Update Locations sent to the HLR.

A. This measurement provides the number of GPRS Update Locations sent to the HLR.

B. CC

C. Transmission of a 'MAP_UPDATE_LOCATION' service request (3G TS 29.002).

D. A single integer value

E. attUpdateGprsLocationHlr

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.1.44 Succesful GPRS Update Locations sent to the HLR.

A. This measurement provides the number of successful GPRS Update Locations returned from the HLR.

B. CC

C. Transmission of a 'MAP_UPDATE_LOCATION' service request (3G TS 29.002).

D. A single integer value

E. succUpdateGprsLocationHlr

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.1.45 Attempted CancelLocation requests received from an HLR-operator, in case of a HLR-initiated Detach

A. This measurement provides the number of CancelLocation requests received from an HLR-operator, in case of a HLR-initiated Detach

B. CC

C. Receipt of a 'MAP_CANCEL_LOCATION' service request (3G TS 29.002)

D. A single integer value

E. attCancelLocHlrOp

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.1.46 Attempted CancelLocation requests received from a HLR due to a SGSN-change (previous SGSN)

A. This measurement provides the number of CancelLocation requests received from a HLR due to a SGSN-change (previous SGSN)

B. CC

C. Receipt of a "MAP_CANCEL_LOCATION" service request (3G TS 29.002) due to a SGSN-change (previous SGSN)

D. A single integer value

E. attCancelLocHlrSgsnChg

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.1.47 Attempted Reset requests received from a HLR due to an HLR restart, indicating that a failure occured.

A. This measurement provides the number of Reset requests received from a HLR due to an HLR restart, indicating that a failure occured.

B. CC

C. Receipt of a "MAP_RESET" service request (3G TS 29.002) from a HLR

D. A single integer value

E. attResetHlr

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.2 Subscriber Management

5.2.1 Attempted Insert Subscriber Data requests received from a HLR due to an HLR-operator intervention.

A. This measurement provides the number of Insert Subscriber Data requests received from a HLR due to an HLR-operator intervention.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of a "MAP-INSERT-SUBSCRIBER-DATA" service request (3G TS 29.002).

D. A single integer value per measurement type defined in E

E. attInsertSubscrDataHlrOp

attInsertSubscrDataHlrOp	COMB (don't care)
attInsertSubscrDataHlrOp.G	GSM
attInsertSubscrDataHlrOp.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.2.2 Attempted Delete Subscriber Data requests received from a HLR due to an HLR-operator intervention.

A. This measurement provides the number of Delete Subscriber Data requests received from a HLR due to an HLR-operator intervention.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of a "MAP_DELETE_SUBSCRIBER_DATA" service request (3G TS 29.002).

D. A single integer value per measurement type defined in E

E. attDeleteSubscrDataHlrOp

attDeleteSubscrDataHlrOp	COMB (don’t care)
attDeleteSubscrDataHlrOp.G	GSM
attDeleteSubscrDataHlrOp.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.3 SRNC Relocation

5.3.1 Attempted intra/inter 3G-SGSN SRNS Relocation

A. This measurement provides the number of attempts intra/inter 3G-SGSN SRNS Relocation

B. CC

C. Receipt of "Relocation Required" message (3G TS 25.413) from SRNC

D. A single integer value

E. attSRNSReloc

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.2 Successful intra 3G-SGSN SRNS Relocation

A. This measurement provides the number of successful intra 3G-SGSN SRNS Relocation

B. CC

C. Receipt of "Relocation Complete" message (3G TS 25.413) from TRNC

D. A single integer value

E. succIntraSRNSReloc

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.3 Unsuccessful intra 3G-SGSN SRNS Relocation, due to internal reasons

A. This measurement provides the number of unsuccessful intra 3G-SGSN SRNS Relocation, due to internal reasons

B. CC

C. Intra 3G-SGSN SRNS Relocation fails due to reasons located inside this SGSN :- internal resource problem- recovery- ...

D. A single integer value

E. unsuccIntraSRNSRelocInt

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.4 Unsuccessful intra 3G-SGSN SRNS Relocation, due to external reasons

A. This measurement provides the number of unsuccessful intra 3G-SGSN SRNS Relocation, due to external reasons

B. CC

C. Intra 3G-SGSN SRNS Relocation fails due to reasons located in NE outside this SGSN :- "Relocation Preparation Failure" (3G TS 25.413) is sent to the SRNC- "Relocation Failure" (3G TS 25.413) is received from the TRNC- "Relocation Cancel" (3G TS 25.413) is received from the SRNC- missing expected message from RNC (timer expiry)- ...

D. A single integer value

E. unsuccIntraSRNSRelocExt

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.5 Attempted inter 3G-SGSN SRNS Relocation

A. This measurement provides the number of attempts inter 3G-SGSN SRNS Relocation

B. CC

C. Receipt of "Relocation Required" message (3G TS 25.413) from SRNC, where the Target ID indicates Inter SGSN SRNS Relocation

D. A single integer value

E. attInterSRNSReloc

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.6 Successful Inter 3G-SGSN SRNS Relocation, counted in the old 3G-SGSN

A. This measurement provides the number of successful Inter 3G-SGSN SRNS Relocation, counted in the old 3G-SGSN

B. CC

C. Receipt of "Forward Relocation Complete" message (3G TS 29.060) from the new SGSN

D. A single integer value

E. succInterSRNSReloc

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.7 Unsuccessful Inter 3G-SGSN SRNS Relocation, due to internal reasons

A. This measurement provides the number of unsuccessful Inter 3G-SGSN SRNS Relocation, due to internal reasons

B. CC

C. Inter 3G-SGSN SRNS Relocation fails due to reasons located inside this SGSN :- internal resource problem- recovery- ...

D. A single integer value

E. unsuccInterSRNSRelocInt

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.8 Unsuccessful Inter 3G-SGSN SRNS Relocation, due to external reasons

A. This measurement provides the number of unsuccessful Inter 3G-SGSN SRNS Relocation, due to external reasons

B. CC

C. Inter 3G-SGSN SRNS Relocation fails due to reasons located in NE outside this SGSN :- the Cause in "Forward Relocation Response" (3G TS 29.060) from the new 3G-SGSN is not "Request Accepted"- "Relocation Preparation Failure" (3G TS 25.413) is sent to the SRNC- "Relocation Failure" (3G TS 25.413) is received from the TRNC- "Relocation Cancel" (3G TS 25.413) is received from the SRNC- missing expected message from RNC or new 3G-SGSN (timer expiry)- ...

D. A single integer value

E. unsuccInterSRNSRelocExt

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.9 Attempted inter 3G-SGSN SRNS Relocation, counted in the new 3G-SGSN

A. This measurement provides the number of attempts inter 3G-SGSN SRNS Relocation, counted in the new 3G-SGSN

B. CC

C. Receipt of "Forward Relocation Request" message (3G TS 29.060) from the old SGSN

D. A single integer value

E. attInterSRNSRelocNew

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.3.10 Successful Inter 3G-SGSN SRNS Relocation, counted in the new 3G-SGSN

A. This measurement provides the number of successful Inter 3G-SGSN SRNS Relocation, counted in the new 3G-SGSN

B. CC

C. Transmission of "Forward Relocation Complete" message (3G TS 29.060) to the old SGSN

D. A single integer value

E. succInterSRNSRelocNew

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.4 Security

5.4.1 Attempted P-TMSI reallocation procedures

A. This measurement provides the number of attempted P-TMSI reallocation, or implicitly as part of the Location Updating, procedures in this SGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of "P-TMSI REALLOCATION COMMAND" message by the SGSN (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attPTMSIRealloc

attPTMSIRealloc	COMB (don’t care)
attPTMSIRealloc.G	GSM
attPTMSIRealloc.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.2 Successful P-TMSI reallocation procedures

A. This measurement provides the number of successfully performed P-TMSI reallocation procedures in this SGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of "P-TMSI REALLOCATION COMPLETE" message by the SGSN (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. succPTMSIRealloc

succPTMSIRealloc	COMB (don’t care)
succPTMSIRealloc.G	GSM
succPTMSIRealloc.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.3 Attempted Identity Request procedures initiated by this SGSN.

A. This measurement provides the number of attempted Identity Request procedures initiated by this SGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of an "IDENTITY REQUEST" (with Identity Type = IMSI) message to the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attIdentityReqImsi

attIdentityReqImsi	COMB (don’t care)
attIdentityReqImsi.G	GSM
attIdentityReqImsi.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.4 Successful completed Identity Request procedures initiated by this SGSN.

A. This measurement provides the number of successfully completed Identity Request procedures initiated by this SGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "IDENTITY RESPONSE" message with IMSI by the SGSN from the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. succIdentityReqImsi

succIdentityReqImsi	COMB (don't care)
succIdentityReqImsi.G	GSM
succIdentityReqImsi.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.5 Attempted identification information requests sent to a partner (previous) SGSN for subscribers registering afresh in this SGSN.

A. This measurement provides the number of identification information requests sent to a partner (previous) SGSN for subscribers registering afresh in this SGSN.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. transmision of the "Identification Request" message to the old SGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. attIdentityReqToPsgsn

attIdentityReqToPsgsn	COMB (don't care)
attIdentityReqToPsgsn.G	GSM
attIdentityReqToPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.6 Successful replied identification information requests that were sent to a partner (previous) SGSN.

A. This measurement provides the number of successfully replied identification information requests that were sent to a partner (previous) SGSN.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. receipt of the "Identification Response" message from the old SGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. succIdentityReqToPsgsn

succIdentityReqToPsgsn	COMB (don't care)
succIdentityReqToPsgsn.G	GSM
succIdentityReqToPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.7 Attempted Identity Requests sent to the MS.

A. This measurement provides the number of Identity Requests sent to the MS.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

A. C. Transmission of an "IDENTITY REQUEST" message (3G TS 24.008)

C. A single integer value per measurement type defined in E

D. attIdentityRequest

attIdentityRequest	COMB (don’t care)
attIdentityRequest.G	GSM
attIdentityRequest.U	UMTS

E. SgsnFunction

F. Valid for packet switching

G. GSM/UMTS

5.4.8 Successful replied Identity Requests from the MS.

A. This measurement provides the number of successfully replied Identity Requests from the MS.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "IDENTITY RESPONSE" message (3G TS 24.008) from the MS.

D. A single integer value per measurement type defined in E

E. succIdentityRequest

succIdentityRequest	COMB (don’t care)
succIdentityRequest.G	GSM
succIdentityRequest.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.9 Attempted authentication procedures that are started within this SGSN area for a subscriber using a SIM

A. This measurement provides the number of authentication procedures that are started within this SGSN area for a subscriber using a SIM
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of an "AUTHENTICATION AND CIPHERING REQUEST" message to a MS using a SIM (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attAuthProcsSgsnSim

attAuthProcsSgsnSim	COMB (don't care)
attAuthProcsSgsnSim.G	GSM
attAuthProcsSgsnSim.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.10 Successful authentication procedures within this SGSN area, for a subscriber using a SIM.

A. This measurement provides the number of successful authentication procedures within this SGSN area, for a subscriber using a SIM.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of an "AUTHENTICATION AND CIPHERING RESPONSE" message from the MS , using a SIM, where the receipt SRES parameter value matches the value stored in the SGSN (3G TS24.008)

D. A single integer value per measurement type defined in E

E. succAuthProcsSgsnSim

succAuthProcsSgsnSim	COMB (don't care)
succAuthProcsSgsnSim.G	GSM
succAuthProcsSgsnSim.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.11 Attempted authentication procedures that are started within this SGSN area for a subscriber using a USIM

A. This measurement provides the number of authentication procedures that are started within this SGSN area for a subscriber using a USIM
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of an "AUTHENTICATION AND CIPHERING REQUEST" message to a MS using a USIM (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attAuthProcsSgsnUsim

attAuthProcsSgsnUsim	COMB (don't care)
attAuthProcsSgsnUsim.G	GSM
attAuthProcsSgsnUsim.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.12 Successful authentication procedures within this SGSN area, for a subscriber using a USIM.

A. This measurement provides the number of successful authentication procedures within this SGSN area, for a subscriber using a USIM.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "AUTHENTICATION AND CIPHERING RESPONSE" message from the MS , using a USIM, where the receipt RES parameter value matches the value stored in the SGSN (3G TS24.008)

D. A single integer value per measurement type defined in E

E. succAuthProcsSgsnUsim

succAuthProcsSgsnUsim	COMB (don’t care)
succAuthProcsSgsnUsim.G	GSM
succAuthProcsSgsnUsim.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.13 Received ciphering and Authentication failures within this SGSN area.

A. This measurement provides the number of ciphering and Authentication failures within this SGSN area.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "AUTHENTICATION AND CIPHERING FAILURE" message from the MS. (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. recPOAuthFailSgsn

recPOAuthFailSgsn	COMB (don’t care)
recPOAuthFailSgsn.G	GSM
recPOAuthFailSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.14 Attempted identification information requests that were received from a partner (new) SGSN for subscribers de-registering from this SGSN

A. This measurement provides the number of identification information requests that were received from a partner (new) SGSN for subscribers de-registering from this SGSN
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of the "Identification Request" message from a partner (new) SGSN. (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. attIdentityReqFromPsgsn

attIdentityReqFromPsgsn	COMB (don't care)
attIdentityReqFromPsgsn.G	GSM
attIdentityReqFromPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.15 Succesfully replied identification information requests that were received from a partner (new) SGSN

A. This measurement provides the number of succesfully replied identification information requests that were received from a partner (new) SGSN
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of the "Identification Response" message to the new SGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. succIdentityReqFromPsgsn

succIdentityReqFromPsgsn	COMB (don't care)
succIdentityReqFromPsgsn.G	GSM
succIdentityReqFromPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.16 Attempted SGSN context requests sent to a partner (previous) SGSN for subscribers registering afresh in this SGSN.

A. This measurement provides the number of SGSN context requests sent to a partner (previous) SGSN for subscribers registering afresh in this SGSN.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of the "Context Request" message to the previous SGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. attContextRequestToPsgsn

attContextRequestToPsgsn	COMB (don't care)
attContextRequestToPsgsn.G	GSM
attContextRequestToPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.17 Successfully replied SGSN context requests that were sent to a partner (previous) SGSN

A. This measurement provides the number of successfully replied SGSN context requests that were sent to a partner (previous) SGSN
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of the "Context Response" message from the previous SGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. succContextRequestToPsgsn

succContextRequestToPsgsn	COMB (don’t care)
succContextRequestToPsgsn.G	GSM
succContextRequestToPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.18 Attempted SGSN context requests received from a partner (new) SGSN for a subscriber de-registering from this SGSN

A. This measurement provides the number of SGSN context requests received from a partner (new) SGSN for a subscriber de-registering from this SGSN
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of the "Context Request" message from the new SGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. attContextRequestFromPsgsn

attContextRequestFromPsgsn	COMB (don’t care)
attContextRequestFromPsgsn.G	GSM
attContextRequestFromPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.19 Successfully replied SGSN context requests received from a partner (new) SGSN

A. This measurement provides the number of successfully replied SGSN context requests received from a partner (new) SGSN
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of the "Context Response" message to the new SGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. succContextRequestFromPsgsn

succContextRequestFromPsgsn	COMB (don't care)
succContextRequestFromPsgsn.G	GSM
succContextRequestFromPsgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.4.20 Number of P-TMSI - IMSI correlation failures (User Identity Confidentiality (3G TS 23.060))

A. This measurement provides the number of P-TMSI - IMSI correlation failures (User Identity Confidentiality (3G TS 23.060))

B. CC

C. This counter is triggered before the handling of the "Security Functions" (3G TS 23.060), in case of "Attach Request", "Routing Area Update Request", or "Service Request" : if the correlation between the received P-TMSI and the stored IMSI is not valid then this counter is incremented

D. A single integer value

E. nbrPTMSICorrFailRnc

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.4.21 Attempted security mode control procedures started by the SGSN

A. This measurement provides the number of security mode control procedures started by the SGSN

B. CC

C. Transmission of a "SECURITY MODE COMMAND" message to the MS (3G TS 25.413)

D. A single integer value

E. attSecMode

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.4.22 Successful security mode procedures.

A. This measurement provides the number of successful security mode procedures. The Security mode command response from MS starts the uplink integrity protection (and possible ciphering), i.e. also all following messages sent from the MS are integrity protected (and possibly ciphered).

B. CC

C. Receipt of a "SECURITY MODE COMPLETE" message from the MS (3G TS 25.413)

D. A single integer value

E. succSecMode

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.4.23 Attempted ciphering procedures started by the SGSN

A. This measurement provides the number of ciphering procedures started by the SGSN

B. CC

C. Transmision of a "SECURITY MODE COMMAND" message with cyphering activated ("Encryption Algorithm" is not "no encryption (0)"), to the MS (3G TS 25.413)

D. A single integer value

E. attCiphering

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.4.24 Successful ciphering procedures started by the SGSN

A. This measurement provides the number of successful ciphering procedures started by the SGSN

B. CC

C. Receipt of a "SECURITY MODE COMPLETE" message, with cyphering activated, from the MS (3G TS 25.413)

D. A single integer value

E. succCiphering

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.4.25 Attempted MAP V1 requests for authentication sets, sent to the HLR by SGSN.

A. This measurement provides the number of attempted MAP V1 requests for authentication sets, sent to the HLR by SGSN.

B. CC

C. Transmission of a "MAP V1 SEND_AUTHENTICATION_INFO" service request, requesting authentication sets present (3G TS 29.002).

D. A single integer value

E. attReqAuthSetsHlrV1

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.4.26 Successful MAP V1 requests for authentication sets that were sent to the HLR.

A. This measurement provides the number of successful MAP V1 requests for authentication sets that were sent to the HLR.

B. CC

C. Receipt of a "MAP V1 SEND_AUTHENTICATION_INFO" service confirmation, containing requested authentication sets (parameter "AuthenticationSetList" present 3G TS 29.002)

D. A single integer value

E. succReqAuthSetsHlrV1

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.4.27 Number of empty responses to the MAP V1 request for authentication sets that were sent to the HLR.

A. This measurement provides the number of empty responses to the MAP V1 request for authentication sets that were sent to the HLR.

B. CC

C. Receipt of a MAP V1 "SEND_AUTHENTICATION_INFO_ACK" service confirmation, no Authentication sets present (3G TS 29.002).

D. A single integer value

E. nbrEmptyRespAuthSetsHlrV1

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.4.28 Attempted MAP V3 requests for Authentication sets sent to the HLR by SGSN

A. This measurement provides the number of attempted MAP V3 requests for Authentication sets sent to the HLR by SGSN

B. CC

C. Transmission of a MAP V3 "SEND_AUTHENTICATION_INFO" service request, requesting authentication sets present (3G TS 29.002).

D. A single integer value

E. attReqAuthSetsHlrV3

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.4.29 Successful MAP V3 requests for authentication sets that were sent to the HLR.

A. This measurement provides the number of successful MAP V3 requests for authentication sets that were sent to the HLR.

B. CC

C. Receipt of a MAP V3 "SEND_AUTHENTICATION_INFO" service confirmation, containing requested authentication sets (parameter "AuthenticationSetList" present 3G TS 29.002)

D. A single integer value

E. succReqAuthSetsHlrV3

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.4.30 Number of empty responses to the MAP V3 request for authentication sets that were sent to the HLR.

A. This measurement provides the number of empty responses to the MAP V3 request for authentication sets that were sent to the HLR.

B. CC

C. Receipt of a MAP V3 "SEND_AUTHENTICATION_INFO_ACK" service confirmation, no Authentication sets present (3G TS 29.002).

D. A single integer value

E. nbrEmptyRespAuthSetsHlrV3

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.5 SMS

The three measurement groups defined in 5.5.n are subject to the “2 out of 3 approach”.

5.5.1 SMS in the CS domain (MSC)

Up to now, no counters are defined for the failure cases. FFS.

5.5.1.1 Attempted CS SMS mobile originating

A. This measurement provides the number of CS SMS mobile originating attempts.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt by the MSC of "RP-DATA" Message (3G TS 24.011) from the MS.

D. A single integer value per measurement type defined in E

E. attSmsMoCS

attSmsMoCS	COMB (don't care)
attSmsMoCS.G	GSM
attSmsMoCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.1.2 Successful CS SMS mobile originating

A. This measurement provides the number of successful CS SMS mobile originating attempts.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission by the MSC of "RP-ACK" Message (3G TS 24.011) to the MS

D. A single integer value per measurement type defined in E

E. succSmsMoCS

succSmsMoCS	COMB (don't care)
succSmsMoCS.G	GSM
succSmsMoCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.1.3 Attempted CS SMS mobile terminating.

A. This measurement provides the number of CS SMS mobile terminating attempts. .
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission by the MSC of "RP-DATA" Message (3G TS 24.011)

D. A single integer value per measurement type defined in E

E. attSmsMtCS

attSmsMtCS	COMB (don't care)
attSmsMtCS.G	GSM
attSmsMtCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.1.4 Successful CS SMS mobile terminating

A. This measurement provides the number of successful CS SMS mobile terminating attempts.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt by the MSC of "RP-ACK" Message (3G TS 24.011)

D. A single integer value per measurement type defined in E

E. succSmsMtCS

succSmsMtCS	COMB (don't care)
succSmsMtCS.G	GSM
succSmsMtCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.1.5 Attempted CS ms-Present

A. This attribute counts the number of times that a MS (attached to a MSC) send that it is ready to receive SM. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of MAP-READY-FOR-SM with alertReason = ms-Present to the HLR from the MSC (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. attMsPresentCS

attMsPresentCS	COMB (don't care)
attMsPresentCS.G	GSM
attMsPresentCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.1.6 Attempted CS "memory available"

A. This attribute counts the number of times that a MS (attached to a MSC) sent a indication of "memory available" to MSC. .
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of MAP-READY-FOR-SM with alertReason = memoryAvailable to the HLR from the MSC (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. attMemoryAvailableCS

attMemoryAvailableCS	COMB (don't care)
attMemoryAvailableCS.G	GSM
attMemoryAvailableCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.1.7 Succesful CS ms-Present

A. This attribute counts the number of succesful times that a MS (attached to a MSC) send that it is ready to receive SM.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. This counter will be increased when a return result is received by the MSC from the HLR in response to the MAP_READY_FOR_SM with reason = “MS present”. (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. SuccMsPresentCS

SuccMsPresentCS	COMB (don’t care)
SuccMsPresentCS.G	GSM
SuccMsPresentCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.1.8 Successful CS “memory available”

A. This attribute counts the number of successful times that a MS (attached to a MSC) sent a indication of “memory available” to MSC. .
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. This counter will be increased when a return result is received by the MSC from the HLR in response to the MAP_READY_FOR_SM with reason = “memory available”. (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. SuccMemoryAvailableCS

SuccMemoryAvailableCS	COMB (don’t care)
SuccMemoryAvailableCS.G	GSM
SuccMemoryAvailableCS.U	UMTS

F. MscFunction

G. Valid for circuit switching

H. GSM/UMTS

5.5.2 SMS in the PS domain (SGSN)

Up to now, no counters are defined for the failure cases. FFS.

5.5.2.1 Attempted PS SMS mobile originating

A. This measurement provides the number of PS SMS mobile originating attempts.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt by the SGSN of "RP-DATA" Message (3G TS 24.011) from the MS.

D. A single integer value per measurement type defined in E

E. attSmsMoPS

attSmsMoPS	COMB (don’t care)
attSmsMoPS.G	GSM
attSmsMoPS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.2.2 Successful PS SMS mobile originating

A. This measurement provides the number of successful PS SMS mobile originating attempts.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission by the SGSN of "RP-ACK" Message (3G TS 24.011) to the MS

D. A single integer value per measurement type defined in E

E. succSmsMoPS

succSmsMoPS	COMB (don’t care)
succSmsMoPS.G	GSM
succSmsMoPS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.2.3 Attempted PS SMS mobile terminating.

A. This measurement provides the number of PS SMS mobile terminating attempts. .
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission by the SGSN of "RP-DATA" Message (3G TS 24.011)

D. A single integer value per measurement type defined in E

E. attSmsMtPS

attSmsMtPS	COMB (don’t care)
attSmsMtPS.G	GSM
attSmsMtPS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.2.4 Successful PS SMS mobile terminating

A. This measurement provides the number of successful PS SMS mobile terminating attempts.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt by the SGSN of "RP-ACK" Message (3G TS 24.011)

D. A single integer value per measurement type defined in E

E. succSmsMtPS

succSmsMtPS	COMB (don’t care)
succSmsMtPS.G	GSM
succSmsMtPS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.2.5 Attempted PS ms-Present

A. This attribute counts the number of times that a MS (attached to a SGSN) send that it is ready to receive SM.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of MAP-READY-FOR-SM with alertReason = ms-Present to the HLR from the SGSN (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. attMsPresentPS

attMsPresentPS	COMB (don’t care)
attMsPresentPS.G	GSM
attMsPresentPS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.2.6 Attempted PS “memory available”

A. This attribute counts the number of times that a MS (attached to a SGSN) sent a indication of “memory available” to SGSN. .
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of MAP-READY-FOR-SM with alertReason = memoryAvailable to the HLR from the SGSN (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. attMemoryAvailablePS

attMemoryAvailablePS	COMB (don't care)
attMemoryAvailablePS.G	GSM
attMemoryAvailablePS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.2.7 Succesful PS ms-Present

A. This attribute counts the number of succesful times that a MS (attached to a SGSN) send that it is ready to receive SM.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. This counter will be increased when a return result is received by the SGSN from the HLR in response to the MAP_READY_FOR_SM with reason = "MS present". (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. SuccMsPresentPS

SuccMsPresentPS	COMB (don't care)
SuccMsPresentPS.G	GSM
SuccMsPresentPS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.2.8 Successful PS "memory available".

A. This attribute counts the number of successful times that a MS (attached to a SGSN) sent a indication of "memory available" to SGSN. .
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. This counter will be increased when a return result is received by the SGSN from the HLR in response to the MAP_READY_FOR_SM with reason = "memory available". (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. SuccMemoryAvailablePS

SuccMemoryAvailablePS	COMB (don't care)
SuccMemoryAvailablePS.G	GSM
SuccMemoryAvailablePS.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.5.3 SMS in the CS/PS domain (MSC/SGSN)

Unlike the measurements in previous chapters, the measurements in this chapter do not differentiate between the PS and the CS domain, and deliver one total count.

Up to now, no counters are defined for the failure cases. FFS.

5.5.3.1 Attempted SMS mobile originating

A. This measurement provides the number of SMS mobile originating attempts.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt by the MSC/SGSN of "RP-DATA" Message (3G TS 24.011) from the MS.

D. A single integer value per measurement type defined in E

E. attSmsMo

attSmsMo	COMB (don’t care)
attSmsMo.G	GSM
attSmsMo.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.5.3.2 Successful SMS mobile originating

A. This measurement provides the number of successful SMS mobile originating attempts.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission by the MSC/SGSN of "RP-ACK" Message (3G TS 24.011) to the MS

D. A single integer value per measurement type defined in E

E. succSmsMo

succSmsMo	COMB (don’t care)
succSmsMo.G	GSM
succSmsMo.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.5.3.3 Attempted SMS mobile terminating.

A. This measurement provides the number of SMS mobile terminating attempts. .
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission by the MSC/SGSN of "RP-DATA" Message (3G TS 24.011)

D. A single integer value per measurement type defined in E

E. attSmsMt

attSmsMt	COMB (don't care)
attSmsMt.G	GSM
attSmsMt.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.5.3.4 Successful SMS mobile terminating

A. This measurement provides the number of successful SMS mobile terminating attempts.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt by the MSC/SGSN of "RP-ACK" Message (3G TS 24.011)

D. A single integer value per measurement type defined in E

E. succSmsMt

succSmsMt	COMB (don't care)
succSmsMt.G	GSM
succSmsMt.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.5.3.5 Attempted ms-Present

A. This attribute counts the number of times that a MS (attached to a MSC/SGSN) send that it is ready to receive SM.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of MAP-READY-FOR-SM with alertReason = ms-Present to the HLR from the MSC/SGSN (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. attMsPresent

attMsPresent	COMB (don't care)
attMsPresent.G	GSM
attMsPresent.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.5.3.6 Attempted “memory available”

A. This attribute counts the number of times that a MS (attached to a MSC/SGSN) sent a indication of “memory available” to MSC/SGSN. .
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of MAP-READY-FOR-SM with alertReason = memoryAvailable to the HLR from the MSC/SGSN (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. attMemoryAvailable

attMemoryAvailable	COMB (don’t care)
attMemoryAvailable.G	GSM
attMemoryAvailable.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.5.3.7 Succesful ms-Present

A. This attribute counts the number of succesful times that a MS (attached to a MSC/SGSN) send that it is ready to receive SM.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. This counter will be increased when a return result is received by the MSC/SGSN from the HLR in response to the MAP_READY_FOR_SM with reason = “MS present”. (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. SuccMsPresent

SuccMsPresent	COMB (don’t care)
SuccMsPresent.G	GSM
SuccMsPresent.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.5.3.8 Successful “memory available”

A. This attribute counts the number of successful times that a MS (attached to a MSC/SGSN) sent a indication of “memory available” to MSC/SGSN. .
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. This counter will be increased when a return result is received by the MSC/SGSN from the HLR in response to the MAP_READY_FOR_SM with reason = “memory available”. (3G TS 29.002)

D. A single integer value per measurement type defined in E

E. SuccMemoryAvailable

SuccMemoryAvailable	COMB (don't care)
SuccMemoryAvailable.G	GSM
SuccMemoryAvailable.U	UMTS

F. MscFunction or SgsnFunction

G. Valid for packet switching and circuit switching

H. GSM/UMTS

5.6 Session Management

5.6.1 Attempted PDP context activation procedures initiated by MS

A. This measurement provides the number of attempted PDP context activation procedures. These include the static as well as the dynamic PDP addresses.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of a "Activate PDP Context Request" message from the MS (3G TS 24.008).

D. A single integer value

E. attActPdpContext

attActPdpContext	COMB (don't care)
attActPdpContext.G	GSM
attActPdpContext.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.2 Attempted dynamic PDP context activation procedures initiated by MS

A. This measurement provides the number of attempted PDP context activation requests where a dynamic PDP address is required to be used.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of a "Activate PDP Context Request" message from the MS with an empty PDP address (3G TS 24.008) .

D. A single integer value per measurement type defined in E

E. attActPdpContextDyn

attActPdpContextDyn	COMB (don't care)
attActPdpContextDyn.G	GSM

attActPdpContextDyn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.3 Successful PDP context activation procedures initiated by MS

A. This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of a "Activate PDP Context Accept" message to the MS (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succActPdpContext

succActPdpContext	COMB (don’t care)
succActPdpContext.G	GSM
succActPdpContext.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.4 Successful dynamic PDP context activation procedures initiated by MS

A. This measurement provides the number of successfully completed PDP context activations where a dynamic PDP address is used.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of a "Activate PDP Context Accept" message to the MS (3G TS 24.008), the PDP address has been dynamically assigned.

D. A single integer value per measurement type defined in E

E. succActPdpContextDyn

succActPdpContextDyn	COMB (don’t care)
succActPdpContextDyn.G	GSM
succActPdpContextDyn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.5 mean number of activated PDP contexts

A. mean number of activated PDP contexts
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. SI

C. This measurement is obtained by sampling at a pre-defined interval, the number activated PDP contexts, and then taking the arithmetic mean

D. A single integer value per measurement type defined in E

E. meanActPDPContext

meanActPDPContext	COMB (don’t care)
meanActPDPContext.G	GSM
meanActPDPContext.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.6 Attempted PDP context deactivation procedures initiated by the MS

A. This measurement provides the number of PDP context deactivation procedures initiated by the MS.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of a "Deactivate PDP Context Request" message from the MS (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attDeactPdpContextMs

attDeactPdpContextMs	COMB (don’t care)
attDeactPdpContextMs.G	GSM
attDeactPdpContextMs.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.7 Successful PDP context deactivation procedures initiated by the MS

A. This measurement provides the number of successfully completed PDP context deactivations. For these context deactivations, the GGSN is updated successfully (i.e. deletion of the PDP context).
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of a "Deactivate PDP Context Accept" message to the MS (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succDeactPdpContextMs

succDeactPdpContextMs	COMB (don’t care)
succDeactPdpContextMs.G	GSM

succDeactPdpContextMs.U UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.8 Number of active PDP context

A. This measurement provides the number of active PDP context
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. GAUGE

C. The gauge will be incremented when a PDP context is created and will be decremented when a PDP context is deleted.

D. A single integer value per measurement type defined in E

E. nbrActPdpContext

nbrActPdpContext	COMB (don’t care)
nbrActPdpContext.G	GSM
nbrActPdpContext.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.9 Number of mobile subscribers with activated PDP context (i.e. subscribers that can send/receive GPRS packet data).

A. This measurement provides the number of mobile subscribers with activated PDP context (i.e. subscribers that can send/receive GPRS packet data).
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. GAUGE

C. Addition of first PDP context or removal of last PDP context inSGSN location register for a particular subscriber

D. A single integer value per measurement type defined in E

E. nbrActivePdpPerSgsn

nbrActivePdpPerSgsn	COMB (don’t care)
nbrActivePdpPerSgsn.G	GSM
nbrActivePdpPerSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.10 Mean number of subscribers that have an activated PDP context (i.e. subscribers that can send/receive GPRS packet data).

A. This measurement provides the arithmetic mean number value of subscribers that have an activated PDP context (i.e. subscribers that can send/receive GPRS packet data).
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. SI

C. This measurement is obtained by sampling at a pre-defined interval, the number of subscribers with activated PDP context in SGSN, and then taking the arithmetic mean

D. A single integer value per measurement type defined in E

E. meanActivePdpPerSgsn

meanActivePdpPerSgsn	COMB (don’t care)
meanActivePdpPerSgsn.G	GSM
meanActivePdpPerSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.11 Attempted PDP context deactivation procedures initiated by the GGSN

A. This measurement provides the number of PDP context deactivation procedures initiated by the GGSN.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of a "Delete PDP Context Request" message from the GGSN (3G TS 29.060).

D. A single integer value per measurement type defined in E

E. attDeactPdpContextGgsn

attDeactPdpContextGgsn	COMB (don’t care)
attDeactPdpContextGgsn.G	GSM
attDeactPdpContextGgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.12 Successful PDP context deactivation procedures initiated by the GGSN

A. This measurement provides the number of successfully handled PDP context deactivations initiated by the GGSN. For these context deactivations, the MS has accepted the PDP context deactivation.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of a "Delete PDP Context Response" message to the GGSN (3G TS 29.060).

D. A single integer value per measurement type defined in E

E. succDeactPdpContextGgsn

succDeactPdpContextGgsn	COMB (don't care)
succDeactPdpContextGgsn.G	GSM
succDeactPdpContextGgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.13 Attempted PDP context deactivation procedures initiated by the SGSN.

A. This measurement provides the number of PDP context deactivation procedures initiated by the SGSN. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. transmision of a "Delete PDP Context Request" message to the GGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. attDeactPdpContextSgsn

attDeactPdpContextSgsn	COMB (don't care)
attDeactPdpContextSgsn.G	GSM
attDeactPdpContextSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.14 Successful PDP context deactivations initiated by the SGSN.

A. This measurement provides the number of successfully handled PDP context deactivations initiated by the SGSN. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. receipt of a "deactivate PDP Context Accept" message from the MS. (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succDeactPdpContextSgsn

succDeactPdpContextSgsn	COMB (don't care)
succDeactPdpContextSgsn.G	GSM
succDeactPdpContextSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.15 Attempted SGSN-Initiated PDP context update procedures

A. This measurement provides the number of attempted SGSN-Initiated PDP context update procedures. An Update PDP Context Request message shall be sent from a SGSN to a GGSN as part of the GPRS Inter SGSN Routeing Update procedure or the PDP Context Modification procedure or to redistribute contexts due to load sharing. It shall be used to change the QoS and the path. The message shall be sent by the new SGSN at the Inter SGSN Routeing Update procedure.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmision of an "Update PDP Context Request" message to the GGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. attUpdPdpContextSgsn

attUpdPdpContextSgsn	COMB (don’t care)
attUpdPdpContextSgsn.G	GSM
attUpdPdpContextSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.16 Successful SGSN-Initiated PDP context update procedures

A. This measurement provides the number of successfully handled SGSN-Initiated PDP context update procedures. These updates are performed successfully when a positive update PDP context response is received from the GGSN
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "Update PDP Context Response" message from the GGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. succUpdPdpContextSgsn

succUpdPdpContextSgsn	COMB (don’t care)
succUpdPdpContextSgsn.G	GSM
succUpdPdpContextSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.17 Attempted GGSN-Initiated PDP context update procedures

A. This measurement provides the number of attempted GGSN-Initiated PDP context update procedures. An Update PDP Context Request may also be sent from a GGSN to a SGSN to re-negotiate the QoS of a PDP context. This GGSN-initiated Update PDP Context Request can also be used to provide a PDP address to the SGSN (and MS). The latter shall be used by GGSN when it acts as a DHCP Relay Agent or Mobil IP Foreign Agent.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "Update PDP Context Request" message from the GGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. attUpdPdpContextGgsn

attUpdPdpContextGgsn	COMB (don't care)
attUpdPdpContextGgsn.G	GSM
attUpdPdpContextGgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.18 Successful GGSN-Initiated PDP context update procedures

A. This measurement provides the number of successfully handled GGSN-Initiated PDP context update procedures. These updates are performed successfully when a positive update PDP context response is received from the SGSN The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of an "Update PDP Context Response" message to the GGSN (3G TS 29.060)

D. A single integer value per measurement type defined in E

E. succUpdPdpContextGgsn

succUpdPdpContextGgsn	COMB (don't care)
succUpdPdpContextGgsn.G	GSM
succUpdPdpContextGgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.19 Attempted SGSN-Initiated PDP context modifications procedures.

A. This measurement provides the number of attempted SGSN-Initiated PDP context modifications procedures. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of an "Modify PDP Context Request" message to the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attModPdpContextSgsn

attModPdpContextSgsn	COMB (don't care)
attModPdpContextSgsn.G	GSM
attModPdpContextSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.20 Successfully SGSN-Initiated PDP context modifications procedures

A. This measurement provides the number of successfully handled SGSN-Initiated PDP context modifications procedures. These modifications are performed successfully when a positive Modify PDP Context Accept is received from the MS
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "Modify PDP Context Accept" message from the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. succModPdpContextSgsn

succModPdpContextSgsn	COMB (don’t care)
succModPdpContextSgsn.G	GSM
succModPdpContextSgsn.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.21 Attempted MS-Initiated PDP context modifications procedures.

A. This measurement provides the number of attempted MS-Initiated PDP context modifications procedures.
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Receipt of an "Modify PDP Context Request" message from the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. attModPdpContextMs

attModPdpContextMs	COMB (don’t care)
attModPdpContextMs.G	GSM
attModPdpContextMs.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.22 Successfully MS-Initiated PDP context modifications procedures

A. This measurement provides the number of successfully handled MS-Initiated PDP context modifications procedures. These modifications are performed successfully when a positive Modify PDP Context Accept is received from the MS
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Transmission of an "Modify PDP Context Accept" message to the MS (3G TS 24.008)

D. A single integer value per measurement type defined in E

E. succModPdpContextMs

succModPdpContextMs	COMB (don't care)
succModPdpContextMs.G	GSM
succModPdpContextMs.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.23 Attempted Secondary PDP context activation procedures.

A. This measurement provides the number of attempted Secondary PDP context activation procedures. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Receipt of a "Activate Secondary PDP Context Request" message from the MS (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. attActSecondPdpContext

attActSecondPdpContext	COMB (don't care)
attActSecondPdpContext.G	GSM
attActSecondPdpContext.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.6.24 Successful Secondary PDP context activations.

A. This measurement provides the number of successfully completed Secondary PDP context activations. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission of a "Activate Secondary PDP Context Accept" message to the MS (3G TS 24.008).

D. A single integer value per measurement type defined in E

E. succActSecondPdpContext

succActSecondPdpContext	COMB (don't care)
succActSecondPdpContext.G	GSM
succActSecondPdpContext.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.7 CAMEL Measurements

5.7.1 Attempted CAMEL dialogues

A. total number of CAMEL dialogue attempts
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Incremented when a TDP (Trigger Detection Point) is reached and CAP is informed.

D. A single integer value per measurement type defined in E

E. attCamelDialogues

attCamelDialogues	COMB (don’t care)
attCamelDialogues.G	GSM
attCamelDialogues.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.7.2 Unsuccessful CAMEL dialogues, aborted locally by gprsSSF

A. number of unsuccessful CAMEL dialogues, aborted locally by gprsSSF
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Incremented when a CAMEL dialogue isaborted locally by SSF.

D. A single integer value per measurement type defined in E

E. unsuccCamelDialoguesSsf

unsuccCamelDialoguesSsf	COMB (don’t care)
unsuccCamelDialoguesSsf.G	GSM
unsuccCamelDialoguesSsf.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.7.3 Unsuccessful CAMEL dialogues, error or reject from gsmSCF

A. number of unsuccessful CAMEL dialogues, error or reject from gsmSCF
The three measurement types defined in E are subject to the “2 out of 3 approach”.

B. CC

C. Incremented when a CAMEL dialogue is aborted by SCF.

D. A single integer value per measurement type defined in E

E. unsuccCamelDialoguesScf

unsuccCamelDialoguesScf	COMB (don’t care)

unsuccCamelDialoguesScf.G	GSM
unsuccCamelDialoguesScf.U	UMTS

F. SgsnFunction

G. Valid for packet switching

H. GSM/UMTS

5.8 UMTS-GSM Intersystem Change

5.8.1 Attempted intra SGSN inter system changes from UMTS to GSM

A. Number of attempted intra SGSN inter system changes from UMTS to GSM

B. CC

C. Receipt of "Routing Area Update REQUEST" message from the MS, where the SGSN determines that it concers a intra SGSN inter system changes from UMTS to GSM. (3G TS 24.008)

D. A single integer value

E. attIntraSgsnUmtsGsmRau

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.8.2 Successful intra SGSN inter system changes from UMTS to GSM

A. Successful intra SGSN inter system changes from UMTS to GSM

B. CC

C. Transmission of "ROUTING AREA UPDATE ACCEPT" message to the MS (3G TS 24.008). Only the cases where this message is sent for "UMTS to GSM Intra SGSN Change" are counted.

D. A single integer value

E. succIntraSgsnUmtsGsmRau

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.8.3 Unsuccessful intra SGSN inter system changes UMTS to GSM RAU, due to internal reasons

A. Number of unsuccessful intra SGSN inter system UMTS to GSM RAU, due to internal reasons

B. CC

C. "UMTS to GSM Intra SGSN Change" fails due to reasons located inside this 2G+3G-SGSN :- internal resource problem- recovery- ...

D. A single integer value

E. unsuccIntraSgsnUmtsGsmRauInt

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.8.4 Unsuccessful intra SGSN inter system changes UMTS to GSM RAU, due to external reasons

A. Number of unsuccessful intra SGSN inter system UMTS to GSM RAU, due to external reasons

B. CC

C. "UMTS to GSM Intra SGSN Change" fails due to reasons located in NE outside this 2G+3G-SGSN, such as abnormal(reject, failure,..)/missing responses from SRNS, MSC/VLR, HLR, ...

D. A single integer value

E. unsuccIntraSgsnUmtsGsmRauExt

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.8.5 Attempted intra SGSN inter system changes from GSM to UMTS

A. Number of attempted intra SGSN inter system changes from GSM to UMTS

B. CC

C. Receipt of "Routing Area Update REQUEST" message from the MS, where the SGSN determines that it concerns a intra SGSN inter system changes from GSM to UMTS. (3G TS 24.008)

D. A single integer value

E. attIntraSgsnGsmUmtsRau

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.8.6 Successful intra SGSN inter system changes from GSM to UMTS

A. Successful intra SGSN inter system changes from GSM to UMTS

B. CC

C. Transmission of "ROUTING AREA UPDATE ACCEPT" message to the MS (3G TS 24.008). Only the cases where this message is sent for "GSM to UMTS Intra SGSN Change" are counted.

D. A single integer value

E. succIntraSgsnGsmUmtsRau

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.8.7 Unsuccessful intra SGSN inter system changes GSM to UMTS RAU, due to internal reasons

A. Number of unsuccessful intra SGSN inter system GSM to UMTS RAU, due to internal reasons

B. CC

C. "GSM to UMTS Intra SGSN Change" fails due to reasons located inside this 2G+3G-SGSN :- internal resource problem- recovery- ...

D. A single integer value

E. unsuccIntraSgsnGsmUmtsRauInt

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.8.8 Unsuccessful intra SGSN inter system changes GSM to UMTS RAU, due to external reasons

A. Number of unsuccessful intra SGSN inter system GSM to UMTS RAU, due to external reasons

B. CC

C. "GSM to UMTS Intra SGSN Change" fails due to reasons located in NE outside this 2G+3G-SGSN, such as abnormal(reject, failure,..)/missing responses from SRNS, MSC/VLR, HLR, ...

D. A single integer value

E. unsuccIntraSgsnGsmUmtsRauExt

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9 UMTS GTP Measurements

5.9.1 GTP-U Iu

5.9.1.1 Number of outgoing GTP data packets on the Iu interface

A. This measurement provides the number of GTP data PDUs which have been generated by the GTP-U protocol entity on the Iu interface.

B. CC

C. Transmission by the SGSN of a GTP data PDU on the Iu interface to the MS

D. A single integer value

E. gtpuOutDataPktIu

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.9.1.2 Number of incoming GTP data packets on the Iu interface

A. This measurement provides the number of GTP data PDUs which have been accepted and processed by the GTP-U protocol entity on the Iu interface

B. CC

C. Reception by the SGSN of a GTP data PDU on the Iu interface from the MS

D. A single integer value

E. gtpuInDataPktIu

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.9.1.3 Number of octets of outgoing GTP data packets on the Iu interface

A. This measurement provides the byte number of outgoing data packets on the Iu interface without the GTP-U header.

B. CC

C. Transmission by the SGSN of an GTP-Data-PDU (T-PDU) on the Iu interface to the MS

D. A single integer value

E. gtpuOutDataOctIu

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.9.1.4 Number of octets of incoming GTP data packets on the Iu interface

A. This measurement provides the byte number of incoming data packets on the Iu interface without the GTP-U header.

B. CC

C. Reception by the SGSN of an GTP-Data-PDU (T-PDU) on the Iu interface from the MS

D. A single integer value

E. gtpuInDataOctIu

F. SgsnFunction

G. Valid for packet switching

H. UMTS

5.9.2 GTP Gn

5.9.2.1 Number of outgoing GTP data packets on the Gn interface

A. This measurement provides the number of GTP data PDUs which have been generated by the GTP protocol entity on the Gn interface.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission by the SGSN of a GTP data PDU on the Gn interface to the GGSN

D. A single integer value per measurement type defined in E

E.

gtpOutDataPktGn	the total regardless of the GTP version used
gtpOutDataPktGn.v0	only the GTPv0 part
gtpOutDataPktGn.v1	only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9.2.2 Number of incoming GTP data packets on the Gn interface

A. This measurement provides the number of GTP Data PDUs which have been accepted and processed by the GTP protocol entity on the Gn interface.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Reception by the SGSN of a GTP data PDU on the Gn interface from the GGSN

D. A single integer value per measurement type defined in E

E.

gtpInDataPktGn	the total regardless of the GTP version used
gtpInDataPktGn.v0	only the GTPv0 part
gtpInDataPktGn.v1	only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9.2.3 Number of octets of outgoing GTP data packets on the Gn interface

A. This measurement provides the number of octets of outgoing GTP data packets on the Gn interface.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission by the SGSN of an GTP-Data-PDU (T-PDU) on the Gn interface to the GGSN

D. A single integer value per measurement type defined in E

E.

gtpOutDataOctGn	the total regardless of the GTP version used
gtpOutDataOctGn.v0	only the GTPv0 part
gtpOutDataOctGn.v1	only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9.2.4 Number of octets of incoming GTP data packets on the Gn interface

A. This measurement provides the number of octets of incoming GTP data packets on the Gn interface.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Reception by the SGSN of an GTP-Data-PDU (T-PDU) on the Gn interface from the GGSN

D. A single integer value per measurement type defined in E

E. gtpInDataOctGn the total regardless of the GTP version used
gtpInDataOctGn.v0 only the GTPv0 part
gtpInDataOctGn.v1 only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9.2.5 Number of outgoing GTP signalling packets on the Gn interface

A. This measurement provides the number of GTP signalling PDUs which have been generated by the GTP protocol entity on the Gn interface.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission by the SGSN of a GTP signalling PDU on the Gn interface to the GGSN

D. A single integer value per measurement type defined in E

E. gtpOutSigPktGn the total regardless of the GTP version used
gtpOutSigPktGn.v0 only the GTPv0 part
gtpOutSigPktGn.v1 only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9.2.6 Number of incoming GTP signalling packets on the Gn interface

A. This measurement provides the number of GTP signalling PDUs which have been accepted and processed by the GTP protocol entity on the Gn interface.
The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Reception by the SGSN of a GTP signalling PDU on the Gn interface from the GGSN

D. A single integer value per measurement type defined in E

E. gtpInSigPktGn the total regardless of the GTP version used
gtpInSigPktGn.v0 only the GTPv0 part
gtpInSigPktGn.v1 only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9.2.7 Number of octets of outgoing GTP signalling packets on the Gn interface

A. This measurement provides the number of octets of outgoing GTP signalling packets on the Gn interface. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Transmission by the SGSN of an GTP-Signalling-PDU on the Gn interface to the GGSN

D. A single integer value per measurement type defined in E

E. gtpOutSigOctGn the total regardless of the GTP version used
gtpOutSigOctGn.v0 only the GTPv0 part
gtpOutSigOctGn.v1 only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

5.9.2.8 Number of octets of incoming GTP signalling packets on the Gn interface

A. This measurement provides the number of octets of incoming GTP signalling packets on the Gn interface. The three measurement types defined in E are subject to the "2 out of 3 approach".

B. CC

C. Reception by the SGSN of an GTP-Signalling-PDU on the Gn interface from the GGSN

D. A single integer value per measurement type defined in E

E. gtpInSigOctGn the total regardless of the GTP version used
gtpInSigOctGn.v0 only the GTPv0 part
gtpInSigOctGn.v1 only the GTPv1 part

F. SgsnFunction

G. Valid for packet switching

H. COMB

Annex (A) (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Jun 2001	S_12	SP-010237	-		Submitted to TSG SA #12 for Information.		1.0.2