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3GPP

Postal address

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

Internet
http://www.3gpp.org

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Foreword

This Technical Specification has been produced by the 3GPP.

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

Version 3.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 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 specification;

Introduction

This Technical Specification (TS) is part of a set of TSs 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 TS 32.106 [10].

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 this TS is to describe the mechanisms involved in the collection of the data and the definition of the data itself.

1 Scope

The present document describes the requirements for the management of performance measurements and the collection of performance measurement data across a 3G network. It defines the administration of measurement schedules by the OMC, the generation of measurement results in the Network Elements (NEs) and the transfer of these results to one or more Operations Systems, i.e. OMC(s) and/or NMC(s).

The basic performance management concept that this TS is built upon is described in clause 4. The requirements how an OMC administers the performance measurements and how the results can be collected are defined in detail in clause 5. Annex A specifies the file format for the bulk transfer of performance measurement results to the NMC, while annex B discusses the file transfer procedure utilised on that interface. A set of measurements available for collection by NEs are described in annex C, effort has been made to ensure consistency in the definition of measurements between different NEs.

The following is beyond the scope of this TS, and therefore this TS does not describe:

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

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

The objectives of this standardisation are:

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

The definition of the standard measurements is intended to result in comparability of measurement data produced in a multi-vendor 3G network, for those measurement types that can be standardised across all vendors' implementations.

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

This TS considers all the above aspects of performance management for a 3G network and its NEs defined in the 3G core Technical Specifications. However, only those aspects which are specific to a 3G system and particular to 3G network operation are included in this TS.

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.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 Normative references

Editor' note: to be updated/ completed

[1] GSM 02.16 (ETS 300 508): "Digital cellular telecommunication system (Phase 2); International Mobile station Equipment Identities (IMEI)". Editor' note: new 3G reference TS?

[2] GSM 04.08 (ETS 300 557): "Digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification". Editor' note: Replace by new 3G reference TS if needed

[3] GSM 04.11 (ETS 300 559): "Digital cellular telecommunication system (Phase 2); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface". Editor' note: Replace by new 3G reference TS if needed

[4] GSM 05.08 (ETS 300 578): "Digital cellular telecommunication system (Phase 2); Radio subsystem link control". Editor' note: Replace by new 3G reference TS if needed

[5] GSM 08.08 (ETS 300 590): "Digital cellular telecommunication system (Phase 2); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification". Editor' note: Replace by new 3G reference TS if needed

[6] GSM 08.58 (ETS 300 596): "Digital cellular telecommunication system (Phase 2); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Layer 3 specification". Editor' note: Replace by new 3G reference TS if needed

[7] GSM 09.02 (ETS 300 599): "Digital cellular telecommunication system (Phase 2); Mobile Application Part (MAP) specification". Editor' note: new 3G reference TS?

[8] 3G TS 32.101 "3G Telecom Management principles and high level requirements"[9]3G TS 32.102 "3G Telecom Management architecture"

[10] 3G TS 32.106.

[12] ITU-T Recommendation E.880: "Field data collection and evaluation on the performance of equipment, network and services". Check if still up to date?

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

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

Editor's note: add new specs, e.g for GPRS, RFCs for FTP, TCP/IP

3 Definitions and Abbreviations

3.1 Definitions

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

Editor's note: tbd

3.2 Abbreviations

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

Editor's note: these must be updated

3G	3rd Generation
3GPP	3G Partnership Project
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
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
NMC	Network Management Centre

Editor's note: this term is used for the network management level management system until the terminology is settled within [8] and [9].

OA&M	Operation, Administration and Maintenance
OMC	Operation & Maintenance Centre

Editor's note: this term is used for the network element management system until the terminology is settled within [8] and [9].

OS	Operations System (OMC, NMC)
OSI	Open Systems Interconnection
PM	Performance Management
QoS	Quality of Service
RNC	Radio Network Controller
TS	Technical Specification
TFTP	Trivial FTP
UTRAN	UMTS Terrestrial Radio Access Network

4 Performance measurement concept

Any evaluation of 3G system behaviour will require performance data collected and recorded by its NEs according to a schedule established by the OMC. This aspect of the management environment is termed Performance Management. The purpose of any performance management activity is to collect data which can be used to verify the physical and logical configuration of the network and to locate potential problems as early as possible. The type of data to be collected is defined by the equivalent measurements, refer to annex C. This TS concentrates on the requirements of 3G telecom management to produce this data. Any management actions performed at the OSs subsequently to analyse the performance data are not considered in this TS.

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

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

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

- the management of the performance measurement collection process (4.2.1);
- the generation of performance measurement results (4.2.2);
- the local storage of measurement results in the NE (4.2.3);
- the transfer of measurement results from the NE to an OS (4.2.4); and
- the storage, preparation and presentation of results to the operating personnel (4.2.5).

4.1 Measurement data requirements

This subclause describes the typical requirements for performance data to be produced by the NEs which comprise a 3G system. It is important to note that an actual measurement value collected from the network may be used to satisfy requirements in more than one category of measurement described below.

4.1.1 Traffic measurements

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

The types of traffic evaluations for which 3G specific measurements may be used include:

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

Examples of measured values may include:

- pages per Location area per hour;
- busy hour call attempts per RNC, MSC;
- handovers per RNC per hour, etc.

4.1.2 Network configuration evaluation

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

4.1.3 Resource access

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

4.1.4 Quality of Service (QoS)

The user of a 3G system views the provided service from outside the network. That perception can be described in observed QoS terms. QoS can indicate the network performance expected to be experienced by the user. For further detail see ITU-T Recommendation E.880 [12].

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

4.1.5 Resource availability

The availability performance is dependent on the defined objectives, i.e. the availability performance activities carried out during the different phases of the life cycle of the system, and on the physical and administrative conditions. For further detail see ITU-T Recommendation E.880 [12].

4.2 Measurement administration

The range of measurements which will be available from the NEs are expected to cover all of the requirements described in subclause 4.1. However, not all of these measurements will be required all of the time, from every occurrence, of every relevant NE. With a highly distributed network like a 3G mobile telecommunication system it is also necessary to gather the measurement data so as to perform consistent analysis of the results and to evaluate the interactions between the NEs.

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

4.2.1 Measurement job administration

Measurement jobs, i.e. the processes which accumulate the data and assemble it for collection and/or inspection, will need to be scheduled for the period or periods for which gathering of data shall be performed.

The administration of measurement jobs comprises the following actions:

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

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

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

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

5) Reporting and routing of results to one or more OSs (OMC and/or NMC);

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

4.2.2 Measurement result generation

Each measurement job will be collecting result data at a particular frequency, known as the granularity period of the measurement. At the end of the granularity period a scheduled result report shall be generated for each measurement job that is actively collecting performance measurement data.

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

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

These are described in the following paragraphs.

Cumulative counter:

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

Status inspection:

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

Gauge:

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

Discrete Event Registration:

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

4.2.3 Local storage of results at the Network Element

It shall be possible for the NE to retain measurement data it has produced for deferred retrieval by the OS(s). This data will be retained at the NE under the control of the OMC. The storage capacity and the duration for which the data will be retained at the NE will be Operator and implementation dependent.

4.2.4 Measurement result transfer

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

1) the scheduled result reports generated by the NE (notifications) can be sent to the OMC as soon as they are available;

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

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

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

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

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

4.2.5 Performance data presentation

The performance data user interface presentation, including the storage and preparation of the data, is outside the scope of this TS.

4.3 Measurement definition

This subclause looks at the requirements for the definition of the individual measurements.

4.3.1 Nature of the result

The measurements defined for the 3G system have to be collected in the NEs. As each NE has its own role to play in the provision of the mobile service then each will have a different perspective on the performance of the network. The measurement definitions shall, therefore, contain a description of the intended result of the measurement in terms of what is being measured.

4.3.2 Perceived accuracy

The accuracy of measurements can be seen in three ways:

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

Representation of all occurrences:

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

Same period for the same two events:

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

Measurement collection periods:

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

These interruptions can be one or more of the following:

- failure of the resource;
- failure of the procedure being measured;
- resource only becomes available after the measurement period has commenced;
- procedure only becomes available after the measurement period has commenced.

In these cases the measurement result shall highlight such interruptions to indicate that the result is suspect. In extreme circumstances, no result reports at all can be generated. Any actions to be taken subsequently with regards to the usefulness of the data will depend on the circumstances and the requirements of individual 3G Operators.

4.3.3 Comparability of measurement data

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

4.3.4 Measurement identification

In complex networks it is easy to generate large amounts of performance data. It is essential that all such data is recognisable in respect of each request made. As all the required information which can distinguish each request already exists by definition the request, it makes sense to use this information, rather than create anything new.

5 Performance management requirements

5.1 Introduction

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

5.1.1 Basic functions

The performance management concept as applicable in this specification is based on the general framework for 3G telecom management as outlined in 3G TS 32.101 [8] and 3G TS 32.102 [9]. As an example, figure 1 outlines this concept in the context of the UTRAN.

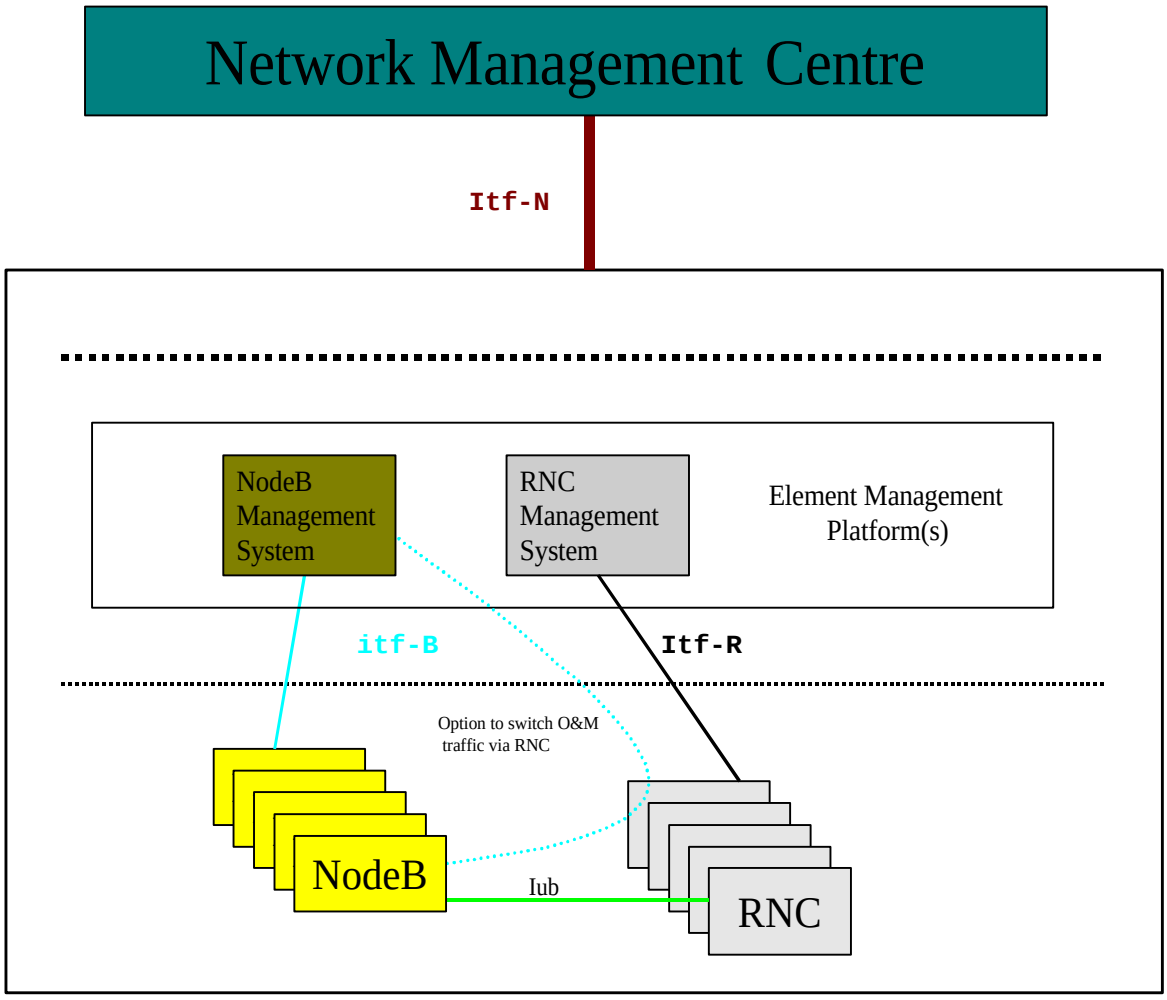

Figure 1: UTRAN Performance management concept

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

The OMC shall be able to administer the measurements, e.g. create/delete measurement jobs and define their schedules. The OMC and/or the NMC can retrieve the measurement results via appropriate interfaces. The measurements that will generate this data are defined in annex C of this TS. This data may be used in its original form or processed according to the system operator requirements.

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

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

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

5.1.2 Measurement administration

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

A (performance) measurement concept covers:

1) measurement data collection requirements:

   - **Measurement types.** Corresponds to the measurements as defined in annex C;
   - **Measured network resources.** The resource(s) to which the measurement types shall be applied have to be specified, e.g. one or more NodeB(s);
   - **Measurement recording**, consisting of periods of time at which the NE is collecting (that is, making available in the NE) measurement data.

2) measurement reporting requirements:

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

3) measurement result transfer requirements:

   - measurement results can be transferred from the NE to the OMC according to the measurement parameters, and/or they are stored locally in the NE and can be retrieved when required;
   - measurement results can be stored in the network (NEs or OMC) for retrieval by the NMC when required.

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

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

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

5.2 Measurement jobs

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

5.2.1 Measurement job characteristics

5.2.1.1 Measurement types

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

5.2.1.2 Measurement schedule

The measurement schedule specifies the time frames during which the measurement job will be active. The measurement job is active as soon as the starttime - if supplied in the schedule - is reached. The system shall support a job starttime of up to at least 90 days from the job creation date. If no starttime is provided, the measurement job shall become active immediately. The measurement job remains active until the stoptime - if supplied in the schedule - is reached. If no job

stoptime is specified the measurement job will run indefinitely and can only be stopped by OMC intervention, i.e. by deleting or suspending the measurement job.

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

5.2.1.3 Granularity period

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

5.2.1.4 Measurement reporting

Scheduled measurement reports are produced at the end of each granularity period, and contain the information as requested by the system operator. This information consists of:

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

Editor's note: this section must be aligned with the file format description in annex A

5.2.2 Measurement job state and status attributes

According to the OSI systems management concept, the state of a resource is reflected in indicators (attributes). Status attributes are provided to qualify these state attributes. Full details are provided in ITU-T Recommendation X.731 [13]. As for a measurement job, the following information is provided:

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

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

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

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

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

5.2.3 Measurement job administration

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

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

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

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

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

5.3 Measurement results

5.3.1 Measurement result characteristics

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

Measurement results for all measurements of a particular measurement job are gathered in a single report at the end of the granularity period. The report may contain, in addition to the specific measurement results, fixed information that is global for all measurement results associated with that measurement job, such as an identification of the involved network resources and a time stamp referring to the time at which the NE started collecting the measurement results. For further details see annex A of this TS.

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

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

5.3.2 Transfer of measurement results

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

1) immediate notifications:

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

2) deferred retrieval:

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

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

Each implementation shall support a file transfer facility to an external OS (i.e. not supplied by the NE vendor), such as an NMC. This facility shall be implemented using either the FTAM [14] or (T)FTP protocol. This interface may be located either in the NEs or the OMC, as chosen by the vendor. As a result, it may not at all be necessary to transfer measurement result reports to the OMC, if

- the NMC interface is implemented in the NEs, and
- the Operator chooses to postprocess measurement results only in the NMC.

Editor' note: the following text is kept here as a placeholder and will be modified/moved in alignment with annexes A and B in the future.

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

- the time of the transfer (in push mode);
- the definition of the file names;
- the routing of the transfer to one or more OS(s) (in push mode);
- the selection of the contents of the files, i.e. which reports to include; and
- the storage/deletion of the files in the NE.

However, the file format and encoding (ASN.1) shall comply with annex A of this TS.

Annex A (Normative): Measurement Report File Format

This annex describes the format of measurement result files that can be transferred from the network (NEs or OMC) to the NMC.

To be supplied

Annex B (Normative): Measurement Report File Transfer Procedure

This annex describes the procedure to transfer files containing performance measurement results from the network (OMC or NEs) to the NMC.

To be supplied

Annex C (Normative): Performance Measurement Requirements Summary

Only measurement types that are specific to 3G networks are defined within this annex, i.e. measurements related to "external" technologies, such as ATM or IP, will not be covered.

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

A. **Description**

A short explanation of the measurement operation.

B. **Collection Method**

The form in which this measurement data is obtained:

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

C. **Condition**

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

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

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

B.1 Measurements Related To The RNC

It should be investigated whether GSM BSC measurements can be re-used

B.2 Measurements related to the NodeB

It should be investigated whether GSM BTS measurements can be re-used

B.3 Measurements Related to the MSC

It is expected that GSM measurements can be re-used to a large extent.

B.4 Measurements Related to the HLR

It is expected that GSM measurements can be re-used to a large extent, especially those added for GPRS.

B.5 Measurements Related to the VLR

It is expected that GSM measurements can be re-used to a great extent.

B.6 Measurements Related to the EIR

Check if there is a similar functionality in 3G networks, possibly re-use GSM measurements.

B.7 Measurements Related to the SMS IWMSC/GMSC

It is expected that GSM measurements can be re-used to a great extent.

B.8 Measurements Related to the SGSN

It is expected that GSM GPRS measurements can be fully re-used (more to be added?)

B.9 Measurements Related to the GGSN

It is expected that GSM GPRS measurements can be fully re-used (more to be added?)

History

Document history		
0.0.1	06/07/99	Initial draft based on version GSM 12.04 v4.3.1
0.0.2	24/08/99	Incorporation of changes agreed at last meeting. Some clarifications and streamlining of terminology added. Strict separation between OMC and NMC interface introduced.
0.0.3	14/09/99	Incorporation of minor editorial changes and clarifications as agreed during the last meeting. Addition of TFTP as an allowed protocol for the NMC interface.
1.0.0	10/10/99	Submitted to TSG-SA #5 (11-13 October, 1999) for information. Identical to v0.0.3