Technical Specification Group Services and System Aspects **TSGS#13(01)0468**

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Source: **SA5**

Title: **Rel-4 CR32.403 (Telecommunication Management; Performance Measurements; UMTS and combined UMTS/GSM)**

Document for: **Approval**

Agenda Item: **7.5.3**

Doc-1st-Level	Doc-2nd-Level	Spec	CR	Rev	Phase	Subject	Cat	Version Current	Version-New	Workitem
SP-010468	S5-010542	32.403	001		Rel-4	Corrections on UMTS and combined UMTS/GSM measurements	F	4.0.0	4.1.0	OAM-PM

3GPP TSG-SA5 (Telecom Management) **S5-010542**
Meeting #22, Paris, France, 3 – 7 September 2001 **S5B010520**

CR-Form-v3

CHANGE REQUEST

⌘ **32.403** **CR** **001** ⌘ 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:	⌘	Corrections on UMTS and combined UMTS/GSM measurements
Source:	⌘	SA5
Work item code:	⌘	OAM-PM
Date:	⌘	07/09/2001
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘ Some measurement types require a refined specification.

Summary of change: ⌘ The following modifications were made:
- Addition of the family prefix for CN measurements
- Identification of the list of measurement families
- Addition of an annex to provide examples for the "(n-1) out of n" approach
- Application of the "(n-1) out of n" approach to all relevant measurements
- Addition of 'NoReply' cause for concerned measurements
- Enhancement of per cause measurements
- Reference to the official CM neighbouring cell object

Consequences if not approved: ⌘ TS is not applicable as such:
- Measurement names are not consistent across the document
- "(n-1) out of n" concept is not sufficiently described
- "(n-1) out of n" concept is not applied to all concerned measurements
- Per cause measurements cannot be efficiently implemented

Clauses affected: ⌘ All clauses

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

Other comments: ⌘

3GPP TS 32.403 V4.1.0 (2001-09)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication Management; Performance Management; Performance Measurements UMTS and combined UMTS/GSM (Release 4)

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Contents

Foreword

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

The present document is part of the 32.400-series covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication Management; Performance Management (PM), as identified below:

TS 32.401: "Concept and Requirements"**;**

TS 32.402: "Performance Measurements - GSM";

TS 32.403: "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 32.401 [12] 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 the present 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 the present 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: "Telecommunication Management; Configuration Management; 3G configuration management; Concept and main 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 32.622: "Telecommunication Management; Configuration Management; Part 2: Generic network resources IRP: NRM".

[10] 3GPP TS 32.632: "Telecommunication Management; Configuration Management; Core Network Resources IRP: NRM".

[11] 3GPP TS 32.642: "Telecommunication Management; Configuration Management; Part 2: UTRAN network resources IRP: NRM".

[12] 3GPP TS 32.401: "Telecommunication Management; Performance Management (PM); Concept and Requirements".

[13] GSM 12.04: "Digital cellular telecommunication system (Phase 2) (GSM); Performance Management and Measurements for a GSM Public Land Mobile Network (PLMN)".

[14] 3GPP TS 32.402: "Telecommunication Management; Performance Management (PM); Performance Measurements - GSM".

[15] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".

[16] GSM 08.18: "Digital cellular telecommunication system (Phase 2) (GSM); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol".

[17] 3GPP TS 23.060: "General Packet Radio Service (GPRS) Service description; Stage 2".

[18] 3GPP TS 29.002: "Mobile Application Part (MAP)".

[19] 3GPP TS 29.060: "GPRS Tunnelling protocol (GTP) across the Gn and Gp interface".

[20] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) Support on Mobile Radio Interface".

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 clause of the TS, and the applicability of the approach will be mentioned in the supersection that groups the measurements.
- Examples of measurements which are subject to the "*(n-1)* out of *n*" approach are provided in the Annex A.

Measurement family

The measurement names defined in this document are all beginning with a prefix containing the measurement family name (e.g. RAB.AttEstabCS.Conv, MM.AttGprsAttach). This family name identifies all measurements which relate to a given functionality and it may be used for measurement administration (see 3GPP TS 32.401 [12]).

The list of families currently used in this document is as follows:

- RAB (measurements related to Radio Access Bearer management)
- SIG (measurements related to Signalling)
- RRC (measurements related to Radio Resource Control)
- SHO (measurements related to Soft Handover)
- HHO (measurements related to Hard Handover)
- RELOC (measurements related to SRNS Relocation)
- IRATHO (measurements related to inter-Radio Access Technology Handover)
- MM (measurements related to Mobility Management)
- SUB (measurements related to Subscriber Management)
- SEC (measurements related to Security)
- SMS (measurements related to Short Message Service)
- SM (measurements related to Session Management)
- CAM (measurements related to CAMEL)
- ISYSC (measurements related to GSM/UMTS Intersystem changes)
- GTP (measurements related to GTP)

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 clause 3.3).

Assn	Assign(ment,ed)
Att	Attempt(s,ed)
Auth	Authentication

Bgrd	Background
Call	Call
Chg	Change
Conn	Connection
Combi	Combined
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
Nat	National
Netw	Network
NodeB	NodeB
Oct	Octet(s)
Out	Outgoing
Pkt	Packet(s)
Prep	Preparation
Proc	Procedure
PS	Packet switched
RAB	Radio Access Bearer
RAT	Radio Access Technology
ReEstab	Re-establish (ed,ment)
Rel	Released
Reloc	Relocation
Req	Request(s,ed)
RL	Radio Link
RNC	RNC
RRC	Radio Resource Control
Setup	Setup
SGSN	SGSN
SHO	Soft Handover
Sig	Signalling
Strm	Streaming
Sub	Subscriber
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 n 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 the present 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: 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 the present 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 32.622 [9], 32.632 [10], 32.642 [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;
- Combined: 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 the present document or GSM12.04/TS32.402, 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 Routing Area

The Object Class Routing Area (RA) is needed to conduct measurements on RA level. For the purpose of the present document the Routing Area 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".

3.5 Management of per cause measurements

Per cause measurements may lead in certain cases to a lot of measurement subtypes which will increase substantially the size of the measurement report file. Since all per cause measurements are not necessarily useful to the end-user, two options are possible for the management of the corresponding measurement subtypes:

- support all the subtypes corresponding to the cause codes as defined in the 3GPP standards. In that case, the sum of all supported per cause measurements is equal to the total sum across all subtypes.

- support only a subset of the subtypes (allowed only if the cause codes are specified in 3GPP standards). In that case, the first value of the result sequence must be the total sum across all the cause codes as defined in 3GPP standards. This implies that all subtypes of a given measurement type appear as uninterrupted sequence in the result file. The keyword *.sum* placed behind the measurement type is used to identify the sum subtype. The choice of the supported cause codes is manufacturer dependent.

4 Measurements related to the RNC

4.1 RAB assignment

The five measurement types defined in the clause 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 shall equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

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 plus a possible sum value identified by the *.sum* suffix.

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 shall equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

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 plus a possible sum value identified by the *.sum* suffix.

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 shall equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

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 plus a possible sum value identified by the *.sum* suffix.

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 shall equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the .*sum* suffix.

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 shall equal the total number of RAB Releases for the CS domain. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the .*sum* suffix.

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 shall equal the total number of RAB Releases for the PS domain. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 clause 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 shall equal the total number of RRC Connection Establishment attempts. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 shall equal the total number of RRC Connection Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form RRC.FailConnEstab.*Cause*
where *Cause* identifies the Rejection Cause.
The cause 'No Reply' is identified by the *.NoReply* suffix.

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 shall equal the total number of RRC Connection Establishments. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the .*sum* suffix.

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 clause 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.
Each RRC Connection Release message received is added to the relevant per cause measurement. The possible causes are included in TS 25.331.
Each expected UTRAN Mobility Information Confirm 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 shall equal the total number of RRC re-establishment failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the .*sum* suffix.

e) The measurement name has the form RRC.FailConnReEstab.*Cause*
where *Cause* identifies the Failure Cause.
The cause 'No Reply' is identified by the .*NoReply* suffix.

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 shall equal the total number of RRC Connection Release attempts on DCCH. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the .*sum* suffix.

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 shall equal the total number of RRC Connection Release attempts on CCCH. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 Radio link additions to active link set (UE side)

The three measurement types defined in the clause 4.7.1.n for the radio link additions to active link set (UE side) are subject to the "2 out of 3 approach".

4.7.1.1 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

4.7.1.2 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

4.7.1.3 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 shall equal the total number of failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the .*sum* suffix.

e) The measurement name has the form SHO.FailRLAddUESide.*Cause*
where *Cause* identifies the failure cause.
The cause 'No Reply' is identified by the .*NoReply* suffix.

f) UtranCell

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.7.2 Radio link deletions from active link set (UE side)

4.7.2.1 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

4.7.2.2 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 Radio link additions (UTRAN side)

The three measurement types defined in the clause 4.8.1.n for radio link additions (UTRAN side) are subject to the "2 out of 3 approach".

4.8.1.1 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

4.8.1.2 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

4.8.1.3 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 TS 25.443.

- 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 TS 25.423.

- The sum of all supported per cause measurements shall equal the total number of Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

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

4.8.2 Radio link deletions (UTRAN side)

4.8.2.1 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

4.8.2.2 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 Outgoing intra-cell hard handovers

The three measurement types defined in the clause 4.9.1.n for outgoing intra-cell hard handovers are subject to the "2 out of 3 approach".

4.9.1.1 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.1.2 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.1.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailOutIntraCell.*Cause*
where *Cause* identifies the failure cause.

f) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.2 Outgoing intra-NodeB hard handovers

The three measurement types defined in the clause 4.9.2.n for outgoing intra-NodeB hard handovers are subject to the "2 out of 3 approach".

4.9.2.1 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.2.2 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.2.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailOutIntraNodeB.*Cause*
where *Cause* identifies the failure cause.

f) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.3 Outgoing inter-NodeB, intra-RNC hard handovers

The three measurement types defined in the clause 4.9.3.n for outgoing inter-NodeB, intra-RNC hard handovers are subject to the "2 out of 3 approach".

4.9.3.1 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.3.2 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.3.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailOutInterNodeBIntraRNC.*Cause*
where *Cause* identifies the failure cause.

f) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.4 Outgoing inter-RNC hard handovers via Iur

The three measurement types defined in the clause 4.9.4.n for outgoing inter-RNC hard handovers are subject to the "2 out of 3 approach".

4.9.4.1 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.4.2 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.4.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailOutInterRNCIur.*Cause*
where *Cause* identifies the failure cause.

f) UtranRelation

g) Valid for circuit switched and packet switched traffic.

UMTS4.9.5Relocation preparation for outgoing inter-RNC hard handovers switching in the CN

The three measurement types defined in the clause 4.9.5.n for relocation preparation for outgoing inter-RNC hard handovers switching in the CN are subject to the "2 out of 3 approach".

4.9.5.1 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.5.2 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.5.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailRelocPrepOutInterRNCCN.*Cause*
where *Cause* identifies the name of the failure cause.

f) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.6 Outgoing inter-RNC hard handovers switching in the CN

The three measurement types defined in the clause 4.9.6.n for outgoing inter-RNC hard handovers switching in the CN are subject to the "2 out of 3 approach".

4.9.6.1 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.6.2 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) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.6.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailOutInterRNCCN.*Cause*
where *Cause* identifies the failure cause.

f) UtranRelation

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.10 Relocation

4.10.1 Relocations preparations

The three measurement types defined in the clause 4.10.1.n for relocations preparations are subject to the "2 out of 3 approach".

4.10.1.1 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

4.10.1.2 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

4.10.1.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

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

4.10.2 Relocations

4.10.2.1 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 Relocation preparation for outgoing circuit switched inter-RAT handovers

The three measurement types defined in the clause 4.11.1.n for relocation preparation for outgoing circuit switched inter-RAT handovers are subject to the "2 out of 3 approach".

4.11.1.1 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) IRATHO.AttRelocPrepOutCS

f) UtranRelation

g) Valid for circuit switched traffic.

h) UMTS

4.11.1.2 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) IRATHO.SuccRelocPrepOutCS

f) UtranRelation

g) Valid for circuit switched traffic.

h) UMTS

4.11.1.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the .*sum* suffix.

e) The measurement name has the form IRATHO.FailRelocPrepOutCS.*Cause*
where *Cause* identifies the failure cause.

f) UtranRelation

g) Valid for circuit switched traffic.

h) UMTS

4.11.2 Outgoing circuit switched inter-RAT handovers

The three measurement types defined in the clause 4.11.2.n for outgoing circuit switched inter-RAT handovers are subject to the "2 out of 3 approach".

4.11.2.1 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) IRATHO.AttOutCS

f) UtranRelation

g) Valid for circuit switched traffic.

h) UMTS

4.11.2.2 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)
IRATHO.SuccOutCS

f) UtranRelation

g) Valid for circuit switched traffic.

h) UMTS

4.11.2.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form IRATHO.FailOutCS.*Cause*
where *Cause* identifies the failure cause.

f) UtranRelation

g) Valid for circuit switched traffic.

h) UMTS

4.11.3 Incoming circuit switched inter-RAT handovers

The three measurement types defined in the clause 4.11.3.n for incoming circuit switched inter-RAT handovers are subject to the "2 out of 3 approach".

4.11.3.1 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) IRATHO.AttIncCS

f) UtranCell

g) Valid for circuit switched traffic.

h) UMTS

4.11.3.2 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) IRATHO.SuccIncCS

f) UtranCell

g) Valid for circuit switched traffic.

h) UMTS

4.11.3.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form IRATHO.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 Outgoing packet switched inter-RAT handovers, UTRAN controlled

The three measurement types defined in the clause 4.12.1.n for outgoing packet switched inter-RAT handovers, UTRAN controlled are subject to the "2 out of 3 approach".

4.12.1.1 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) IRATHO.AttOutPSUTRAN

f) UtranCell

g) Valid for packet switched traffic.

h) UMTS

4.12.1.2 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) IRATHO.SuccOutPSUTRAN

f) UtranCell

g) Valid for packet switched traffic.

h) UMTS

4.12.1.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the .*sum* suffix.

e) The measurement name has the form IRATHO.FailOutPSUTRAN.*Cause*
where *Cause* identifies the failure cause.

f) UtranCell

g) Valid for packet switched traffic.

h) UMTS

4.12.2 Outgoing packet switched inter-RAT handovers, UE controlled

4.12.2.1 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) IRATHO.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(TS 24.008; attach type = GPRS attach).

d) A single integer value per measurement type defined in E

e) MM.AttGprsAttach:

MM.AttGprsAttach	Combined (don't care)
MM.AttGprsAttach.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SuccGprsAttach:

MM.SuccGprsAttach	Combined (don't care)
MM.SuccGprsAttach.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AttIntraSgsnRaUpdate:

MM.AttIntraSgsnRaUpdate	Combined (don't care)
MM.AttIntraSgsnRaUpdate.G	GSM
MM.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 (TS 24.008).

d) A single integer value

e) MM.SuccIntraSgsnRaUpdate:

MM.SuccIntraSgsnRaUpdate	Combined (don't care)
MM.SuccIntraSgsnRaUpdate.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AttGprsDetachMs:

MM.AttGprsDetachMs	Combined (don't care)
MM.AttGprsDetachMs.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AttGprsDetachSgsn:

MM.AttGprsDetachSgsn	Combined (don't care)
MM.AttGprsDetachSgsn.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AttInterSgsnRaUpdate:

MM.AttInterSgsnRaUpdate	Combined (don't care)
MM.AttInterSgsnRaUpdate.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SuccInterSgsnRaUpdate:

MM.SuccInterSgsnRaUpdate	Combined (don't care)
MM.SuccInterSgsnRaUpdate.G	GSM
MM.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 (3GPP TS 24.008; attach type = GPRS attach while IMSI attached).

d) A single integer value per measurement type defined in E

e) MM.AttImsiAttach:

MM.AttImsiAttach	Combined (don't care)
MM.AttImsiAttach.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SuccImsiAttach

MM.SuccImsiAttach	Combined (don't care)
MM.SuccImsiAttach.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AttImsiDetachMs:

MM.AttImsiDetachMs	Combined (don't care)
MM.AttImsiDetachMs.G	GSM
MM.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 (TS 24.008; attach type = Combined GPRS/IMSI attach).

d) A single integer value per measurement type defined in E

e) MM.AttCombiAttach:

MM.AttCombiAttach	Combined (don't care)
MM.AttCombiAttach.G	GSM
MM.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 (3GPP TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SuccCombiAttach:

MM.SuccCombiAttach	Combined (don't care)
MM.SuccCombiAttach.G	GSM
MM.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 (3GPP TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AttCombiDetachMs:

MM.AttCombiDetachMs	Combined (don't care)
MM.AttCombiDetachMs.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SuccGprsDetachSgsn:

MM.SuccGprsDetachSgsn	Combined (don't care)
MM.SuccGprsDetachSgsn.G	GSM
MM.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 (3GPP TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.AttCombiIntraSgsnRaUpdate:

MM.AttCombiIntraSgsnRaUpdate	Combined (don't care)
MM.AttCombiIntraSgsnRaUpdate.G	GSM
MM.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. (TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.AttImsiCombiIntraSgsnRAUpdate:

MM.AttImsiCombiIntraSgsnRAUpdate	Combined (don't care)
MM.AttImsiCombiIntraSgsnRAUpdate.G	GSM
MM.AttImsiCombiIntraSgsnRAUpdate.U	UMTS

f) RA, specified by a concatenation of the LAC and the RAC

g) Valid for packet switching

h) GSM/UMTS

5.1.18 Successful 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 (3GPP TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.SuccCombiIntraSgsnRaUpdate:

MM.SuccCombiIntraSgsnRaUpdate	Combined (don't care)
MM.SuccCombiIntraSgsnRaUpdate.G	GSM
MM.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 (3GPP TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.AttCombiInterSgsnRaUpdate

MM.AttCombiInterSgsnRaUpdate	Combined (don't care)
MM.AttCombiInterSgsnRaUpdate.G	GSM
MM.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) MM.AttImsiCombiInterSgsnRAUpdate:

MM.AttImsiCombiInterSgsnRAUpdate	Combined (don't care)
MM.AttImsiCombiInterSgsnRAUpdate.G	GSM
MM.AttImsiCombiInterSgsnRAUpdate.U	UMTS

f) RA, specified by a concatenation of the LAC and the RAC

g) Valid for packet switching

h) GSM/UMTS

5.1.21 Successful 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 (TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.SuccCombiInterSgsnRaUpdate:

MM.SuccCombiInterSgsnRaUpdate	Combined (don't care)
MM.SuccCombiInterSgsnRaUpdate.G	GSM
MM.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 (TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.NbrPTMSIDetachFail:

MM.NbrPTMSIDetachFail	Combined (don't care)
MM.NbrPTMSIDetachFail.G	GSM
MM.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) MM.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 (3GPP TS 25.413) from the SGSN to the MS

d) A single integer value

e) MM.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 (3GPP TS 25.413) from the SGSN to the MS

d) A single integer value

e) MM.AttPsPagingProcGbIu

f) RA, specified by a concatenation of the LAC and the RAC

g) Valid for packet switching

h) Combined

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) MM.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 (3GPP TS 25.413). Each paging message will be counted separately, addressed to all RNC in this certain RA.

d) A single integer value

e) MM.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 successful 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 (3GPP TS 23.060) or during intersystem change UMTS -> GSM

d) A single integer value

e) MM.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 (3GPP TS 24.008)) or during intersystem change GSM -> UMTS

d) A single integer value

e) MM.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) MM.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) MM.NbrSubPmmConnected

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.1.32 Number of attached subscribers

a) This measurement provides the number of attached subscribers 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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.NbrActAttachedSub:

MM.NbrActAttachedSub	Combined (don't care)
MM.NbrActAttachedSub.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.NbrHomeSub:

MM.NbrHomeSub	Combined (don't care)
MM.NbrHomeSub.G	GSM
MM.NbrHomeSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.34 Number of visiting national subscribers

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) 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) MM.NbrVisitingNatSub:

MM.NbrVisitingNatSub	Combined (don't care)
MM.NbrVisitingNatSub.G	GSM
MM.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.NbrVisitingForeign

MM.NbrVisitingForeign	Combined (don't care)
MM.NbrVisitingForeign.G	GSM
MM.NbrVisitingForeign.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.36 Mean number of attached subscribers

a) This measurment provides the arithmetic mean number of the number of attached subscribers 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) MM.MeanNbrAttachedSub:

MM.MeanNbrAttachedSub	Combined (don't care)
MM.MeanNbrAttachedSub.G	GSM
MM.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) MM.MeanNbrHomeSub:

MM.MeanNbrHomeSub	Combined (don't care)
MM.MeanNbrHomeSub.G	GSM
MM.MeanNbrHomeSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.38 Mean Number of visiting national subscribers

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) MM.MeanNbrVisitingNatSub:

MM.MeanNbrVisitingNatSub	Combined (don't care)
MM.MeanNbrVisitingNatSub.G	GSM
MM.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) MM.MeanNbrVisitingForeign:

MM.MeanNbrVisitingForeign	Combined (don't care)
MM.MeanNbrVisitingForeign.G	GSM
MM.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) MM.NbrCamelSub:

MM.NbrCamelSub	Combined (don't care)
MM.NbrCamelSub.G	GSM
MM.NbrCamelSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.41 Mean Number of CAMEL subscribers

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) MM.MeanNbrCamelSub:

MM.MeanNbrCamelSub	Combined (don't care)
MM.MeanNbrCamelSub.G	GSM
MM.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 (TS 29.002) during a GPRS Update Location procedure.

d) A single integer value

e) MM.AttInsertSubscrDataHlrUpdLoc

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 29.002).

d) A single integer value

e) MM.AttUpdateGprsLocationHlr

f) SgsnFunction

g) Valid for packet switching

h) Combined

5.1.44 Successful 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 (TS 29.002).

d) A single integer value

e) MM.SuccUpdateGprsLocationHlr

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 29.002)

d) A single integer value

e) MM.AttCancelLocHlrOp

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 29.002) due to a SGSN-change (previous SGSN)

d) A single integer value

e) MM.AttCancelLocHlrSgsnChg

f) SgsnFunction

g) Valid for packet switching

h) Combined

5.1.47 Attempted Reset requests received from a HLR due to an HLR restart, indicating that a failure occurred.

a) This measurement provides the number of Reset requests received from a HLR due to an HLR restart, indicating that a failure occurred.

b) CC

c) Receipt of a 'MAP_RESET' service request (TS 29.002) from a HLR

d) A single integer value

e) MM.AttResetHlr

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SUB.AttInsertSubscrDataHlrOp:

SUB.AttInsertSubscrDataHlrOp	Combined (don't care)
SUB.AttInsertSubscrDataHlrOp.	GSM
SUB.AttInsertSubscrDataHlrOp.	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 (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SUB.AttDeleteSubscrDataHlrOp:

SUB.AttDeleteSubscrDataHlrOp	Combined (don't care)
SUB.AttDeleteSubscrDataHlrOp.	GSM
SUB.AttDeleteSubscrDataHlrOp.	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.3 SRNS 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 (TS 25.413) from SRNC

d) A single integer value

e) RELOC.AttSGSN

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 (TS 25.413) from TRNC

d) A single integer value

e) RELOC.SuccIntraSGSN

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.3 Failed intra 3G-SGSN SRNS Relocation, due to internal reasons

a) This measurement provides the number of failed 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) RELOC.FailIntraSGSNInt

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.4 Failed intra 3G-SGSN SRNS Relocation, due to external reasons

a) This measurement provides the number of failed 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" (TS 25.413) is sent to the SRNC- "Relocation Failure" (TS 25.413) is received from the TRNC- "Relocation Cancel" (TS 25.413) is received from the SRNC- missing expected message from RNC (timer expiry)- ...

d) A single integer value

e) RELOC.FailIntraSGSNExt

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 (TS 25.413) from SRNC, where the Target ID indicates Inter SGSN SRNS Relocation

d) A single integer value

e) RELOC.AttInterSGSN

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 (TS 29.060) from the new SGSN

d) A single integer value

e) RELOC.SuccInterSGSN

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.7 Failed inter 3G-SGSN SRNS Relocation, due to internal reasons

a) This measurement provides the number of failed 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) RELOC.FailInterSGSNInt

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.8 Failed 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" (TS 29.060) from the new 3G-SGSN is not "Request Accepted"- "Relocation Preparation Failure" (TS 25.413) is sent to the SRNC- "Relocation Failure" (TS 25.413) is received from the TRNC- "Relocation Cancel" (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) RELOC.FailInterSGSNExt

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 (TS 29.060) from the old SGSN

d) A single integer value

e) RELOC.AttInterSGSNNew

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 (TS 29.060) to the old SGSN

d) A single integer value

e) RELOC.SuccInterSGSNNew

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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.AttPTMSIRealloc:

SEC.AttPTMSIRealloc	Combined (don't care)
SEC.AttPTMSIRealloc.G	GSM
SEC.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.SuccPTMSIRealloc:

SEC.SuccPTMSIRealloc	Combined (don't care)
SEC.SuccPTMSIRealloc.G	GSM
SEC.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.AttIdentityReqImsi:

SEC.AttIdentityReqImsi	Combined (don't care)
SEC.AttIdentityReqImsi.G	GSM
SEC.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.SuccIdentityReqImsi:

SEC.SuccIdentityReqImsi	Combined (don't care)
SEC.SuccIdentityReqImsi.G	GSM
SEC.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SEC.AttIdentityReqToPsgsn:

SEC.AttIdentityReqToPsgsn	Combined (don't care)
SEC.AttIdentityReqToPsgsn.G	GSM
SEC.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SEC.SuccIdentityReqToPsgsn:

SEC.SuccIdentityReqToPsgsn	Combined (don't care)
SEC.SuccIdentityReqToPsgsn.G	GSM
SEC.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

c) Transmission of an "IDENTITY REQUEST" message (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.AttIdentityRequest:

SEC.AttIdentityRequest	Combined (don't care)
SEC.AttIdentityRequest.G	GSM
SEC.AttIdentityRequest.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) 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 (TS 24.008) from the MS.

d) A single integer value per measurement type defined in e)

e) SEC.SuccIdentityRequest:

SEC.SuccIdentityRequest	Combined (don't care)
SEC.SuccIdentityRequest.G	GSM
SEC.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.AttAuthProcsSgsnSim:

SEC.AttAuthProcsSgsnSim	Combined (don't care)
SEC.AttAuthProcsSgsnSim.G	GSM
SEC.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 (TS24.008)

d) A single integer value per measurement type defined in e)

e) SEC.SuccAuthProcsSgsnSim:

SEC.SuccAuthProcsSgsnSim	Combined (don't care)
SEC.SuccAuthProcsSgsnSim.G	GSM
SEC.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.AttAuthProcsSgsnUsim:

SEC.AttAuthProcsSgsnUsim	Combined (don't care)
SEC.AttAuthProcsSgsnUsim.G	GSM
SEC.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SEC.SuccAuthProcsSgsnUsim:

SEC.SuccAuthProcsSgsnUsim	Combined (don't care)
SEC.SuccAuthProcsSgsnUsim.G	GSM
SEC.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SEC.RecPOAuthFailSgsn:

SEC.RecPOAuthFailSgsn	Combined (don't care)
SEC.RecPOAuthFailSgsn.G	GSM
SEC.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 (TS 29.060).

d) A single integer value per measurement type defined in e)

e) SEC.AttIdentityReqFromPsgsn:

SEC.AttIdentityReqFromPsgsn	Combined (don't care)
SEC.AttIdentityReqFromPsgsn.G	GSM
SEC.AttIdentityReqFromPsgsn.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.4.15 Successfully replied identification information requests that were received from a partner (new) SGSN

a) This measurement provides the number of successfully 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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SEC.SuccIdentityReqFromPsgsn:

SEC.SuccIdentityReqFromPsgsn	Combined (don't care)
SEC.SuccIdentityReqFromPsgsn.G	GSM
SEC.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SEC.AttContextRequestToPsgsn:

SEC.AttContextRequestToPsgsn	Combined (don't care)
SEC.AttContextRequestToPsgsn.G	GSM
SEC.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SEC.SuccContextRequestToPsgsn:

SEC.SuccContextRequestToPsgsn	Combined (don't care)
SEC.SuccContextRequestToPsgsn.G	GSM
SEC.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SEC.AttContextRequestFromPsgsn:

SEC.AttContextRequestFromPsgsn	Combined (don't care)
SEC.AttContextRequestFromPsgsn.G	GSM
SEC.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SEC.SuccContextRequestFromPsgsn:

SEC.SuccContextRequestFromPsgsn	Combined (don't care)
SEC.SuccContextRequestFromPsgsn.G	GSM
SEC.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 (TS 23.060))

a) This measurement provides the number of P-TMSI - IMSI correlation failures (User Identity Confidentiality (TS 23.060))

b) CC

c) This counter is triggered before the handling of the "Security Functions" (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) SEC.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 (TS 25.413)

d) A single integer value

e) SEC.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 (TS 25.413)

d) A single integer value

e) SEC.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 (TS 25.413)

d) A single integer value

e) SEC.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 (TS 25.413)

d) A single integer value

e) SEC.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 (TS 29.002).

d) A single integer value

e) SEC.AttReqAuthSetsHlrV1

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 TS 29.002)

d) A single integer value

e) SEC.SuccReqAuthSetsHlrV1

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 29.002).

d) A single integer value

e) SEC.NbrEmptyRespAuthSetsHlrV1

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 29.002).

d) A single integer value

e) SEC.AttReqAuthSetsHlrV3

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 TS 29.002).

d) A single integer value

e) SEC.SuccReqAuthSetsHlrV3

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 29.002).

d) A single integer value

e) SEC.NbrEmptyRespAuthSetsHlrV3

f) SgsnFunction

g) Valid for packet switching

h) Combined

5.5 SMS

The three measurement groups defined in clause 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 (TS 24.011) from the MS.

d) A single integer value per measurement type defined in e)

e) SMS.AttMoCS:

SMS.AttMoCS	Combined (don't care)
SMS.AttMoCS.G	GSM
SMS.AttMoCS.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 (TS 24.011) to the MS

d) A single integer value per measurement type defined in e)

e) SMS.SuccMoCS:

SMS.SuccMoCS	Combined (don't care)
SMS.SuccMoCS.G	GSM
SMS.SuccMoCS.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 (TS 24.011)

d) A single integer value per measurement type defined in e)

e) SMS.AttMtCS:

SMS.AttMtCS	Combined (don't care)
SMS.AttMtCS.G	GSM
SMS.AttMtCS.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 (TS 24.011)

d) A single integer value per measurement type defined in e)

e) SMS.SuccMtCS:

SMS.SuccMtCS	Combined (don't care)
SMS.SuccMtCS.G	GSM
SMS.SuccMtCS.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 (TS 29.002)

d) A single integer value per measurement type defined in e)

e) SMS.AttMsPresentCS:

SMS.AttMsPresentCS	Combined (don't care)
SMS.AttMsPresentCS.G	GSM
SMS.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 (TS 29.002)

d) A single integer value per measurement type defined in e)

e) SMS.AttMemoryAvailableCS:

SMS.AttMemoryAvailableCS	Combined (don't care)
SMS.AttMemoryAvailableCS.G	GSM
SMS.AttMemoryAvailableCS.U	UMTS

f) MscFunction

g) Valid for circuit switching

h) GSM/UMTS

5.5.1.7 Successful CS ms-Present

a) This attribute counts the number of successful 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" (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SMS.SuccMsPresentCS:

SMS.SuccMsPresentCS	Combined (don't care)
SMS.SuccMsPresentCS.G	GSM
SMS.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" (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SMS.SuccMemoryAvailableCS:

SMS.SuccMemoryAvailableCS	Combined (don't care)
SMS.SuccMemoryAvailableCS.G	GSM
SMS.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 (TS 24.011) from the MS.

d) A single integer value per measurement type defined in e)

e) SMS.AttMoPS:

SMS.AttMoPS	Combined (don't care)
SMS.AttMoPS.G	GSM
SMS.AttMoPS.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 (TS 24.011) to the MS

d) A single integer value per measurement type defined in e)

e) SMS.SuccMoPS:

SMS.SuccMoPS	Combined (don't care)
SMS.SuccMoPS.G	GSM
SMS.SuccMoPS.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 (TS 24.011)

d) A single integer value per measurement type defined in e)

e) SMS.AttMtPS

SMS.AttMtPS	Combined (don't care)
SMS.AttMtPS.G	GSM
SMS.AttMtPS.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 (TS 24.011)

d) A single integer value per measurement type defined in e)

e) SMS.SuccMtPS:

SMS.SuccMtPS	Combined (don't care)
SMS.SuccMtPS.G	GSM
SMS.SuccMtPS.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 (TS 29.002)

d) A single integer value per measurement type defined in e)

e) SMS.AttMsPresentPS:

SMS.AttMsPresentPS	Combined (don't care)
SMS.AttMsPresentPS.G	GSM
SMS.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 (TS 29.002)

d) A single integer value per measurement type defined in e)

e) SMS.AttMemoryAvailablePS:

SMS.AttMemoryAvailablePS	Combined (don't care)
SMS.AttMemoryAvailablePS.G	GSM
SMS.AttMemoryAvailablePS.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.5.2.7 Successful PS ms-Present

a) This attribute counts the number of successful 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" (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SMS.SuccMsPresentPS:

SMS.SuccMsPresentPS	Combined (don't care)
SMS.SuccMsPresentPS.G	GSM
SMS.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" (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SMS.SuccMemoryAvailablePS:

SMS.SuccMemoryAvailablePS	Combined (don't care)
SMS.SuccMemoryAvailablePS.G	GSM
SMS.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 (TS 24.011) from the MS.

d) A single integer value per measurement type defined in e)

e) SMS.AttMo:

SMS.AttMo	Combined (don't care)
SMS.AttMo.G	GSM
SMS.AttMo.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 (TS 24.011) to the MS

d) A single integer value per measurement type defined in e)

e) SMS.SuccMo:

SMS.SuccMo	Combined (don't care)
SMS.SuccMo.G	GSM
SMS.SuccMo.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 (TS 24.011)

d) A single integer value per measurement type defined in e)

e) SMS.AttMt:

SMS.AttMt	Combined (don't care)
SMS.AttMt.G	GSM
SMS.AttMt.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 (TS 24.011)

d) A single integer value per measurement type defined in e)

e) SMS.SuccMt:

SMS.SuccMt	Combined (don't care)
SMS.SuccMt.G	GSM
SMS.SuccMt.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 (TS 29.002)

d) A single integer value per measurement type defined in e)

e) SMS.AttMsPresent:

SMS.AttMsPresent	Combined (don't care)
SMS.AttMsPresent.G	GSM
SMS.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 (TS 29.002)

d) A single integer value per measurement type defined in e)

e) SMS.AttMemoryAvailable:

SMS.AttMemoryAvailable	Combined (don't care)
SMS.AttMemoryAvailable.G	GSM
SMS.AttMemoryAvailable.U	UMTS

f) MscFunction or SgsnFunction

g) Valid for packet switching and circuit switching

h) GSM/UMTS

5.5.3.7 Successful ms-Present

a) This attribute counts the number of successful 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" (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SMS.SuccMsPresent:

SMS.SuccMsPresent	Combined (don't care)
SMS.SuccMsPresent.G	GSM
SMS.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" (TS 29.002).

d) A single integer value per measurement type defined in e)

e) SMS.SuccMemoryAvailable:

SMS.SuccMemoryAvailable	Combined (don't care)
SMS.SuccMemoryAvailable.G	GSM
SMS.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 (TS 24.008).

d) A single integer value

e) SM.AttActPdpContext:

SM.AttActPdpContext	Combined (don't care)
SM.AttActPdpContext.G	GSM
SM.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SM.AttActPdpContextDyn:

SM.AttActPdpContextDyn	Combined (don't care)
SM.AttActPdpContextDyn.G	GSM
SM.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SM.SuccActPdpContext:

SM.SuccActPdpContext	Combined (don't care)
SM.SuccActPdpContext.G	GSM
SM.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 (TS 24.008), the PDP address has been dynamically assigned.

d) A single integer value per measurement type defined in e)

e) SM.SuccActPdpContextDyn:

SM.SuccActPdpContextDyn	Combined (don't care)
SM.SuccActPdpContextDyn.G	GSM
SM.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) SM.MeanActPDPContext:

SM.MeanActPDPContext	Combined (don't care)
SM.MeanActPDPContext.G	GSM
SM.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SM.AttDeactPdpContextMs:

SM.AttDeactPdpContextMs	Combined (don't care)
SM.AttDeactPdpContextMs.G	GSM
SM.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SM.SuccDeactPdpContextMs:

SM.SuccDeactPdpContextMs	Combined (don't care)
SM.SuccDeactPdpContextMs.G	GSM
SM.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) SM.NbrActPdpContext:

SM.NbrActPdpContext	Combined (don't care)
SM.NbrActPdpContext.G	GSM
SM.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 in SGSN location register for a particular subscriber

d) A single integer value per measurement type defined in e)

e) SM.NbrActivePdpPerSgsn:

SM.NbrActivePdpPerSgsn	Combined (don't care)
SM.NbrActivePdpPerSgsn.G	GSM
SM.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) SM.MeanActivePdpPerSgsn:

SM.MeanActivePdpPerSgsn	Combined (don't care)
SM.MeanActivePdpPerSgsn.G	GSM
SM.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 (TS 29.060).

d) A single integer value per measurement type defined in e)

e) SM.AttDeactPdpContextGgsn:

SM.AttDeactPdpContextGgsn	Combined (don't care)
SM.AttDeactPdpContextGgsn.G	GSM
SM.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 (TS 29.060).

d) A single integer value per measurement type defined in e)

e) SM.SuccDeactPdpContextGgsn:

SM.SsuccDeactPdpContextGgsn	Combined (don't care)
SM.SsuccDeactPdpContextGgsn.G	GSM
SM.SsuccDeactPdpContextGgsn.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SM.AttDeactPdpContextSgsn:

SM.AttDeactPdpContextSgsn	Combined (don't care)
SM.AttDeactPdpContextSgsn.G	GSM
SM.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SM.SuccDeactPdpContextSgsn:

SM.SuccDeactPdpContextSgsn	Combined (don't care)
SM.SuccDeactPdpContextSgsn.G	GSM
SM.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SM.AttUpdPdpContextSgsn:

SM.AttUpdPdpContextSgsn	Combined (don't care)
SM.AttUpdPdpContextSgsn.G	GSM
SM.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SM.SsuccUpdPdpContextSgsn:

SM.SsuccUpdPdpContextSgsn	Combined (don't care)
SM.SsuccUpdPdpContextSgsn.G	GSM
SM.SsuccUpdPdpContextSgsn.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SM.AttUpdPdpContextGgsn:

SM.AttUpdPdpContextGgsn	Combined (don't care)
SM.AttUpdPdpContextGgsn.G	GSM
SM.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 (TS 29.060)

d) A single integer value per measurement type defined in e)

e) SM.SuccUpdPdpContextGgsn:

SM.SuccUpdPdpContextGgsn	Combined (don't care)
SM.SuccUpdPdpContextGgsn.G	GSM
SM.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SM.AttModPdpContextSgsn:

SM.AttModPdpContextSgsn	Combined (don't care)
SM.AttModPdpContextSgsn.G	GSM
SM.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SM.SuccModPdpContextSgsn:

SM.SuccModPdpContextSgsn	Combined (don't care)
SM.SuccModPdpContextSgsn.G	GSM
SM.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SM.AttModPdpContextMs

SM.AttModPdpContextMs	Combined (don't care)
SM.AttModPdpContextMs.G	GSM
SM.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 (TS 24.008)

d) A single integer value per measurement type defined in e)

e) SM.SsuccModPdpContextMs:

SM.SsuccModPdpContextMs	Combined (don't care)
SM.SsuccModPdpContextMs.G	GSM
SM.SsuccModPdpContextMs.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SM.AttActSecondPdpContext:

SM.AttActSecondPdpContext	Combined (don't care)
SM.AttActSecondPdpContext.G	GSM
SM.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 (TS 24.008).

d) A single integer value per measurement type defined in e)

e) SM.SuccActSecondPdpContext:

SM.SuccActSecondPdpContext	Combined (don't care)
SM.SuccActSecondPdpContext.G	GSM
SM.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) CAM.AttCamelDialogues:

CAM.AttCamelDialogues	Combined (don't care)
CAM.AttCamelDialogues.G	GSM
CAM.AttCamelDialogues.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.7.2 Failed CAMEL dialogues, aborted locally by gprsSSF

a) Number of failed 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 is aborted locally by SSF.

d) A single integer value per measurement type defined in e)

e) CAM.FailDialoguesSsf:

CAM.FailDialoguesSsf	Combined (don't care)

CAM.FailDialoguesSsf.G	GSM
CAM.FailDialoguesSsf.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.7.3 Failed CAMEL dialogues, error or reject from gsmSCF

a) Number of failed 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) CAM.FailDialoguesScf:

CAM.FailDialoguesScf	Combined (don't care)
CAM.FailDialoguesScf.G	GSM
CAM.FailDialoguesScf.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. (TS 24.008)

d) A single integer value

e) ISYSC.AttIntraSgsnUmtsGsmRau

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (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) ISYSC.SuccIntraSgsnUmtsGsmRau

f) SgsnFunction

g) Valid for packet switching

h) Combined

5.8.3 Failed intra SGSN inter system changes UMTS to GSM RAU, due to internal reasons

a) Number of failed 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) ISYSC.FailIntraSgsnUmtsGsmRauInt

f) SgsnFunction

g) Valid for packet switching

h) Combined

5.8.4 Failed intra SGSN inter system changes UMTS to GSM RAU, due to external reasons

a) Number of failed 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) ISYSC.FailIntraSgsnUmtsGsmRauExt

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (TS 24.008).

d) A single integer value

e) ISYSC.AttIntraSgsnGsmUmtsRau

f) SgsnFunction

g) Valid for packet switching

h) Combined

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 (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) ISYSC.SuccIntraSgsnGsmUmtsRau

f) SgsnFunction

g) Valid for packet switching

h) Combined

5.8.7 Failed intra SGSN inter system changes GSM to UMTS RAU, due to internal reasons

a) Number of failed 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) ISYSC.FailIntraSgsnGsmUmtsRauInt

f) SgsnFunction

g) Valid for packet switching

h) Combined

5.8.8 Failed intra SGSN inter system changes GSM to UMTS RAU, due to external reasons

a) Number of failed 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) ISYSC.FailIntraSgsnGsmUmtsRauExt

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.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) GTP.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) GTP.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) GTP.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) GTP.OutDataPktGn the total regardless of the GTP version used
GTP.OutDataPktGn.v0 only the GTPv0 part
GTP.OutDataPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.InDataPktGn the total regardless of the GTP version used
GTP.InDataPktGn.v0 only the GTPv0 part
GTP.InDataPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.OutDataOctGn the total regardless of the GTP version used
GTP.OutDataOctGn.v0 only the GTPv0 part
GTP.OutDataOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.InDataOctGn the total regardless of the GTP version used
GTP.InDataOctGn.v0 only the GTPv0 part
GTP.InDataOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.OutSigPktGn the total regardless of the GTP version used
GTP.OutSigPktGn.v0 only the GTPv0 part
GTP.OutSigPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.InSigPktGn the total regardless of the GTP version used
GTP.InSigPktGn.v0 only the GTPv0 part
GTP.InSigPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.OutSigOctGn the total regardless of the GTP version used
GTP.OutSigOctGn.v0 only the GTPv0 part
GTP.OutSigOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

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) GTP.InSigOctGn the total regardless of the GTP version used
GTP.InSigOctGn.v0 only the GTPv0 part
GTP.InSigOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) Combined

Annex A (informative): Examples for “(n-1) out of n” approach

The measurements result values generated by a NE are often redundant, or the info contained in the measurement results can be obtained in a number of different ways.

The “(n-1) out of n” approach allows a vendor to implement a subset of 3GPP defined measurements, for example if there exists a relation (A+B=C) then any 2 out of 3 defined measurements A, B, C are sufficient information to calculate the third (n=3). In case there exists a relation (A+B+C=D), then any 3 out of the 4 would suffice, and the same kind of approach would be applicable.

A.1 Attempt/success/failure procedure measurements

Consider the number of attempts to start a specific procedure (e.g. RRC connection establishment). Some of these attempts will fail, some will be successful. Three different counters can be defined to measure these procedures: an attempt counter, a success counter, and a failure counter, but in fact only 2 may be provided, since we have the fixed relation (#success + #failure) = #attempt.

It is to be noted that all combinations do not provide the same level of details. For example, in the case only #attempt and #success are provided, it will not be possible to retrieve the detailed failure causes.

The three measurement types defined in section 4.4 RRC connection establishment are subject to the "(n-1) out of n” approach with n=3:

- Attempted RRC connection establishments
- Failed RRC connection establishments
- Successful RRC connection establishments

The “(n-1) out of n” approach is also applicable for more complex measurements split according to a specific criterion, e.g. Queuing. For example, the CS measurements described in section 4.1 RAB assignment are subject to a 4 out of 5 approach:

- attempted RAB establishments for CS domain
- successful RAB establishments without queuing for CS domain
- failed RAB establishments without queuing for CS domain
- successful RAB establishments with queuing for CS domain
- failed RAB establishments with queuing for CS domain

Any of the five measurements can be calculated from the four others but all combinations will not provide the same level of details (e.g. failure causes).

A.2 GSM/UMTS combined measurements

With relation to the field H of the measurement template, a measurement indicated with GSM/UMTS is an example of the “(n-1) out of n” approach with n=3 since (GSM + UMTS) = Combined.

In that case, all concerned measurements are included in the same template but the vendor may provide only 2 sub-measurements out of 3.

The measurement described in section 5.6.1 Attempted PDP context activation procedures initiated by MS is subject to the the "(n-1) out of n” approach with n=3:

- SM.AttActPdpContext (attempted context activation procedures with no distinction between GSM and UMTS)

- SM.AttActPdpContext.G (attempted context activation procedures for GSM only)
- SM.AttActPdpContext.U (attempted context activation procedures for UMTS only)

A.3 Embedded “(n-1) out of n” approaches

It is also possible to combine the approaches described above. For example, the measurements described in section 5.5 SMS are subject to the “(n-1) out of n” approach at two levels.

Firstly, measurements are split according to the CS/PS domain, for example:

- Attempted CS SMS mobile originating
- Attempted PS SMS mobile originating
- Attempted SMS mobile originating

where any of the three measurements can be calculated from the two others.

Secondly, each measurement provides 3 sub-measurements, for example for Attempted CS SMS mobile originating:

- SMS.AttMoCS
- SMS.AttMoCS.G
- SMS.AttMoCS.U

where any of the three sub-measurements can be calculated from the two others.

Annex B (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 Approval.	1.0.2	4.0.0
Sep 2001	S_13	SP-010468	001	--	Corrections on UMTS and combined UMTS/GSM measurements: Addition of family name for CN measurements, addition of the list of families, addition of Annex A: "(n-1) out of n" examples, application of the "(n-1) out of n" approach to all relevant measurements, enhancement of per cause measurements	4.0.0	4.1.0

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Contents

Foreword

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

The present document is part of the 32.400-series covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication Management; Performance Management (PM), as identified below:

TS 32.401: "Concept and Requirements"**;**

TS 32.402: "Performance Measurements - GSM";

TS 32.403: "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 32.401 [12] 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 the present 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 the present document ~~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: "Telecommunication Management; Configuration Management; 3G configuration management; Concept and main 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 32.62~~0~~ 2: "Telecommunication Management; Configuration Management; Part 2: Generic network resources IRP: NRM".

[10] 3GPP TS 32.6321 2: "Telecommunication Management; Configuration Management; Core Network Resources IRP: NRM".

[11] 3GPP TS 32.6422-2: "Telecommunication Management; Configuration Management; Part 2: UTRAN network resources IRP: NRM".

[12] 3GPP TS 32.401: "Telecommunication Management; Performance Management (PM); Concept and Requirements".

[13] GSM 12.04: "Digital cellular telecommunication system (Phase 2) (GSM); Performance Management and Measurements for a GSM Public Land Mobile Network (PLMN)".

[14] 3GPP TS 32.402: "Telecommunication Management; Performance Management (PM); Performance Measurements - GSM".

[15] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".

[16] GSM 08.18: "Digital cellular telecommunication system (Phase 2) (GSM); General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol".

[17] 3GPP TS 23.060: "General Packet Radio Service (GPRS) Service description; Stage 2".

[18] 3GPP TS 29.002: "Mobile Application Part (MAP)".

[19] 3GPP TS 29.060: "GPRS Tunnelling protocol (GTP) across the Gn and Gp interface".

[20] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) Support on Mobile Radio Interface".

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 clause of the TS, and the applicability of the approach will be mentioned in the supersection that groups the measurements.
- Examples of measurements which are subject to the "*(n-1)* out of *n*" approach are provided in the Annex A.

Measurement family

The measurement names defined in this document are all beginning with a prefix containing the measurement family name (e.g. RAB.AttEstabCS.Conv, MM.AttGprsAttach). This family name identifies all measurements which relate to a given functionality and it may be used for measurement administration (see 3GPP TS 32.401 [12]).

The list of families currently used in this document is as follows:

- RAB (measurements related to Radio Access Bearer management)
- SIG (measurements related to Signalling)
- RRC (measurements related to Radio Resource Control)
- SHO (measurements related to Soft Handover)
- HHO (measurements related to Hard Handover)
- RELOC (measurements related to SRNS Relocation)
- IRATHO (measurements related to inter-Radio Access Technology Handover)
- MM (measurements related to Mobility Management)
- SUB (measurements related to Subscriber Management)
- SEC (measurements related to Security)
- SMS (measurements related to Short Message Service)
- SM (measurements related to Session Management)
- CAM (measurements related to CAMEL)
- ISYSC (measurements related to GSM/UMTS Intersystem changes)
- GTP (measurements related to GTP)

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 clause 3.3).

Assn	Assign(ment,ed)
Att	Attempt(s,ed)

Auth	Authentication
Bgrd	Background
Call	Call
Chg	Change
Conn	Connection
Combi	Combined
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
Nat	National
Netw	Network
NodeB	NodeB
Oct	Octet(s)
Out	Outgoing
Pkt	Packet(s)
Prep	Preparation
Proc	Procedure
PS	Packet switched
RAB	Radio Access Bearer
RAT	Radio Access Technologyie
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
Sub	Subscriber
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 n 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 the present 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: 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 the present 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 32.62~~0-~~2 [9], 32.62~~31-~~2 [10], 32.642~~2-2~~ [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~~Combined: 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 the present document or GSM12.04/TS32.402, 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 the present 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.~~

~~EXAMPLE 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".~~

~~EXAMPLE 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".~~

3.4.12 Routing Area

The Object Class Routing Area (RA) is needed to conduct measurements on RA level. For the purpose of the present document the Routing Area~~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".

3.5 Management of per cause measurements

Per cause measurements may lead in certain cases to a lot of measurement subtypes which will increase substantially the size of the measurement report file. Since all per cause measurements are not necessarily useful to the end-user, two options are possible for the management of the corresponding measurement subtypes:

- support all the subtypes corresponding to the cause codes as defined in the 3GPP standards. In that case, the sum of all supported per cause measurements is equal to the total sum across all subtypes.

- support only a subset of the subtypes (allowed only if the cause codes are specified in 3GPP standards). In that case, the first value of the result sequence must be the total sum across all the cause codes as defined in 3GPP standards. This implies that all subtypes of a given measurement type appear as uninterrupted sequence in the result file. The keyword *.sum* placed behind the measurement type is used to identify the sum subtype. The choice of the supported cause codes is manufacturer dependent.

4 Measurements related to the RNC

4.1 RAB assignment

The five measurement types defined in the clause 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~~ shall equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

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 plus a possible sum value identified by the *.sum* suffix.

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~~ shall equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

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 plus a possible sum value identified by the *.sum* suffix.

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 shall ~~should~~ equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

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 plus a possible sum value identified by the *.sum* suffix.

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 shall ~~should~~ equal the total number of RAB Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 shall ~~should~~ equal the total number of RAB Releases for the CS domain. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 shall ~~should~~ equal the total number of RAB Releases for the PS domain. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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~~ig~~.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~~ig~~.AttConnEstabPS

f) RncFunction

g) Valid for packet switching.

h) UMTS

4.4 RRC connection establishment

The three measurement types defined in the clause 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 shall ~~should~~ equal the total number of RRC Connection Establishment attempts. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 shall equal the total number of RRC Connection Establishment Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~d)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).~~

~~e)The sum of all supported per cause measurements should equal the total number of RRC Connection Establishment Failures.~~

~~f)~~d)Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

~~g)~~e)The measurement name has the form RRC.FailConnEstab.*Cause*
where *Cause* identifies the Rejection Cause.
The cause 'No Reply' is identified by the *.NoReply* suffix.

~~h)~~f)UtranCell

~~i)~~g)Valid for circuit switched and packet switched traffic.

~~j)~~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 shall ~~should~~ equal the total number of RRC Connection Establishments. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 clause 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.
Each RRC Connection Release message received is added to the relevant per cause measurement. The possible causes are included in TS 25.331.
Each expected UTRAN Mobility Information Confirm 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 shall equal the total number of RRC re-establishment failures.
In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.~~A single integer value.~~

e) The measurement name has the form RRC.FailConnReEstab.*Cause*
where *Cause* identifies the Failure Cause.
The cause 'No Reply' is identified by the *.NoReply* suffix.

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 shall ~~should~~ equal the total number of RRC Connection Release attempts on DCCH. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 shall ~~should~~ equal the total number of RRC Connection Release attempts on CCCH. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes plus a possible sum value identified by the *.sum* suffix.

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 Radio link additions to active link set (UE side)

The three measurement types defined in the clause 4.7.1.n for the radio link additions to active link set (UE side) are subject to the "2 out of 3 approach".

4.7.1.1 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

4.7.1.2 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

4.7.1.3 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 shall equal the total number of failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~d)The sum of all supported per cause measurements should equal the total number of failures.~~

~~e)~~d)Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

~~f)~~e)The measurement name has the form SHO.FailRLAddUESide.*Cause*
where *Cause* identifies the failure cause.
The cause 'No Reply' is identified by the *.NoReply* suffix.

~~g)~~f)UtranCell

~~h)~~g)Valid for circuit switched and packet switched traffic.

~~i)~~h)UMTS

4.7.2 Radio link deletions from active link set (UE side)

4.7.2.1~~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

4.7.2.2~~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 Radio link additions (UTRAN side)

The three measurement types defined in the clause 4.8.1.n for radio link additions (UTRAN side) are subject to the "2 out of 3 approach".

4.8.1.1 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

4.8.1.2 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

4.8.1.3 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 TS 25.443.

- 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 TS 25.423.

- The sum of all supported per cause measurements shall ~~should~~ equal the total number of Failures. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

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

4.8.2 Radio link deletions (UTRAN side)

4.8.2.14 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

4.8.2.2~~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 Outgoing intra-cell hard handovers

The three measurement types defined in the clause 4.9.1.n for outgoing intra-cell hard handovers are subject to the "2 out of 3 approach".

4.9.1.1 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 -~~UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.21.2 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 UtranRelationCell).

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.1.33 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 shall should equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailOutIntraCell.*Cause*
where *Cause* identifies the failure cause.

f) Neighbour Cell (UtranCell UtranRelationCell).

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.2 Outgoing intra-NodeB hard handovers

The three measurement types defined in the clause 4.9.2.n for outgoing intra-NodeB hard handovers are subject to the "2 out of 3 approach".

4.9.2.14 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 UtranRelationCell).

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.2.25 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 UtranRelationCell).

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.2.36 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d)The sum of all supported per cause measurements should equal the total number of failed events.

e)d)Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

f)e)The measurement name has the form HHO.FailOutIntraNodeB.*Cause*
where *Cause* identifies the failure cause.

g)f)Neighbour Cell (UtranCell UtranRelationCell).

h)g)Valid for circuit switched and packet switched traffic.

i)h)UMTS

4.9.3 Outgoing inter-NodeB, intra-RNC hard handovers

The three measurement types defined in the clause 4.9.3.n for outgoing inter-NodeB, intra-RNC hard handovers are subject to the "2 out of 3 approach".

4.9.3.1~~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~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.3.2~~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~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.3.3~~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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~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 plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailOutInterNodeBIntraRNC.*Cause*
where *Cause* identifies the failure cause.

f) ~~Neighbour Cell (UtranCell~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.4 Outgoing inter-RNC hard handovers via Iur

The three measurement types defined in the clause 4.9.4.n for outgoing inter-RNC hard handovers are subject to the "2 out of 3 approach".

4.9.4.1~~0~~ 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~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.4.2~~1~~ 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~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.4.3~~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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~d)The sum of all supported per cause measurements should equal the total number of failed events.~~

~~e)~~d) Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

~~f)~~e) The measurement name has the form HHO.FailOutInterRNCIur.*Cause*
where *Cause* identifies the failure cause.

~~g)~~f) ~~Neighbour Cell (UtranCell -~~UtranRelation~~Cell).~~

~~h)~~g) Valid for circuit switched and packet switched traffic.

~~i)~~UMTS

4.9.5 Relocation preparation for outgoing inter-RNC hard handovers switching in the CN

The three measurement types defined in the clause 4.9.5.n for relocation preparation for outgoing inter-RNC hard handovers switching in the CN are subject to the "2 out of 3 approach".

4.9.5.1~~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 -~~UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.5.2~~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~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.~~1~~5.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~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 plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form HHO.FailRelocPrepOutInterRNCCN.*Cause*
where *Cause* identifies the name of the failure cause.

f) ~~Neighbour Cell (UtranCell~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.6 Outgoing inter-RNC hard handovers switching in the CN

The three measurement types defined in the clause 4.9.6.n for outgoing inter-RNC hard handovers switching in the CN are subject to the "2 out of 3 approach".

4.9.~~1~~6.1 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~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.6.2~~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~~ UtranRelation~~Cell).~~

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.9.6.3~~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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~d)The sum of all supported per cause measurements should equal the total number of failed events.~~

~~e)~~d)Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

~~f)~~e)The measurement name has the form HHO.FailOutInterRNCCN.*Cause*
where *Cause* identifies the failure cause.

~~g)~~f)~~Neighbour Cell (UtranCell~~ UtranRelation~~Cell).~~

~~h)~~g)Valid for circuit switched and packet switched traffic.

~~i)~~h)UMTS

4.10 Relocation

4.10.1 Relocations preparations

The three measurement types defined in the clause 4.10.1.n for relocations preparations are subject to the "2 out of 3 approach".

4.10.1.1 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~~eIoc~~.AttPrep

f) RncFunction

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.10.1.2 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~~eIoc~~.SuccPrep

f) RncFunction

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.10.1.~~3~~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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~d)The sum of all supported per cause measurements should equal the total number of failed events.~~

~~e)~~d)Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

~~f)~~e)The measurement name has the form RELOC~~eIoc~~.FailPrep.*Cause*
where *Cause* identifies the failure cause.

~~g)~~f)RncFunction

~~h)~~g)Valid for circuit switched and packet switched traffic.

~~i)~~h)UMTS

4.10.2 Relocations

4.10.2.14 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~~eloc~~.Succ

f) RncFunction

g) Valid for circuit switched and packet switched traffic.

h) UMTS

4.11 Circuit switched inter-RAT handover

4.11.1 Relocation preparation for outgoing circuit switched inter-RAT handovers

The three measurement types defined in the clause 4.11.1.n for relocation preparation for outgoing circuit switched inter-RAT handovers are subject to the "2 out of 3 approach".

4.11.1.1 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~~IRATHO.AttRelocPrepOutCS

f) ~~Neighbour Cell (UtranCell~~ UtranRelation~~Cell).~~

g) Valid for circuit switched traffic.

h) UMTS

4.11.1.2 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~~IRATHO.SuccRelocPrepOutCS

f) ~~Neighbour Cell (UtranCell~~ UtranRelation~~Cell).~~

g) Valid for circuit switched traffic.

h) UMTS

4.11.1.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~d)The sum of all supported per cause measurements should equal the total number of failed events.~~

~~e)~~d)Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

~~f)~~e)The measurement name has the form ~~RATHO~~IRATHO.FailRelocPrepOutCS.*Cause*
where *Cause* identifies the failure cause.

~~g)~~f)~~Neighbour Cell (UtranCell~~ UtranRelation~~Cell).~~

~~h)~~g)Valid for circuit switched traffic.

~~i)~~h)UMTS

4.11.2 Outgoing circuit switched inter-RAT handovers

The three measurement types defined in the clause 4.11.2.n for outgoing circuit switched inter-RAT handovers are subject to the "2 out of 3 approach".

4.11.2.14 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~~IRATHO.AttOutCS

f) ~~Neighbour Cell (UtranCell~~ UtranRelation~~Cell).~~

g) Valid for circuit switched traffic.

h) UMTS

4.11.2.25 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
IRATHORATHO.SuccOutCS

f) Neighbour Cell (UtranCell UtranRelationCell)..

g) Valid for circuit switched traffic.

h) UMTS

4.11.2.36 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

d)The sum of all supported per cause measurements should equal the total number of failed events.

e)d)Each measurement is an integer value. The number of measurements is equal to the number of causes supported plus a possible sum value identified by the *.sum* suffix.

f)e)The measurement name has the form IRATHO.FailOutCS.*Cause*
where *Cause* identifies the failure cause.

g)f)Neighbour Cell (UtranCell UtranRelationCell).

h)g)Valid for circuit switched traffic.

i)h)UMTS

4.11.3 Incoming circuit switched inter-RAT handovers

The three measurement types defined in the clause 4.11.3.n for incoming circuit switched inter-RAT handovers are subject to the "2 out of 3 approach".

4.11.3.17 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) IRATHO.AttIncCS

f) UtranCell

g) Valid for circuit switched traffic.

h) UMTS

4.11.3.2~~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) IRATHO.SuccIncCS

f) UtranCell

g) Valid for circuit switched traffic.

h) UMTS

4.11.3.3~~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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~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 plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form IRATHO.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 Packet switched inter-RAT handover~~

4.12.1 Outgoing packet switched inter-RAT handovers, UTRAN controlled

The three measurement types defined in the clause 4.12.1.n for outgoing packet switched inter-RAT handovers, UTRAN controlled are subject to the "2 out of 3 approach".

4.12.1.1 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) IRATHO.AttOutPSUTRAN

f) UtranCell

g) Valid for packet switched traffic.

h) UMTS

4.12.1.2 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) IRATHO.SuccOutPSUTRAN

f) UtranCell

g) Valid for packet switched traffic.

h) UMTS

4.12.1.3 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 shall equal the total number of failed events. In case only a subset of per cause measurements is supported, a sum measurement subtype will be provided first.

~~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 plus a possible sum value identified by the *.sum* suffix.

e) The measurement name has the form IRATHO.FailOutPSUTRAN.*Cause*
where *Cause* identifies the failure cause.

f) UtranCell

g) Valid for packet switched traffic.

h) UMTS

4.12.2 Outgoing packet switched inter-RAT handovers, UE controlled

4.12.24.1 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) IRATHO.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(TS 24.008; attach type = GPRS attach).

d) A single integer value per measurement type defined in E

e) MM.AattGprsAttach:

MM.AattGprsAttach	~~COMB~~ Combined (don't care)
MM.AattGprsAttach.G	GSM
MM.AattGprsAttach.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SsuccGprsAttach:

MM.SsuccGprsAttach	~~COMB~~ Combined (don't care)
MM.SsuccGprsAttach.G	GSM
MM.SsuccGprsAttach.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 uUpdate 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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AattIntraSgsnRaUpdate:

MM.AattIntraSgsnRaUpdate	~~COMB~~ Combined (don't care)
MM.AattIntraSgsnRaUpdate.G	GSM
MM.AattIntraSgsnRaUpdate.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 uUpdate 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 (TS 24.008).

d) A single integer value

e) MM.SsuccIntraSgsnRaUpdate:

MM.SsuccIntraSgsnRaUpdate	~~COMB~~ Combined (don't care)
MM.SsuccIntraSgsnRaUpdate.G	GSM
MM.SsuccIntraSgsnRaUpdate.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AattGprsDetachMs:

MM.AattGprsDetachMs	~~COMB~~ Combined (don't care)
MM.AattGprsDetachMs.G	GSM
MM.AattGprsDetachMs.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AattGprsDetachSgsn:

MM.AattGprsDetachSgsn	~~COMB~~ Combined (don't care)
MM.AattGprsDetachSgsn.G	GSM
MM.AattGprsDetachSgsn.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 uUpdate 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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AattInterSgsnRaUpdate:

MM.AattInterSgsnRaUpdate	~~COMB~~ Combined (don't care)
MM.AattInterSgsnRaUpdate.G	GSM
MM.AattInterSgsnRaUpdate.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 u~~U~~pdate 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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.S~~s~~uccInterSgsnRaUpdate:

MM.SsuccInterSgsnRaUpdate	~~COMB~~ Combined (don't care)
MM.SsuccInterSgsnRaUpdate.G	GSM
MM.SsuccInterSgsnRaUpdate.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 (3GPP TS 24.008; attach type = GPRS attach while IMSI attached).

d) A single integer value per measurement type defined in E

e) MM.AattImsiAttach:

MM.AattImsiAttach	~~COMB~~ Combined (don't care)
MM.AattImsiAttach.G	GSM
MM.AattImsiAttach.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SsuccImsiAttach

MM.SsuccImsiAttach	~~COMB~~ Combined (don't care)
MM.SsuccImsiAttach.G	GSM
MM.SsuccImsiAttach.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AattImsiDetachMs:

MM.AattImsiDetachMs	~~COMB~~ Combined (don't care)
MM.AattImsiDetachMs.G	GSM
MM.AattImsiDetachMs.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 (TS 24.008; attach type = Combined GPRS/IMSI attach).

d) A single integer value per measurement type defined in E

e) MM.AattCombiAttach:

MM.AattCombiAttach	~~COMB~~ Combined (don't care)
MM.AattCombiAttach.G	GSM
MM.AattCombiAttach.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 (3GPP TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.SsuccCombiAttach:

MM.SsuccCombiAttach	~~COMB~~Combined (don't care)
MM.SsuccCombiAttach.G	GSM
MM.SsuccCombiAttach.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 (3GPP TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.AattCombiDetachMs:

MM.AattCombiDetachMs	~~COMB~~ Combined (don't care)
MM.AattCombiDetachMs.G	GSM
MM.AattCombiDetachMs.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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.S~~s~~uccGprsDetachSgsn:

MM.S~~s~~uccGprsDetachSgsn	~~COMB~~ Combined (don't care)
MM.S~~s~~uccGprsDetachSgsn.G	GSM
MM.S~~s~~uccGprsDetachSgsn.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 u~~U~~pdate 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 (3GPP TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.A~~a~~ttCombiIntraSgsnRaUpdate:

MM.A~~a~~ttCombiIntraSgsnRaUpdate	~~COMB~~ Combined (don't care)
MM.A~~a~~ttCombiIntraSgsnRaUpdate.G	GSM
MM.A~~a~~ttCombiIntraSgsnRaUpdate.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 u~~U~~pdate 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. (TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.AattImsiCombiIntraSgsnRAUpdate:

MM.AattImsiCombiIntraSgsnRAUpdate	~~COMB~~ Combined (don't care)
MM.AattImsiCombiIntraSgsnRAUpdate.G	GSM
MM.AattImsiCombiIntraSgsnRAUpdate.U	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~~Successful combined RA/LA intra-SGSN Routing Area u~~U~~pdate 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 (3GPP TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.S~~s~~uccCombiIntraSgsnRaUpdate:

MM.S~~s~~uccCombiIntraSgsnRaUpdate	~~COMB~~ Combined (don't care)
MM.S~~s~~uccCombiIntraSgsnRaUpdate.G	GSM
MM.S~~s~~uccCombiIntraSgsnRaUpdate.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 u~~U~~pdate 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 (3GPP TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.AattCombiInterSgsnRaUpdate

MM.AattCombiInterSgsnRaUpdate	~~COMB~~ Combined (don't care)
MM.AattCombiInterSgsnRaUpdate.G	GSM
MM.AattCombiInterSgsnRaUpdate.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 uUpdate 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) MM.AattImsiCombiInterSgsnRAUpdate:

MM.AattImsiCombiInterSgsnRAUpdate	COMB Combined (don't care)
MM.AattImsiCombiInterSgsnRAUpdate.G	GSM
MM.AattImsiCombiInterSgsnRAUpdate.U	UMTS

f) RA, specified by a concatenation of the LAC and the RAC

g) Valid for packet switching

h) GSM/UMTS

5.1.21 Successful combined RA/LA inter-SGSN Routing Area uUpdate 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 (TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.SsuccCombiInterSgsnRaUpdate:

MM.SsuccCombiInterSgsnRaUpdate	COMB Combined (don't care)
MM.SsuccCombiInterSgsnRaUpdate.G	GSM
MM.SsuccCombiInterSgsnRaUpdate.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 (TS 24.008)

d) A single integer value per measurement type defined in E

e) MM.N~~n~~brPTMSIDetachFail:

MM.N~~n~~brPTMSIDetachFail	~~COMB~~ Combined (don't care)
MM.N~~n~~brPTMSIDetachFail.G	GSM
MM.N~~n~~brPTMSIDetachFail.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) I~~i~~ncremented 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) MM.A~~a~~ttPsPagingProcGb

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) ~~i~~Incremented when a UMTS paging procedure is started i.e. at the transmission of the first "Paging" message (3GPP TS 25.413) from the SGSN to the MS

d) A single integer value

e) MM.A~~a~~ttPsPagingProcIu

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) Iincremented 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 (3GPP TS 25.413) from the SGSN to the MS

d) A single integer value

e) MM.AattPsPagingProcGbIu

f) RA, specified by a concatenation of the LAC and the RAC

g) Valid for packet switching

h) COMBCombined

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) MM.NnbrPsPagingMesGb

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 (3GPP TS 25.413). Each paging message will be counted separately, addressed to all RNC in this certain RA.

d) A single integer value

e) MM.NnbrPsPagingMesIu

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 successful 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 (3GPP TS 23.060) or during intersystem change UMTS -> GSM

d) A single integer value

e) MM.SsuccPsPagingProcGb

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 (3GPP TS 24.008)) or during intersystem change GSM -> UMTS

d) A single integer value

e) MM.SsuccPsPagingProcIu

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) Iincremented at PS Signalling Connection Release (Iu Release), decremented at PS Detach or PS Signalling Connection Establish (Service Request)

d) A single integer value

e) MM.NnbrSubPmmIdle

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) Ddecremented 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) MM.NnbrSubPmmConnected

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.1.32 Number of attached subscribers

a) This measurement provides the number of attached subscribers 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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.N~~n~~brActAttachedSub:

MM.N~~n~~brActAttachedSub	~~COMB~~ Combined (don't care)
MM.N~~n~~brActAttachedSub.G	GSM
MM.N~~n~~brActAttachedSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.33 Number of ~~Home~~home s~~S~~ubscribers

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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.N~~n~~brHomeSub:

MM.N~~n~~brHomeSub	~~COMB~~ Combined (don't care)
MM.N~~n~~brHomeSub.G	GSM
MM.N~~n~~brHomeSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.34 Number of v~~V~~isiting n~~N~~ational s~~S~~ubscribers

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) MM.NnbrVisitingNatSub:

MM.NnbrVisitingNatSub	COMB Combined (don't care)
MM.NnbrVisitingNatSub.G	GSM
MM.NnbrVisitingNatSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.35 Number of vVisiting fForeign sSubscribers

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 (TS 24.008).

d) A single integer value per measurement type defined in E

e) MM.NnbrVisitingForeign

MM.NnbrVisitingForeign	COMB Combined (don't care)
MM.NnbrVisitingForeign.G	GSM
MM.NnbrVisitingForeign.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.36 Mean number of attached subscribers

a) This measurment provides the arithmetic mean number of the number of attached subscribers within this SGSN area.
The three measurement types defined in e)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

e) MM.MmeanNbrAttachedSub:

MM.MmeanNbrAttachedSub	COMB Combined (don't care)
MM.MmeanNbrAttachedSub.G	GSM

MM.M~~m~~eanNbrAttachedSub.U UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.37 Mean Number of hH~~H~~ome sS~~S~~ubscribers

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)~~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~~

e) MM.M~~m~~eanNbrHomeSub:

MM.M~~m~~eanNbrHomeSub	~~COMB~~ Combined (don't care)
MM.M~~m~~eanNbrHomeSub.G	GSM
MM.M~~m~~eanNbrHomeSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.38 Mean Number of vV~~V~~isiting nN~~N~~ational sS~~S~~ubscribers

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)~~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~~

e) MM.M~~m~~eanNbrVisitingNatSub:

MM.M~~m~~eanNbrVisitingNatSub	~~COMB~~ Combined (don't care)
MM.M~~m~~eanNbrVisitingNatSub.	GSM
MM.M~~m~~eanNbrVisitingNatSub.	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.39 Mean Number of vVisiting fForeign SSubscribers

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)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

e) MM.MmeanNbrVisitingForeign:

MM.MmeanNbrVisitingForeign	COMB Combined (don't care)
MM.MmeanNbrVisitingForeign.	GSM
MM.MmeanNbrVisitingForeign.	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)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

e) MM.NnbrCamelSub:

MM.NnbrCamelSub	COMB Combined (don't care)
MM.NnbrCamelSub.G	GSM
MM.NnbrCamelSub.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.1.41 Mean Number of CAMEL subscribers

a) This measurement provides the arithmetic mean number value of attached subscribers with CAMEL service
The three measurement types defined in e)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

e) MM.MmeanNbrCamelSub:

MM.Mmean NbrCamelSub	COMB Combined (don't care)
MM.Mmean NbrCamelSub.G	GSM
MM.Mmean NbrCamelSub.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 (TS 29.002) during a GPRS Update Location procedure.

d) A single integer value

e) MM.Aattt InsertSubscrDataHlrUpdLoc

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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 (TS 29.002).

d) A single integer value

e) MM.Aattt UpdateGprsLocationHlr

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

5.1.44 Successful 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 (TS 29.002).

d) A single integer value

e) MM.Ssucc UpdateGprsLocationHlr

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 (TS 29.002)

d) A single integer value

e) MM.A~~a~~ttCancelLocHlrOp

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 (TS 29.002) due to a SGSN-change (previous SGSN)

d) A single integer value

e) MM.A~~a~~ttCancelLocHlrSgsnChg

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

5.1.47 Attempted Reset requests received from a HLR due to an HLR restart, indicating that a failure occurred.

a) This measurement provides the number of Reset requests received from a HLR due to an HLR restart, indicating that a failure occurred.

b) CC

c) Receipt of a 'MAP_RESET' service request (TS 29.002) from a HLR

d) A single integer value

e) MM.A~~a~~ttResetHlr

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of a "MAP-INSERT-SUBSCRIBER-DATA" service request (TS 29.002).

d) A single integer value per measurement type defined in e)~~E~~

e) SUB.~~a~~AttInsertSubscrDataHlrOp:

SUB.A~~a~~ttInsertSubscrDataHlrOp	~~COMB~~ Combined (don't care)
SUB.A~~a~~ttInsertSubscrDataHlrOp.	GSM
SUB.A~~a~~ttInsertSubscrDataHlrOp.	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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of a "MAP_DELETE_SUBSCRIBER_DATA" service request (TS 29.002).

d) A single integer value per measurement type defined in e)~~E~~

e) SUB.~~a~~AttDeleteSubscrDataHlrOp:

SUB.A~~a~~ttDeleteSubscrDataHlrOp	~~COMB~~ Combined (don't care)
SUB.A~~a~~ttDeleteSubscrDataHlrOp	GSM
SUB.A~~a~~ttDeleteSubscrDataHlrOp	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.3 SRNS~~C~~ 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 (TS 25.413) from SRNC

d) A single integer value

e) RELOC.A~~a~~ttSGSN~~SRNSReloc~~

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 (TS 25.413) from TRNC

d) A single integer value

e) RELOC.S~~s~~uccIntraSGSN~~SRNSReloc~~

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.3 Failed~~Unsuccessful~~ intra 3G-SGSN SRNS Relocation, due to internal reasons

a) This measurement provides the number of failed~~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) RELOC.Fail~~unsucc~~IntraSGSN~~SRNSReloc~~Int

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.4 Failed~~Unsuccessful~~ intra 3G-SGSN SRNS Relocation, due to external reasons

a) This measurement provides the number of ~~unsuccessful~~ failed 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" (TS 25.413) is sent to the SRNC- "Relocation Failure" (TS 25.413) is received from the TRNC- "Relocation Cancel" (TS 25.413) is received from the SRNC- missing expected message from RNC (timer expiry)- ...

d) A single integer value

e) RELOC.Fail~~unsucc~~IntraSGSN~~SRNSReloc~~Ext

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 (TS 25.413) from SRNC, where the Target ID indicates Inter SGSN SRNS Relocation

d) A single integer value

e) RELOC.A~~a~~ttInterSGSN~~SRNSReloc~~

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.6 Successful i~~i~~nter 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 (TS 29.060) from the new SGSN

d) A single integer value

e) RELOC.S~~s~~uccInterSGSN~~SRNSReloc~~

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.7 ~~Unsuccessful~~ Failed i~~i~~nter 3G-SGSN SRNS Relocation, due to internal reasons

a) This measurement provides the number of failed~~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) RELOC.Fail~~unsucc~~InterSGSN~~SRNSReloc~~Int

f) SgsnFunction

g) Valid for packet switching

h) UMTS

5.3.8 Unsuccessful Failed iInter 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" (TS 29.060) from the new 3G-SGSN is not "Request Accepted"- "Relocation Preparation Failure" (TS 25.413) is sent to the SRNC- "Relocation Failure" (TS 25.413) is received from the TRNC- "Relocation Cancel" (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) RELOC.FailunsuccInterSGSNSRNSRelocExt

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 (TS 29.060) from the old SGSN

d) A single integer value

e) RELOC.AattInterSGSNSRNSRelocNew

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 (TS 29.060) to the old SGSN

d) A single integer value

e) RELOC.SsuccInterSGSNSRNSRelocNew

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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission of "P-TMSI REALLOCATION COMMAND" message by the SGSN (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.A~~a~~ttPTMSIRealloc:

SEC.A~~a~~ttPTMSIRealloc	~~COMB~~ Combined (don't care)
SEC.A~~a~~ttPTMSIRealloc.G	GSM
SEC.A~~a~~ttPTMSIRealloc.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of "P-TMSI REALLOCATION COMPLETE" message by the SGSN (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.S~~s~~uccPTMSIRealloc:

SEC.S~~s~~uccPTMSIRealloc	~~COMB~~ Combined (don't care)
SEC.S~~s~~uccPTMSIRealloc.G	GSM
SEC.S~~s~~uccPTMSIRealloc.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)~~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 (TS 24.008)

d) A single integer value per measurement type defined in e)E

e) SEC.AattIdentityReqImsi:

SEC.AattIdentityReqImsi	COMB Combined (don't care)
SEC.AattIdentityReqImsi.G	GSM
SEC.AattIdentityReqImsi.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)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 (TS 24.008)

d) A single integer value per measurement type defined in e)E

e) SEC.SsuccIdentityReqImsi:

SEC.SsuccIdentityReqImsi	COMB Combined (don't care)
SEC.SsuccIdentityReqImsi.G	GSM
SEC.SsuccIdentityReqImsi.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)E are subject to the "2 out of 3 approach".

b) CC

c) Ttransmision of the "Identification Request" message to the old SGSN (TS 29.060)

d) A single integer value per measurement type defined in e)E

e) SEC.AattIdentityReqToPsgsn:

SEC.AattIdentityReqToPsgsn	COMB Combined (don't care)
SEC.AattIdentityReqToPsgsn.G	GSM
SEC.AattIdentityReqToPsgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) R~~r~~eceipt of the "Identification Response" message from the old SGSN (TS 29.060)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.S~~s~~uccIdentityReqToPsgsn:

SEC.S~~s~~uccIdentityReqToPsgsn	~~COMB~~ Combined (don't care)
SEC.S~~s~~uccIdentityReqToPsgsn.G	GSM
SEC.S~~s~~uccIdentityReqToPsgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) ~~C.~~ Transmission of an "IDENTITY REQUEST" message (TS 24.008)

d) A single integer value per measurement type defined in ~~E~~e)

e) SEC.A~~a~~ttIdentityRequest:

SEC.A~~a~~ttIdentityRequest	~~COMB~~ Combined (don't care)
SEC.A~~a~~ttIdentityRequest.G	GSM
SEC.A~~a~~ttIdentityRequest.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) 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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of an "IDENTITY RESPONSE" message (TS 24.008) from the MS.

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.SsuccIdentityRequest:

SEC.SsuccIdentityRequest	~~COMB~~ Combined (don't care)
SEC.SsuccIdentityRequest.G	GSM
SEC.SsuccIdentityRequest.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)~~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 (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.A~~a~~ttAuthProcsSgsnSim:

SEC.A~~a~~ttAuthProcsSgsnSim	~~COMB~~ Combined (don't care)
SEC.A~~a~~ttAuthProcsSgsnSim.G	GSM
SEC.A~~a~~ttAuthProcsSgsnSim.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)~~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 (TS24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.SsuccAuthProcsSgsnSim:

SEC.SsuccAuthProcsSgsnSim	~~COMB~~ Combined (don't care)
SEC.SsuccAuthProcsSgsnSim.G	GSM
SEC.SsuccAuthProcsSgsnSim.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 ~~a~~authentication procedures that are started within this SGSN area for a subscriber using a USIM
The three measurement types defined in e)~~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 (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.A~~a~~ttAuthProcsSgsnUsim:

SEC.A~~a~~ttAuthProcsSgsnUsim	~~COMB~~ Combined (don't care)
SEC.A~~a~~ttAuthProcsSgsnUsim.G	GSM
SEC.A~~a~~ttAuthProcsSgsnUsim.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)~~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 (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.S~~s~~uccAuthProcsSgsnUsim:

SEC.S~~s~~uccAuthProcsSgsnUsim	~~COMB~~ Combined (don't care)
SEC.S~~s~~uccAuthProcsSgsnUsim.G	GSM
SEC.S~~s~~uccAuthProcsSgsnUsim.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)E are subject to the "2 out of 3 approach".

b) CC

c) Receipt of an "AUTHENTICATION AND CIPHERING FAILURE" message from the MS (TS 24.008).

d) A single integer value per measurement type defined in e)E

e) SEC.RrecPOAuthFailSgsn:

SEC.RrecPOAuthFailSgsn	COMB Combined (don't care)
SEC.RrecPOAuthFailSgsn.G	GSM
SEC.RrecPOAuthFailSgsn.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)E are subject to the "2 out of 3 approach".

b) CC

c) Receipt of the "Identification Request" message from a partner (new) SGSN (TS 29.060).

d) A single integer value per measurement type defined in e)E

e) SEC.AattIdentityReqFromPsgsn:

SEC.AattIdentityReqFromPsgsn	COMB Combined (don't care)
SEC.AattIdentityReqFromPsgsn.G	GSM
SEC.AattIdentityReqFromPsgsn.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.4.15 Successfully replied identification information requests that were received from a partner (new) SGSN

a) This measurement provides the number of successfully replied identification information requests that were received from a partner (new) SGSN
The three measurement types defined in e)E are subject to the "2 out of 3 approach".

b) CC

c) Transmission of the "Identification Response" message to the new SGSN (TS 29.060)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.SsuccIdentityReqFromPsgsn:

SEC.SsuccIdentityReqFromPsgsn	~~COMB~~ Combined (don't care)
SEC.SsuccIdentityReqFromPsgsn.G	GSM
SEC.SsuccIdentityReqFromPsgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission of the "Context Request" message to the previous SGSN (TS 29.060)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.AattContextRequestToPsgsn:

SEC.AattContextRequestToPsgsn	~~COMB~~ Combined (don't care)
SEC.AattContextRequestToPsgsn.G	GSM
SEC.AattContextRequestToPsgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of the "Context Response" message from the previous SGSN (TS 29.060)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.SsuccContextRequestToPsgsn:

SEC.SsuccContextRequestToPsgsn	~~COMB~~ Combined (don't care)
SEC.SsuccContextRequestToPsgsn.G	GSM
SEC.SsuccContextRequestToPsgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of the "Context Request" message from the new SGSN (TS 29.060)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.Aa~~t~~tContextRequestFromPsgsn:

SEC.Aa~~t~~tContextRequestFromPsgsn	~~COMB~~ Combined (don't care)
SEC.Aa~~t~~tContextRequestFromPsgsn.G	GSM
SEC.Aa~~t~~tContextRequestFromPsgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission of the "Context Response" message to the new SGSN (TS 29.060)

d) A single integer value per measurement type defined in e)~~E~~

e) SEC.S~~s~~uccContextRequestFromPsgsn:

SEC.S~~s~~uccContextRequestFromPsgsn	~~COMB~~ Combined (don't care)
SEC.S~~s~~uccContextRequestFromPsgsn.G	GSM
SEC.S~~s~~uccContextRequestFromPsgsn.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 (TS 23.060))

a) This measurement provides the number of P-TMSI - IMSI correlation failures (User Identity Confidentiality (TS 23.060))

b) CC

c) This counter is triggered before the handling of the "Security Functions" (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) SEC.N~~n~~brPTMSICorrFailRnc

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 (TS 25.413)

d) A single integer value

e) SEC.A~~a~~ttSecMode

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 (TS 25.413)

d) A single integer value

e) SEC.S~~s~~uccSecMode

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 (TS 25.413)

d) A single integer value

e) SEC.A~~a~~ttCiphering

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 (TS 25.413)

d) A single integer value

e) SEC.S~~s~~uccCiphering

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 (TS 29.002).

d) A single integer value

e) SEC.A~~a~~ttReqAuthSetsHlrV1

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 TS 29.002)

d) A single integer value

e) SEC.S~~s~~uccReqAuthSetsHlrV1

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 (TS 29.002).

d) A single integer value

e) SEC.N~~n~~brEmptyRespAuthSetsHlrV1

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 (TS 29.002).

d) A single integer value

e) SEC.A~~a~~ttReqAuthSetsHlrV3

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 TS 29.002).

d) A single integer value

e) SEC.S~~s~~uccReqAuthSetsHlrV3

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 (TS 29.002).

d) A single integer value

e) SEC.Nnbr EmptyRespAuthSetsHlrV3

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

5.5 SMS

The three measurement groups defined in clause 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)E are subject to the "2 out of 3 approach".

b) CC

c) Receipt by the MSC of "RP-DATA" Message (TS 24.011) from the MS.

d) A single integer value per measurement type defined in e)E

e) SMS.AattSmsMoCS:

SMS.AattSmsMoCS	COMB Combined (don't care)
SMS.AattSmsMoCS.G	GSM
SMS.AattSmsMoCS.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)E are subject to the "2 out of 3 approach".

b) CC

c) Transmission by the MSC of "RP-ACK" Message (TS 24.011) to the MS

d) A single integer value per measurement type defined in e)E

e) SMS.S~~s~~ucc~~Sms~~MoCS:

SMS.S~~s~~ucc~~Sms~~MoCS	~~COMB~~ Combined (don't care)
SMS.S~~s~~ucc~~Sms~~MoCS.G	GSM
SMS.S~~s~~ucc~~Sms~~MoCS.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)~~F~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission by the MSC of "RP-DATA" Message (TS 24.011)

d) A single integer value per measurement type defined in e)~~F~~

e) SMS.A~~a~~tt~~Sms~~MtCS:

SMS.A~~a~~tt~~Sms~~MtCS	~~COMB~~ Combined (don't care)
SMS.A~~a~~tt~~Sms~~MtCS.G	GSM
SMS.A~~a~~tt~~Sms~~MtCS.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)~~F~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt by the MSC of "RP-ACK" Message (TS 24.011)

d) A single integer value per measurement type defined in e)~~F~~

e) SMS.S~~s~~ucc~~Sms~~MtCS:

SMS.S~~s~~ucc~~Sms~~MtCS	~~COMB~~ Combined (don't care)
SMS.S~~s~~ucc~~Sms~~MtCS.G	GSM
SMS.S~~s~~ucc~~Sms~~MtCS.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)~~F~~ 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 (TS 29.002)

d) A single integer value per measurement type defined in e)~~F~~

e) SMS.AattMsPresentCS:

SMS.AattMsPresentCS	~~COMB~~ Combined (don't care)
SMS.AattMsPresentCS.G	GSM
SMS.AattMsPresentCS.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)~~F~~ 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 (TS 29.002)

d) A single integer value per measurement type defined in e)~~F~~

e) SMS.AattMemoryAvailableCS:

SMS.AattMemoryAvailableCS	~~COMB~~ Combined (don't care)
SMS.AattMemoryAvailableCS.G	GSM
SMS.AattMemoryAvailableCS.U	UMTS

f) MscFunction

g) Valid for circuit switching

h) GSM/UMTS

5.5.1.7 Successful CS ms-Present

a) This attribute counts the number of successful times that a MS (attached to a MSC) send that it is ready to receive SM.
The three measurement types defined in e)~~F~~ 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" (TS 29.002).

d) A single integer value per measurement type defined in e)~~F~~

e) SMS.SuccMsPresentCS:

SMS.SuccMsPresentCS	~~COMB~~ Combined (don't care)
SMS.SuccMsPresentCS.G	GSM
SMS.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)~~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" (TS 29.002).

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.SuccMemoryAvailableCS:

SMS.SuccMemoryAvailableCS	~~COMB~~ Combined (don't care)
SMS.SuccMemoryAvailableCS.G	GSM
SMS.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt by the SGSN of "RP-DATA" Message (TS 24.011) from the MS.

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.Aatt~~Sms~~MoPS:

SMS.Aatt~~Sms~~MoPS	~~COMB~~ Combined (don't care)
SMS.Aatt~~Sms~~MoPS.G	GSM
SMS.Aatt~~Sms~~MoPS.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission by the SGSN of "RP-ACK" Message (TS 24.011) to the MS

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.S~~s~~ucc~~Sms~~MoPS:

SMS.S~~s~~ucc~~Sms~~MoPS	~~COMB~~ Combined (don't care)
SMS.S~~s~~ucc~~Sms~~MoPS.G	GSM
SMS.S~~s~~ucc~~Sms~~MoPS.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission by the SGSN of "RP-DATA" Message (TS 24.011)

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.A~~a~~tt~~Sms~~MtPS

SMS.A~~a~~tt~~Sms~~MtPS	~~COMB~~ Combined (don't care)
SMS.A~~a~~tt~~Sms~~MtPS.G	GSM
SMS.A~~a~~tt~~Sms~~MtPS.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt by the SGSN of "RP-ACK" Message (TS 24.011)

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.S~~s~~ucc~~Sms~~MtPS:

SMS.S~~s~~ucc~~Sms~~MtPS	~~COMB~~ Combined (don't care)
SMS.S~~s~~ucc~~Sms~~MtPS.G	GSM
SMS.S~~s~~ucc~~Sms~~MtPS.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)~~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 (TS 29.002)

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.A~~a~~ttMsPresentPS:

SMS.A~~a~~ttMsPresentPS	~~COMB~~ Combined (don't care)
SMS.A~~a~~ttMsPresentPS.G	GSM
SMS.A~~a~~ttMsPresentPS.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~~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 (TS 29.002)

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.A~~a~~ttMemoryAvailablePS:

SMS.A~~a~~ttMemoryAvailablePS	~~COMB~~ Combined (don't care)
SMS.A~~a~~ttMemoryAvailablePS.G	GSM
SMS.A~~a~~ttMemoryAvailablePS.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.5.2.7 Successful PS ms-Present

a) This attribute counts the number of successful times that a MS (attached to a SGSN) send that it is ready to receive SM.
The three measurement types defined in e)~~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" (TS 29.002).

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.SuccMsPresentPS:

SMS.SuccMsPresentPS	COMB Combined (don't care)
SMS.SuccMsPresentPS.G	GSM
SMS.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)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" (TS 29.002).

d) A single integer value per measurement type defined in e)E

e) SMS.SuccMemoryAvailablePS:

SMS.SSuccMemoryAvailablePS	COMB Combined (don't care)
SMS.SSuccMemoryAvailablePS.	GSM
SMS.SSuccMemoryAvailablePS.	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)E are subject to the "2 out of 3 approach".

b) CC

c) Receipt by the MSC/SGSN of "RP-DATA" Message (TS 24.011) from the MS.

d) A single integer value per measurement type defined in e)E

e) SMS.AattSmsMo:

SMS.AattSmsMo	COMB Combined (don't care)
SMS.AattSmsMo.G	GSM
SMS.AattSmsMo.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission by the MSC/SGSN of "RP-ACK" Message (TS 24.011) to the MS

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.S~~s~~ucc~~Sms~~Mo:

SMS.S~~s~~ucc~~Sms~~Mo	~~COMB~~ Combined (don't care)
SMS.S~~s~~ucc~~Sms~~Mo.G	GSM
SMS.S~~s~~ucc~~Sms~~Mo.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission by the MSC/SGSN of "RP-DATA" Message (TS 24.011)

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.A~~a~~tt~~Sms~~Mt:

SMS.A~~a~~tt~~Sms~~Mt	~~COMB~~ Combined (don't care)
SMS.A~~a~~tt~~Sms~~Mt.G	GSM
SMS.A~~a~~tt~~Sms~~Mt.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt by the MSC/SGSN of "RP-ACK" Message (TS 24.011)

d) A single integer value per measurement type defined in e)

d)A single integer value per measurement type defined in E

e) SMS.SsuccSmsMt:

SMS.SsuccSmsMt	COMB Combined (don't care)
SMS.SsuccSmsMt.G	GSM
SMS.SsuccSmsMt.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)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 (TS 29.002)

d) A single integer value per measurement type defined in e)E

e) SMS.AattMsPresent:

SMS.AattMsPresent	COMB Combined (don't care)
SMS.AattMsPresent.G	GSM
SMS.AattMsPresent.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)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 (TS 29.002)

d) A single integer value per measurement type defined in e)E

e) SMS.AattMemoryAvailable:

SMS.AattMemoryAvailable	COMB Combined (don't care)
SMS.AattMemoryAvailable.G	GSM
SMS.AattMemoryAvailable.U	UMTS

f) MscFunction or SgsnFunction

g) Valid for packet switching and circuit switching

h) GSM/UMTS

5.5.3.7 Successful ms-Present

a) This attribute counts the number of successful times that a MS (attached to a MSC/SGSN) send that it is ready to receive SM.
The three measurement types defined in e)~~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" (TS 29.002).

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.SuccMsPresent:

SMS.SuccMsPresent	~~COMB~~ Combined (don't care)
SMS.SuccMsPresent.G	GSM
SMS.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)~~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" (TS 29.002).

d) A single integer value per measurement type defined in e)~~E~~

e) SMS.SuccMemoryAvailable:

SMS.SuccMemoryAvailable	~~COMB~~ Combined (don't care)
SMS.SuccMemoryAvailable.G	GSM
SMS.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of a "Activate PDP Context Request" message from the MS (TS 24.008).

d) A single integer value

e) SM.AattActPdpContext:

SM.AattActPdpContext	~~COMB~~ Combined (don't care)
SM.AattActPdpContext.G	GSM
SM.AattActPdpContext.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)~~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 (TS 24.008).

d) A single integer value per measurement type defined in e)~~E~~

e) SM.AattActPdpContextDyn:

SM.AattActPdpContextDyn	~~COMB~~ Combined (don't care)
SM.AattActPdpContextDyn.G	GSM
SM.AattActPdpContextDyn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission of a "Activate PDP Context Accept" message to the MS (TS 24.008).

d) A single integer value per measurement type defined in e)~~E~~

e) SM.SsuccActPdpContext:

SM.SsuccActPdpContext	~~COMB~~ Combined (don't care)
SM.SsuccActPdpContext.G	GSM
SM.SsuccActPdpContext.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)E are subject to the "2 out of 3 approach".

b) CC

c) Transmission of a "Activate PDP Context Accept" message to the MS (TS 24.008), the PDP address has been dynamically assigned.

d) A single integer value per measurement type defined in e)E

e) SM.SsuccActPdpContextDyn:

SM.SsuccActPdpContextDyn	COMB Combined (don't care)
SM.SsuccActPdpContextDyn.G	GSM
SM.SsuccActPdpContextDyn.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.6.5 mean number of activated PDP contexts

a) mMean number of activated PDP contexts
The three measurement types defined in e)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

e) SM.MmeanActPDPContext:

SM.MmeanActPDPContext	COMB Combined (don't care)
SM.MmeanActPDPContext.G	GSM
SM.MmeanActPDPContext.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)E are subject to the "2 out of 3 approach".

b) CC

c) Receipt of a "Deactivate PDP Context Request" message from the MS (TS 24.008).

d) A single integer value per measurement type defined in e)~~E~~

e) SM.A~~a~~ttDeactPdpContextMs:

SM.A~~a~~ttDeactPdpContextMs	~~COMB~~ Combined (don't care)
SM.A~~a~~ttDeactPdpContextMs.G	GSM
SM.A~~a~~ttDeactPdpContextMs.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission of a "Deactivate PDP Context Accept" message to the MS (TS 24.008).

d) A single integer value per measurement type defined in e)~~E~~

e) SM.S~~s~~uccDeactPdpContextMs:

SM.S~~s~~uccDeactPdpContextMs	~~COMB~~ Combined (don't care)
SM.S~~s~~uccDeactPdpContextMs.G	GSM
SM.S~~s~~uccDeactPdpContextMs.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)~~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~~

e) SM.N~~n~~brActPdpContext:

SM.N~~n~~brActPdpContext	~~COMB~~ Combined (don't care)
SM.N~~n~~brActPdpContext.G	GSM
SM.N~~n~~brActPdpContext.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)E are subject to the "2 out of 3 approach".

b) GAUGE

c) Addition of first PDP context or removal of last PDP context in SGSN location register for a particular subscriber

d) A single integer value per measurement type defined in e)E

e) SM.NnbrActivePdpPerSgsn:

SM.NnbrActivePdpPerSgsn	COMB Combined (don't care)
SM.NnbrActivePdpPerSgsn.G	GSM
SM.NnbrActivePdpPerSgsn.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)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

e) SM.MmeanActivePdpPerSgsn:

SM.MmeanActivePdpPerSgsn	COMB Combined (don't care)
SM.MmeanActivePdpPerSgsn.G	GSM
SM.MmeanActivePdpPerSgsn.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)E are subject to the "2 out of 3 approach".

b) CC

c) Receipt of a "Delete PDP Context Request" message from the GGSN (TS 29.060).

d) A single integer value per measurement type defined in Ee)

e) SM.AattDeactPdpContextGgsn:

SM.AattDeactPdpContextGgsn	COMB Combined (don't care)
SM.AattDeactPdpContextGgsn.G	GSM
SM.AattDeactPdpContextGgsn.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)E are subject to the "2 out of 3 approach".

b) CC

c) Transmission of a "Delete PDP Context Response" message to the GGSN (TS 29.060).

d) A single integer value per measurement type defined in e)E

e) SM.SsuccDeactPdpContextGgsn:

SM.SsuccDeactPdpContextGgsn	COMB Combined (don't care)
SM.SsuccDeactPdpContextGgsn.G	GSM
SM.SsuccDeactPdpContextGgsn.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)E are subject to the "2 out of 3 approach".

b) CC

c) Ttransmision of a "Delete PDP Context Request" message to the GGSN (TS 29.060)

d) A single integer value per measurement type defined in e)E

e) SM.AattDeactPdpContextSgsn:

SM.AattDeactPdpContextSgsn	COMB Combined (don't care)
SM.AattDeactPdpContextSgsn.G	GSM
SM.AattDeactPdpContextSgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) ~~r~~Receipt of a "deactivate PDP Context Accept" message from the MS (TS 24.008).

d) A single integer value per measurement type defined in e)~~E~~

e) SM.S~~s~~uccDeactPdpContextSgsn:

SM.S~~s~~uccDeactPdpContextSgsn	~~COMB~~ Combined (don't care)
SM.S~~s~~uccDeactPdpContextSgsn.G	GSM
SM.S~~s~~uccDeactPdpContextSgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmision of an "Update PDP Context Request" message to the GGSN (TS 29.060)

d) A single integer value per measurement type defined in e)~~E~~

e) SM.A~~a~~ttUpdPdpContextSgsn:

SM.A~~a~~ttUpdPdpContextSgsn	~~COMB~~ Combined (don't care)
SM.A~~a~~ttUpdPdpContextSgsn.G	GSM
SM.A~~a~~ttUpdPdpContextSgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of an "Update PDP Context Response" message from the GGSN (TS 29.060)

d) A single integer value per measurement type defined in Ee)

e) SM.SsuccUpdPdpContextSgsn:

SM.SsuccUpdPdpContextSgsn	COMB Combined (don't care)
SM.SsuccUpdPdpContextSgsn.G	GSM
SM.SsuccUpdPdpContextSgsn.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)E are subject to the "2 out of 3 approach".

b) CC

c) Receipt of an "Update PDP Context Request" message from the GGSN (TS 29.060)

d) A single integer value per measurement type defined in e)E

e) SM.AattUpdPdpContextGgsn:

SM.AattUpdPdpContextGgsn	COMB Combined (don't care)
SM.AattUpdPdpContextGgsn.G	GSM
SM.AattUpdPdpContextGgsn.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)E are subject to the "2 out of 3 approach".

b) CC

c) Transmission of an "Update PDP Context Response" message to the GGSN (TS 29.060)

d) A single integer value per measurement type defined in e)E

e) SM.SsuccUpdPdpContextGgsn:

SM.SsuccUpdPdpContextGgsn	COMB Combined (don't care)
SM.SsuccUpdPdpContextGgsn.G	GSM
SM.SsuccUpdPdpContextGgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission of an "Modify PDP Context Request" message to the MS (TS 24.008)

d) A single integer value per measurement type defined in ~~E~~e)

e) SM.A~~a~~ttModPdpContextSgsn:

SM.A~~a~~ttModPdpContextSgsn	~~COMB~~ Combined (don't care)
SM.A~~a~~ttModPdpContextSgsn.G	GSM
SM.A~~a~~ttModPdpContextSgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of an "Modify PDP Context Accept" message from the MS (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SM.S~~s~~uccModPdpContextSgsn:

SM.S~~s~~uccModPdpContextSgsn	~~COMB~~ Combined (don't care)
SM.S~~s~~uccModPdpContextSgsn.G	GSM
SM.S~~s~~uccModPdpContextSgsn.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Receipt of an "Modify PDP Context Request" message from the MS (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SM.A~~a~~ttModPdpContextMs

SM.A~~a~~ttModPdpContextMs	~~COMB~~ Combined (don't care)
SM.A~~a~~ttModPdpContextMs.G	GSM
SM.A~~a~~ttModPdpContextMs.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)~~E~~ are subject to the "2 out of 3 approach".

b) CC

c) Transmission of an "Modify PDP Context Accept" message to the MS (TS 24.008)

d) A single integer value per measurement type defined in e)~~E~~

e) SM.SsuccModPdpContextMs:

SM.SsuccModPdpContextMs	~~COMB~~ Combined (don't care)
SM.SsuccModPdpContextMs.G	GSM
SM.SsuccModPdpContextMs.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)~~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 (TS 24.008).

d) A single integer value per measurement type defined in e)~~E~~

e) SM.A~~a~~ttActSecondPdpContext:

SM.A~~a~~ttActSecondPdpContext	~~COMB~~ Combined (don't care)
SM.A~~a~~ttActSecondPdpContext.G	GSM
SM.A~~a~~ttActSecondPdpContext.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)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 (TS 24.008).

d) A single integer value per measurement type defined in e)E

e) SM.SsuccActSecondPdpContext:

SM.SsuccActSecondPdpContext	COMB Combined (don't care)
SM.SsuccActSecondPdpContext.G	GSM
SM.SsuccActSecondPdpContext.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)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

e) CAM.AattCamelDialogues:

CAM.AattCamelDialogues	COMB Combined (don't care)
CAM.AattCamelDialogues.G	GSM
CAM.AattCamelDialogues.U	UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.7.2 Unsuccessful Failed CAMEL dialogues, aborted locally by gprsSSF

a) Nnumber of failedunsuccessful CAMEL dialogues, aborted locally by gprsSSF
The three measurement types defined in e)E are subject to the "2 out of 3 approach".

b) CC

c) Incremented when a CAMEL dialogue is aborted locally by SSF.

d) A single integer value per measurement type defined in e)E

e) CAM.FailunsuccCamelDialoguesSsf:

CAM.FailunsuccCamelDialoguesSsf	COMB Combined (don't care)

CAM.FailunsuccCamelDialoguesSsf.G GSM
CAM.FailunsuccCamelDialoguesSsf.U UMTS

f) SgsnFunction

g) Valid for packet switching

h) GSM/UMTS

5.7.3 FailedUnsuccessful CAMEL dialogues, error or reject from gsmSCF

a) Nnumber of failedunsuccessful CAMEL dialogues, error or reject from gsmSCF
The three measurement types defined in e)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

e) CAM.FailunsuccCamelDialoguesScf:

CAM.FailunsuccCamelDialoguesScf COMB Combined (don't care)
CAM.FailunsuccCamelDialoguesScf.G GSM
CAM.FailunsuccCamelDialoguesScf.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. (TS 24.008)

d) A single integer value

e) ISYSC.AattIntraSgsnUmtsGsmRau

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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 (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) ISYSC.SsuccIntraSgsnUmtsGsmRau

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

5.8.3 Unsuccessful Failed intra SGSN inter system changes UMTS to GSM RAU, due to internal reasons

a) Number of failedunsuccessful 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) ISYSC.FailunsuccIntraSgsnUmtsGsmRauInt

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

5.8.4 Unsuccessful Failed intra SGSN inter system changes UMTS to GSM RAU, due to external reasons

a) Number of unsuccessful failed 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) ISYSC.FailunsuccIntraSgsnUmtsGsmRauExt

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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 (TS 24.008).

d) A single integer value

e) ISYSC.AattIntraSgsnGsmUmtsRau

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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 (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) ISYSC.S~~s~~uccIntraSgsnGsmUmtsRau

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

5.8.7 ~~Unsuccessful~~ Failed intra SGSN inter system changes GSM to UMTS RAU, due to internal reasons

a) Number of ~~unsuccessful~~ failed 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) ISYSC.Fail~~unsucc~~IntraSgsnGsmUmtsRauInt

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

5.8.8 ~~Unsuccessful~~ Failed intra SGSN inter system changes GSM to UMTS RAU, due to external reasons

a) Number of failed~~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) ISYSC.Fail~~unsucc~~IntraSgsnGsmUmtsRauExt

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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) GTP.GgtpuOutDataPktIu

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) GTP.gGtpuInDataPktIu

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) GTP.GgtpuOutDataOctIu

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) GTP.GgtpuInDataOctIu

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)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

e) GTPgtp.OutDataPktGn the total regardless of the GTP version used
GTPgtp.OutDataPktGn.v0 only the GTPv0 part
GTPgtp.OutDataPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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)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

e) GTPgtp.InDataPktGn the total regardless of the GTP version used
GTPgtp.InDataPktGn.v0 only the GTPv0 part
GTPgtp.InDataPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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)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

e) GTP.gtpOutDataOctGn the total regardless of the GTP version used
GTP.gtpOutDataOctGn.v0 only the GTPv0 part
GTP.gtpOutDataOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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)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

e) GTP.gtpInDataOctGn the total regardless of the GTP version used
GTP.gtpInDataOctGn.v0 only the GTPv0 part
GTP.gtpInDataOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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)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

e) GTP.gtpOutSigPktGn the total regardless of the GTP version used
GTP.gtpOutSigPktGn.v0 only the GTPv0 part
GTP.gtpOutSigPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) COMBCombined

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)~~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~~

e) GTP.~~gtp~~InSigPktGn the total regardless of the GTP version used
GTP.~~gtp~~InSigPktGn.v0 only the GTPv0 part
GTP.~~gtp~~InSigPktGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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)~~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~~

e) GTP.~~gtp~~OutSigOctGn the total regardless of the GTP version used
GTP.~~gtp~~OutSigOctGn.v0 only the GTPv0 part
GTP.~~gtp~~OutSigOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

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)~~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~~

e) GTP.~~gtp~~InSigOctGn the total regardless of the GTP version used
GTP.~~gtp~~InSigOctGn.v0 only the GTPv0 part
GTP.~~gtp~~InSigOctGn.v1 only the GTPv1 part

f) SgsnFunction

g) Valid for packet switching

h) ~~COMB~~Combined

Annex A (informative): Examples for “(n-1) out of n” approach

The measurements result values generated by a NE are often redundant, or the info contained in the measurement results can be obtained in a number of different ways.

The “(n-1) out of n” approach allows a vendor to implement a subset of 3GPP defined measurements, for example if there exists a relation (A+B=C) then any 2 out of 3 defined measurements A, B, C are sufficient information to calculate the third (n=3). In case there exists a relation (A+B+C=D), then any 3 out of the 4 would suffice, and the same kind of approach would be applicable.

A.1 Attempt/success/failure procedure measurements

Consider the number of attempts to start a specific procedure (e.g. RRC connection establishment). Some of these attempts will fail, some will be successful. Three different counters can be defined to measure these procedures: an attempt counter, a success counter, and a failure counter, but in fact only 2 may be provided, since we have the fixed relation (#success + #failure) = #attempt.

It is to be noted that all combinations do not provide the same level of details. For example, in the case only #attempt and #success are provided, it will not be possible to retrieve the detailed failure causes.

The three measurement types defined in section 4.4 RRC connection establishment are subject to the "(n-1) out of n” approach with n=3:

- Attempted RRC connection establishments
- Failed RRC connection establishments
- Successful RRC connection establishments

The “(n-1) out of n” approach is also applicable for more complex measurements split according to a specific criterion, e.g. Queuing. For example, the CS measurements described in section 4.1 RAB assignment are subject to a 4 out of 5 approach:

- attempted RAB establishments for CS domain
- successful RAB establishments without queuing for CS domain
- failed RAB establishments without queuing for CS domain
- successful RAB establishments with queuing for CS domain
- failed RAB establishments with queuing for CS domain

Any of the five measurements can be calculated from the four others but all combinations will not provide the same level of details (e.g. failure causes).

A.2 GSM/UMTS combined measurements

With relation to the field H of the measurement template, a measurement indicated with GSM/UMTS is an example of the “(n-1) out of n” approach with n=3 since (GSM + UMTS) = Combined.

In that case, all concerned measurements are included in the same template but the vendor may provide only 2 sub-measurements out of 3.

The measurement described in section 5.6.1 Attempted PDP context activation procedures initiated by MS is subject to the the "(n-1) out of n” approach with n=3:

- SM.AttActPdpContext (attempted context activation procedures with no distinction between GSM and UMTS)
- SM.AttActPdpContext.G (attempted context activation procedures for GSM only)
- SM.AttActPdpContext.U (attempted context activation procedures for UMTS only)

A.3 Embedded "(n-1) out of n" approaches

It is also possible to combine the approaches described above. For example, the measurements described in section 5.5 SMS are subject to the "(n-1) out of n" approach at two levels.

Firstly, measurements are split according to the CS/PS domain, for example:

- Attempted CS SMS mobile originating
- Attempted PS SMS mobile originating
- Attempted SMS mobile originating

where any of the three measurements can be calculated from the two others.

Secondly, each measurement provides 3 sub-measurements, for example for Attempted CS SMS mobile originating:

- SMS.AttMoCS
- SMS.AttMoCS.G
- SMS.AttMoCS.U

where any of the three sub-measurements can be calculated from the two others.

Annex BA (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 Approval.	1.0.2	4.0.0
Sep 2001	S_13				Addition of family name for CN measurements, addition of the list of families, addition of Annex A: "(n-1) out of n" examples, application of the "(n-1) out of n" approach to all relevant measurements, enhancement of per cause measurements	4.0.0	4.1.0