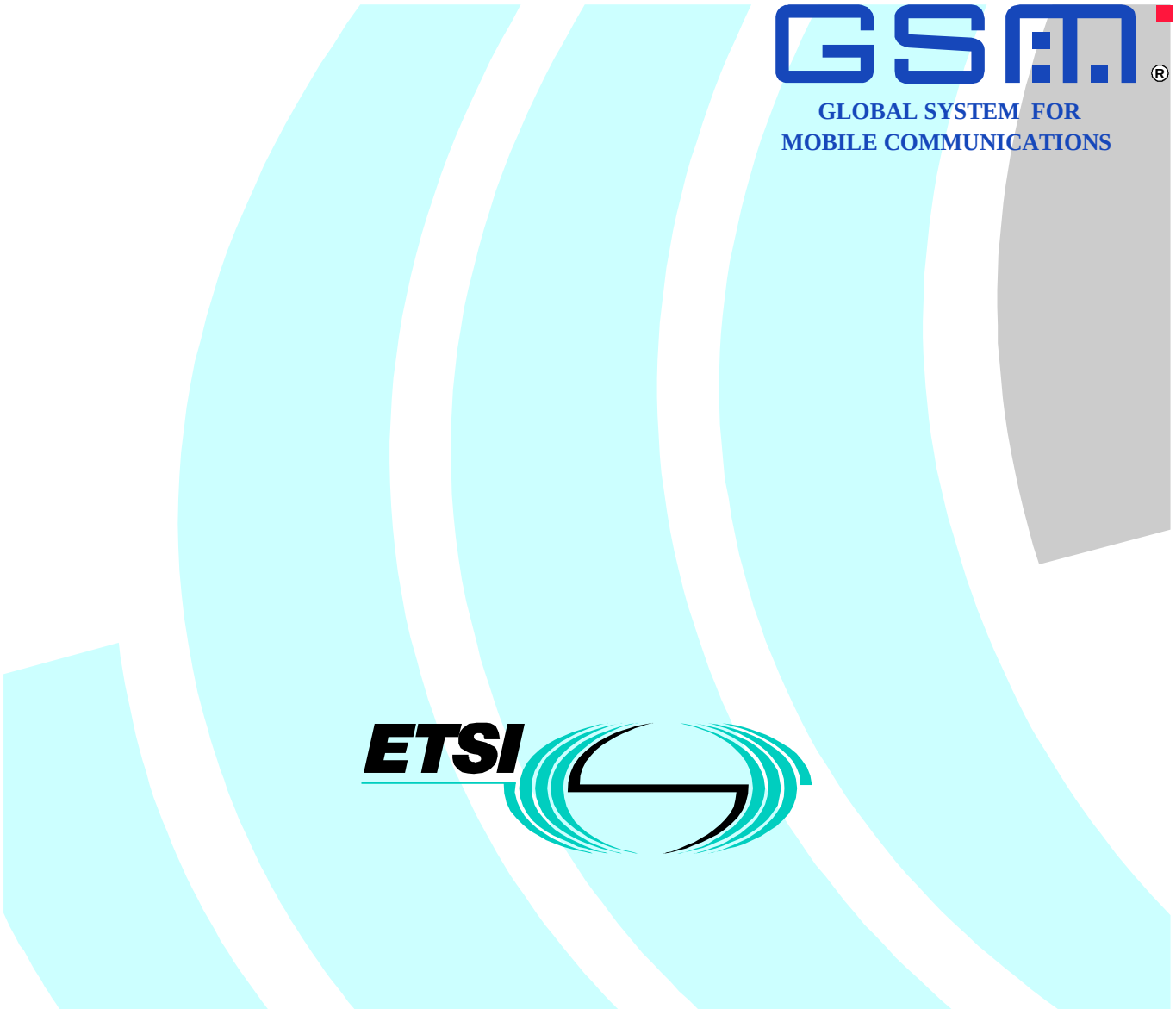
ETSI TS 101 513 V7.0.1 (2000-11)

Technical Specification

Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
Location services management
(GSM 12.71 version 7.0.1 Release 1998)



Reference
DTS/TSGS-051271Q7

Keywords
Digital cellular telecommunications system,
Global System for Mobile communications
(GSM), Location

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document describes the network management for LCS O&M within the digital cellular telecommunications system.

NOTE: TC-SMG has produced documents which give technical specifications for the implementation of the digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These specifications may subsequently become ETSI Technical Specifications (TSs) or Technical Reports (TRs). These ETSI-GSM specifications are, for editorial reasons, still referred to in the present document.

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Version 7.x.y

where:

7 GSM Phase 2+ Release 1998.

x the second digit is incremented for changes of substance, i.e. technical enhancements, corrections, updates, etc.;

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

1 Scope

The present document addresses the network management architecture, functions, and protocol for LCS operations and maintenance. The information model included here defines the managed entities and how they are addressed for purposes of operations and maintenance activities.

There is a requirement for the network management interface to be open to allow interoperation between LMUs and GMLCs of different manufacturers working to the same SMLC. The present document addresses this requirement from an operations and maintenance point of view, which allows this interworking to take place. It shows the split of network management functions between GMLC, SMLC and LMU. The procedures and coding of the messages are specified in detail. In practice, in addition to the present document, it is necessary that the content of manufacturer-dependent information fields be specified to fulfil the functionality.

It is essential for operation that a SMLC can handle the functions used by all its LMUs. Therefore, all items in the present document are considered mandatory unless otherwise indicated in the present document.

NOTE: This version contains only the SMLC-LMU interface. Other work will be undertaken in the future.

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.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04 (ETR 100): "Digital cellular telecommunication system (Phase 2); Abbreviations and acronyms".

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

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

[4] GSM 12.20 (ETS 300 622): "Digital cellular telecommunication system (Phase 2); Base Station System (BSS) Management Information".

[5] GSM 12.21 (ETS 300 623): "Digital cellular telecommunication system (Phase 2); Network Management (NM) procedures and messages on the A-bis interface".

[6] GSM 12.22 (ETS 300 624): "Digital cellular telecommunication system (Phase 2); Interworking of GSM Network Management (NM) procedures and messages at the Base Station Controller (BSC)".

[7] GSM 02.71: Digital cellular telecommunications system (Phase 2+), Location Services (LCS), Service Description, Stage 1.

[8] GSM 03.71: Digital cellular telecommunications system (Phase 2+), Location Services (LCS), Functional Description, Stage 2.

[9] GSM 04.71: Digital cellular telecommunications system (Phase 2+), Mobile radio interface layer 3 location services specification, formats and coding.

[10] ITU-T Recommendation M.3400: TMN management functions.

[11] ITU-T Recommendation X.680: ASN.1 Specification of Basic Notation – Data Network

[12] ITU-T Recommendation X.691: ASSN. Encoding Rules Specification of Packed Encoding Rules - Data Network.

[13] ITU-T Recommendation X.711: Common Management Information Protocol: Specification.

[14] ITU-T Recommendation X.731: Systems Management: State Management Function.

3 Symbols and Abbreviations

3.1 Symbols

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

Lb	Interface between Serving MLC and BSC (BSC interface)
Le	Interface between External User and Gateway MLC (external interface)
Lg	Interface between Gateway MLC and VMSC (Gateway MLC interface)
Lh	Interface between Gateway MLC and HLR (HLR interface)
Lp	Interface between SMLC and peer SMLC (peer interface)
Ls	Interface between Serving MLC and VMSC (Serving MLC interface)
Um	Air Interface to an LMU (measurement interface)

3.2 Abbreviations

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

ASN.1	(CCITT) Abstract Syntax Notation One
A-GPS	Assisted Global Positioning System
BSC	Base Station Controller
BSS	Base Station Subsystem
BTS	Base Transceiver Station
CCCH	Common Control Channel
CMIP	Common Management Information Protocol
DTAP	Direct Transfer Application Part
E-OTD	Enhanced Observed Time Difference
GMLC	Gateway MLC
GPS	Global Positioning System
GSM	Global System for Mobile communications
HLR	Home Location Register
HW	Hardware
ID	Identifier
IMSI	International Mobile Subscriber Identity
LCS	LoCation Service
LLP	LMU LCS Protocol
LMU	Location Measurement Unit
MLC	Mobile Location Centre
MMI	Man-Machine Interface
MS	Mobile Station
MSC	Mobile-services Switching Centre
NE	Network Element
NM	Network Management
NSS	Network and Switching Subsystem
O&M	Operations and Maintenance

OSS	Operations Subsystem
PLMN	Public Land Mobile Network
RIT	Radio Interface Timing
SDCCH	Stand-alone Dedicated Control CHannel
SMLC	Serving Mobile Location Centre
SW	Software
TMN	Telecommunications Management Network
TOA	Time of Arrival
TCH	Traffic CHannel
VLR	Visitor Location Register
VMSC	Visited MSC

Further GSM related abbreviations may be found in GSM 01.04 (ETR 100) [1].

4 LCS O&M Architecture

The LCS O&M reference model proposed for location services in GSM networks is shown in Figure 1.

The interface between the OSS and the SMLC and the interface between the OSS and the GMLC are Q interfaces. This is due to compatibility with OSS interfaces applied to other GSM network elements which are defined using the Q interface (see e.g. GSM12.00 [2], GSM12.01 [3], GSM12.20 [4], GSM12.22 [6], etc.).

The succeeding discussion will be based on Figure 1. (No inference should be drawn from Figure 1 about the physical configuration of an interface.)

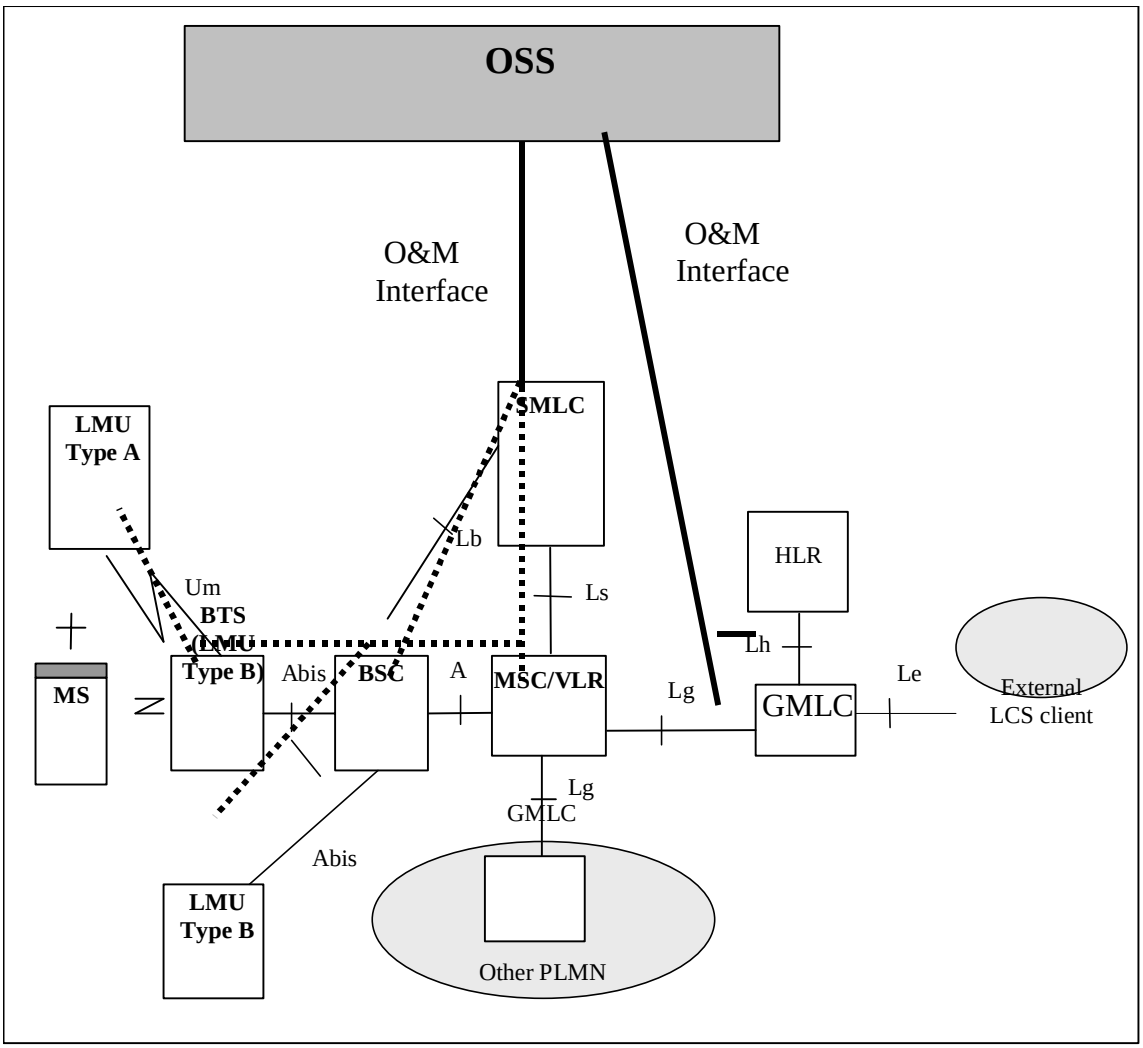


Figure 1: Location Services O&M Reference Model

5 LCS managed entities

The following GSM network entities are the subjects to be managed in LCS.

5.1 Location Measurement Unit (LMU)

An LMU makes radio measurements to support one or more positioning methods. These measurements fall into one of two categories:

a) location measurements specific to one MS used to compute the location of this MS;

b) assistance measurements specific to all MSs in a certain geographic area.

All location and assistance measurements obtained by an LMU are supplied to a particular SMLC associated with the LMU. Instructions concerning the timing, the nature and any periodicity of these measurements are either provided by the SMLC or are pre-administered in the LMU.

Two types of LMU are defined:

- **Type A LMU:** accessed over the GSM radio interface (Um interface);
- **Type B LMU:** accessed over the Abis interface.

The LMU Type A is accessed exclusively over the GSM radio interface (Um interface). There is no wired connection to any other network element. The LMU Type A has a serving BTS and BSC that provide signalling access to a controlling SMLC. With an NSS based SMLC, a Type A LMU also has a serving MSC and VLR and a subscription profile in an HLR. The Type A LMU always has a unique IMSI and supports all radio resource and mobility management functions of the GSM air interface that are necessary to support signalling using an SDCCH to the SMLC. The Type A LMU supports those connection management functions necessary to support LCS signalling transactions with the SMLC and may support certain call control functions to support signalling to an SMLC using a circuit switched data connection [8].

5.2 Serving Mobile Location Centre (SMLC)

The Serving Mobile Location Centre (SMLC) contains functionality required to support LCS. In one PLMN, there may be more than one SMLC.

The SMLC manages the overall co-ordination and scheduling of resources required for performing positioning of an MS. It may calculate the final location estimate and accuracy.

Two types of SMLC are possible:

- **NSS based SMLC:** supports the Ls interface;
- **BSS based SMLC:** supports the Lb interface.

An NSS based SMLC supports positioning of a target MS via signalling on the Ls interface to the visited MSC. A BSS based SMLC supports positioning via signalling on the Lb interface to the BSC serving the target MS. Both types of SMLC may support the Lp interface to enable access to information and resources owned by another SMLC.

The SMLC controls a number of LMUs for the purpose of obtaining radio interface measurements to locate or help locate MS subscribers in the area that it serves. The SMLC is administered with the capabilities and types of measurement produced by each of its LMUs. Signalling between an NSS based SMLC and LMU is transferred via the MSC serving the LMU using the Ls interface and either the Um interface for a Type A LMU or the Abis interface for a Type B LMU. Signalling between a BSS based SMLC and LMU is transferred via the BSC that serves or controls the LMU using the Lb interface and either the Um interface for the Type A LMU or the Abis interface for the Type B LMU.

5.3 Gateway Mobile Location Centre (GMLC)

The Gateway Mobile Location Centre (GMLC) contains functionality required to support LCS. In one PLMN, there may be more than one GMLC.

The GMLC is the first node an external LCS client accesses in a GSM PLMN (i.e. the Le reference point is supported by the GMLC). The GMLC may request routing information from the HLR via the Lh interface. After performing registration authorisation, it sends positioning requests to and receives final location estimates from the VMSC via the Lg interface.

The SMLC and GMLC functionality may be combined in the same physical node, combined in existing physical nodes, or reside in different nodes.

6 LCS O&M Functions

The LCS management functions are grouped into the following five management areas: Performance Management, Fault Management, Configuration Management, Accounting Management and Security Management.

6.1 LMU Management

The description here is based on both Type A and Type B LMUs. O&M related messages will be transferred between the LMU and the SMLC in the same way as the TOA and RIT measurement messages, i.e. from LMU to BTS, BSC, (possibly) MSC and SMLC. It is viewed as a transparent path. The LCS O&M information is stored in the database of the SMLC.

NOTE 1: This section covers LMU functions only. The SMLC will need to support these functions and may perform additional functions as well.

This clause contains requirements that are common to all LMUs. When certain characteristics of an LMU only apply to a specific type, these characteristics are indicated in later sections as conditional on the type. (An example of a specific type of LMU is one that uses GPS to obtain absolute time and thus is able to derive its own position.) When the characteristics of an LMU are specific to the implementation, these characteristics are handled using manufacturer-specific messages or using the software download capability. (Examples of these kinds of data are initialisation data, GPS set-up commands and software files.)

NOTE 2: Only the necessary functions in ITU-T Recommendation M.3400 [10] are included here. All other functions in ITU-T Recommendation M.3400 [10] are not needed for this application. See ITU-T Recommendation M.3400 [10] for specific definitions of each function.

6.1.1 Performance Management

The SMLC collects performance-related data. The SMLC indirectly observes any performance-related data external to the LMU (e.g. number of position failures versus requests). The LMU monitors internal performance-related data and sends alarms to alert the SMLC of any anomalies.

6.1.2 Fault Management

- Alarm Surveillance/Alarm Reporting/Report Alarm.
- Alarm Surveillance/Alarm Reporting/Allow and Inhibit Alarm Reporting.
- Alarm Surveillance/Alarm Reporting/Request Alarm History.
- Alarm Surveillance /Failure Event Detection and Reporting.
- Fault Localisation/NE Fault Localisation/Request diagnostic data.
- Fault Localisation/NE Fault Localisation/Stop diagnosis in progress.

- Fault Localisation/NE Fault Localisation/Diagnostic report.
- Fault Localisation/Running of Diagnostic.
- Fault Correction/NE Fault Correction/Automatic Restoration Report.

6.1.3 Configuration Management

- Installation/Loading software into NEs.
- Provisioning/NE Configuration/Request Configuration.
- Provisioning/NE Configuration/Configuration Report.
- Provisioning/NE Configuration/Set Service State.
- Provisioning/NE Configuration/Request Assignments.

  This function is supported by the Status Query operation specified in GSM 04.71 [9]. An O&M job is defined as an unsatisfied request from the SMLC. Once the LMU has sent all required responses, the job is completed. Unanswered requests from the LMU to the SMLC are not considered jobs.

- Provisioning/NE Configuration/Assignment Reports.

  This function is supported by the Status Query and Status Update operations specified in GSM 04.71 [9]. An O&M job is defined as an unsatisfied request from the SMLC. Once the LMU has sent all required responses, the job is completed. Unanswered requests from the LMU to the SMLC are not considered jobs.

- Provisioning/NE Configuration/Set Parameters.
- Provisioning/NE Configuration/Set Service Thresholds.
- Provisioning/NE Configuration/Start Transmission Test.
- Provisioning/NE Configuration/Restart Request.
- Provisioning/NE Configuration/Restart Report.
- Status and Control/NE Status and Control/Request Status.
- Status and Control/NE Status and Control/Status Report.
- Status and Control/NE Status and Control/Control event report.
- Status and Control/Access to state information in NEs.
- Status and Control/Notification of state changes by NEs.

6.1.4 Accounting Management

Accounting Management is not applicable to the present document.

6.1.5 Security Management

Security Management is not applicable to the present document.

6.2 SMLC Management

For future study.

6.3 GMLC Management

For future study.

7 LCS O&M Protocol

There are two operation codes set aside for LLP O&M messages (OMManagerReq and OMAgentReq). OMManagerReq is invoked by the network, as explained in GSM 04.71 [9], to request a specific O&M activity from the LMU and receive reports from the LMU. OMAgentReq is invoked by the LMU, as explained in GSM 04.71 [9], to report an O&M event to the network or for the LMU to request service from the network.

7.1 LMU LCS O&M Messages and Procedures

7.1.1 Management Information Model

7.1.1.1 Managed Entities

This model describes how entities are managed across the LMU-SMLC interface, but it does not specify how information is transferred inside the site. That is, the manner of communication between a managed entity and managed entities under it is not specified in the present document.

Managed Entities are shown in Figure 2 and listed below. Functional descriptions of each managed entity are found in table 1.

LMU provides the overall management of the timing measurement capability.

Uplink Timing Estimator is needed for TOA only. It conditions the received uplink signal in preparation for the estimation algorithm and then estimates the time of arrival of the received uplink signal.

Downlink Timing Estimator conditions the received downlink signal in preparation for the estimation algorithm and then estimates the time of arrival of the received downlink signal. The downlink timing estimation algorithm and the uplink timing estimation algorithm are different due to the difference in frame structure. The downlink timing estimation algorithm may only be required to perform coarse timing estimates in the case of TOA.

Network Interfacer supports the network interface required for commands and reports between the GSM network and the LMU. The physical interface may be a GSM Radio Interface, a wire or a bus (in the case of an LMU integrated into a BTS). Peer communications are between the SMLC and the LMU.

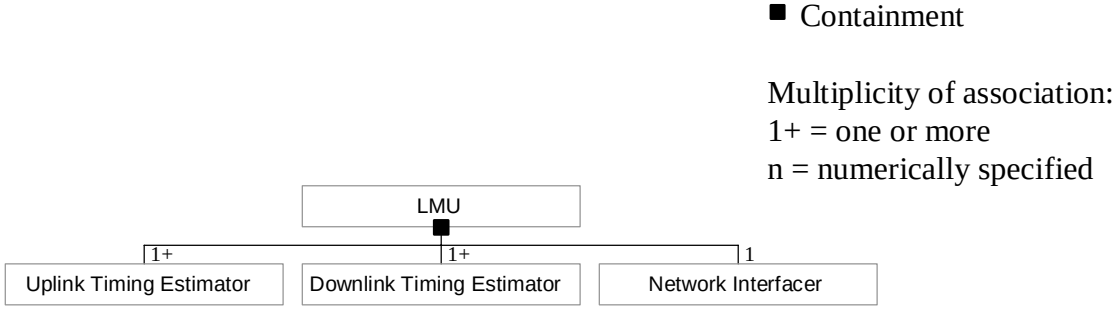


Figure 2: Managed Entity Model Seen Across the LMU-SMLC Interface

Table 1: Managed Entities, Attributes and Procedures Seen Across the LMU-SMLC Interface

Managed Entities	Attributes	Procedures
LMU	Administrative State Operational State Availability Status Manufacturer ID HW Configuration SW Configuration LMU Position (optional) Type[1] Self-Position Capability[1] Set Own Position Upon Startup[2] Method[1] Software Download Capability[1] Time Autonomous Swap[3] Calibration Required[1] TimingType[1]	SW Download Management (7.1.2.2) Diagnostic Test (7.1.2.3) State Management (7.1.2.4) Event Report (7.1.2.5) Equipment Management (7.1.2.6) General Management (A.1.1.7) Report Management (0)
Uplink Timing Estimator (TOA only)	Administrative State Operational State Availability Status Diversity (optional) Attenuator Enable (optional)	SW Download Management (7.1.2.2) Diagnostic Test (7.1.2.3) State Management (7.1.2.4) Event Report (7.1.2.5) Equipment Management (7.1.2.6) General Management (A.1.1.7)
Downlink Timing Estimator	Administrative State Operational State Availability Status Diversity (optional) Attenuator Enable (optional)	SW Download Management (7.1.2.2) Diagnostic Test (7.1.2.3) State Management (7.1.2.4) Event Report (7.1.2.5) Equipment Management (7.1.2.6) General Management (A.1.1.7)
Network Interfacer	Administrative State Operational State Availability Status Attenuator Enable(optional)	SW Download Management (7.1.2.2) Diagnostic Test (7.1.2.3) State Management (7.1.2.4) Event Report (7.1.2.5) Equipment Management (7.1.2.6) General Management (A.1.1.7)

NOTE 1: Mandatory on the manager, optional on the LMU.

NOTE 2: Conditional on the manager when Method = *A-GPS*, optional on the LMU.

NOTE 3: Conditional on the manager when Software Download Capability = *Software Download Capability*, optional on the LMU.

NOTE 4: Attribute support is mandatory unless noted otherwise.

7.1.1.2 Addressing of Managed Entities

It is a GSM requirement that the SMLC is capable of operating with LMUs from different manufacturers. So, it is necessary that the differences between LMUs, as seen by the SMLC, are minimised as much as possible. This is achieved by addressing NM messages by the Managed Entity Class and Managed Entity Instance. Correct addressing of the LMU must be provided in Layer 2. All O&M messages are contained in DTAP messages and addressing the DTAP messages properly is out of the scope of this specification.

Managed entity instances also have a Layer 3 address. The instance number is used to address the managed entity instance. Regardless of whether the Layer 2 address uniquely identifies the managed entity instance or not, the Layer 3 address must also be provided so that it can be used by the management agent to determine which managed entity instance is being addressed.

At the time of initialisation, the SMLC and the LMU need to be able to communicate with each other. Interpretation of the IMSI provides the initial linking information.

Specific equipment configuration information is manufacturer-dependent. However, for interoperability, instance numbering must be known by both manager and agent. This, as well as supported functions, is considered as Shared Management Knowledge.

7.1.1.3 State Management of Managed Entities

State management in the present document is generally in line with CCITT X.731 [14]. How state values are applied is explained below.

CCITT X.731 states that "the management state of a managed entity represents the instantaneous condition of availability and operability of the associated resources from the point of view of management".

In the present document there are two different factors (CCITT X.731 defines usage state in addition to these two) that are considered to affect the management state of a managed entity. They are:

- Administration: permission to use or prohibition against using the resource, imposed through the management services;
- Operability: whether or not the resource is physically installed and working.

The present document defines the following three state management attributes to represent the management state of a managed entity:

- Administrative state;
- Operational state;
- Availability status (this provides additional information for understanding the operational state values).

7.1.1.3.1 Administrative State

Administrative states of the managed entity can be controlled only by the SMLC.

The **locked** state of a managed entity means that the SMLC has terminated all requests to the resource that is represented by the managed entity. No new requests are initiated to this resource.

The **shutting down** state means that no new requests are initiated to this resource. The on-going requests are completed.

The **unlocked** state means that new requests are allowed to the resource represented by the managed entity.

7.1.1.3.2 Operational State

CCITT X.731 gives the following definitions for the values of the operational state attribute:

- **disabled:** the resource is totally inoperable and unable to provide service to the user(s);
- **enabled:** the resource is partially or fully operable and available for use.

In the present document the value *disabled* represents the following conditions that the resources could have:

- hardware or software is not installed;
- power is turned off;
- failure has occurred;
- radio parameters have not yet been set by elementary procedures (7.1.2), therefore, the resource is off-line.

7.1.1.3.3 Availability Status

The availability status elaborates the operational state attribute. State change is only reported when the operational state changes, not when availability status changes. Availability status is only sent as information along with the state change indication. In the present document the following values are used (availability status is a set value):

In test: The resource is undergoing a test procedure. The operational state may be *disabled* or *enabled*, depending on the level of intrusion of the test.

Failed: The resource has an internal fault that prevents it from operating. The operational state is *disabled*.

Power off: The resource requires power to be applied and is not powered on. The operational state is *disabled*.

Off line: The resource requires some manual and/or automatic operation(s) to be performed to make it available for use. The operational state is *disabled*.

Dependency: The resource cannot operate because some other resource on which it depends is unavailable. The operational state is *disabled.*

Degraded: The service available from the resource is degraded in some respect, such as in speed or operating capacity. The operational state is *enabled.*

Not installed: The hardware or the software associated with the managed entity has not been installed at the site. Operational state is *disabled*.

Figure 3 illustrates the operational state and availability status behaviour of managed entities. The initial value of the administrative state is *locked*.

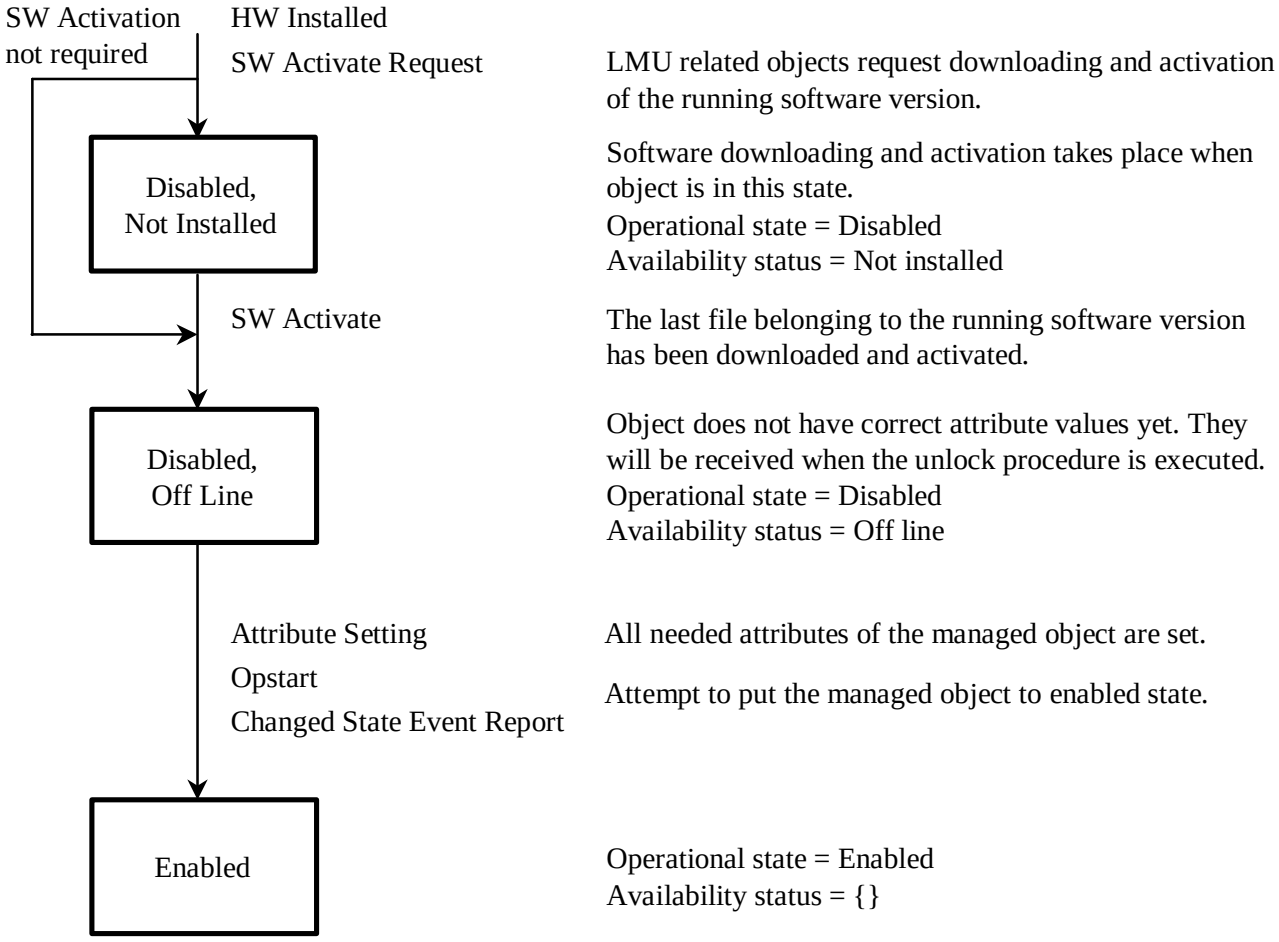


Figure 3: Managed Entities' Operational State and Availability Status Behaviour During Initialisation

7.1.2 Elementary Procedures

The operational procedures applicable to the LMU consist of bringing LMU equipment and software into (or taking them out of) service, initiation of tests at the LMU, collection of test results made at the LMU, reporting and clearing of any LMU faults, and reporting of any LMU external alarms. Bringing into service of equipment at the LMU will consist of manual operations, including powering on, and performing local testing where relevant at the LMU, followed by an indication to the SMLC of the LMU equipment availability. It is then an SMLC function to ensure that relevant data on the existence of the equipment is resident at the LMU, and to activate (bring into service) the new equipment.

7.1.2.1 Definition of the Procedures

All the procedures covered in the present document are based on formatted O&M messages. Most formatted O&M messages initiated by the SMLC (or by an LMU) will receive a response or acknowledgement at Layer 3. A pair of such messages, or single message if a response is not required, is referred to as an elementary procedure. All messages shall be sent using LLP messages.

For all elementary procedures described in subclauses 7.1.2.2 through 7.1.2.8, the protocol scenarios are illustrated with no further explicit reference made from their corresponding subclauses because of their self-explanatory nature.

Descriptions of the messages and the direction of transmission are given in the following subclauses.

No elementary procedure shall be initiated to a managed entity instance which has not yet replied to a previously initiated elementary procedure with a response (a defined response, an ACK or a NACK) within a Layer 3 time-out. The Layer 3 timeout for ACK, NACK and responses shall have a default value of 10 seconds.

An ACK message is returned to inform the application which initialised the message that the command is performed or will be performed.

The whole message must be rejected if there is something not understood/supported in the original message.

A NACK may not be relevant for some elementary procedures.

The most relevant NACK causes, not covered by the general causes (which are used for understanding of header fields), are given for each elementary procedure with reference to the coding of the NACK causes in Subclause A.1.2.4.25.

The general NACK causes are relevant for any NACK message and are also found in A.1.2.4.25.

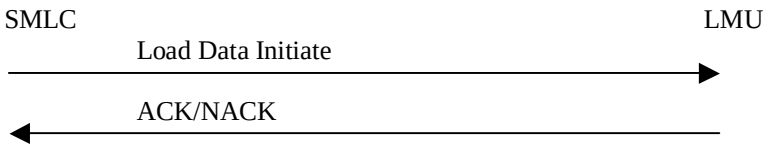
7.1.2.2 SW Download Management Procedures

(See ITU-T Recommendation M.3400 [10] Configuration Management/Installation/Loading SW into NEs).

Software Download Management Procedures facilitate file transfer for downloading software to the LMU. The procedures for software download in the SMLC are as follows. In order to reduce the burden of the management functions on the SMLC, it is recommended that the software storage and the initiation and management control of the procedures reside in the OSS. However, this does not preclude an SMLC from performing these functions.

7.1.2.2.1 Load Data Initiate

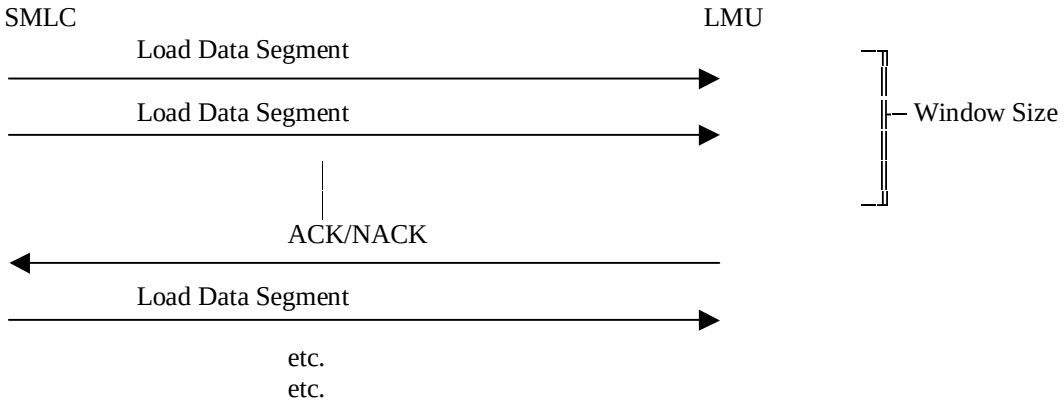
This message shall be sent from the SMLC to the LMU to initiate the loading of a file. It indicates the number of segments for which a Layer 3 acknowledgement is required (window size). When receiving data the LMU shall send an ACK after this number of segments, except for the last batch.



Meaning of ACK message: Ready to receive the specified file.
Message specific NACK causes (see Subclause A.1.2.4.24): 35, 36, 43.

7.1.2.2.2 Load Data Segment

These multi-segment messages shall be used to carry the files for the transfer initiated by the Load Data Initiate message. No other file transfer shall be allowed until the current transfer is finished.



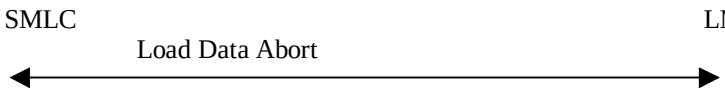
An ACK shall be sent from the LMU to the SMLC every time when *Window Size* number of segments specified in the Load Data Initiate message are downloaded. Each segment will be numbered sequentially. A reception of an ACK must not reset the value of the *sequence number* of the subsequent message segments. When all the expected blocks have been received, an ACK must be sent regardless of the window size. If the timer for a time-out for the Layer 3 acknowledgement expires, the SMLC shall send a Load Data Abort message and the file transfer shall be aborted.

A NACK provides the capability for resending messages that are in error since the last ACK. All messages from the previous ACK shall be resent. Without the NACK, transmission would be delayed while waiting for ACK timeout, or the entire file would need to be resent after receiving a NACK to *Load Data End*.

Meaning of ACK message: A window of *Load Data Segment* messages or a complete file has been received successfully. Message specific NACK causes (see Subclause A.1.2.4.24): 42, 44, 45.

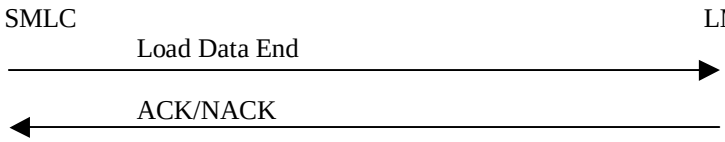
7.1.2.2.3 Load Data Abort

This message shall be used by either end if the file transfer can no longer be supported. This message shall also be used by the LMU if the received amount of data exceeds the expected amount.



7.1.2.2.4 Load Data End

This message shall be sent by the SMLC to the LMU. The LMU sends an ACK when the file has been received in the LMU.



Meaning of ACK message: File download is successfully terminated.
Message specific NACK causes (see Subclause A.1.2.4.24): 37.

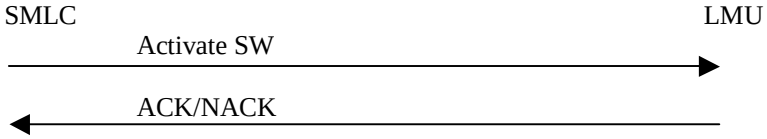
7.1.2.2.5 SW Activate Request

This message shall be sent by the LMU when the resource represented by the managed entity instance has started up. The initialisation of mentioned managed entity instance shall be started with software activation, which may include software download continuing with attribute setting.

Meaning of ACK message: The request is granted and software activation will be commenced.
Message specific NACK causes (see Subclause A.1.2.4.24): 40.

7.1.2.2.6 Activate SW

This message from the SMLC to the LMU shall be used to activate or re-initialise the loaded software, indicating which file (or files) is to be activated. The acknowledgement of the *Activate SW* indicates that the software can be activated. If the software cannot be activated, a NACK must be sent. The activation may include LMU internal software distribution.



Meaning of ACK message: File will be activated.
Message specific NACK causes (see Subclause A.1.2.4.24): 35, 38, 39.

7.1.2.2.7 SW Activated Report

This message from the LMU to the SMLC shall be sent from the addressed managed entity on the LMU at a successful completion of the software distribution to and activation on all indicated destinations in the LMU.

7.1.2.3 Diagnostic Test Procedures

Diagnostic Test Procedures allow the OSS to run tests that are available in the LMU. These are not intended to provide an exhaustive in-field test capability.

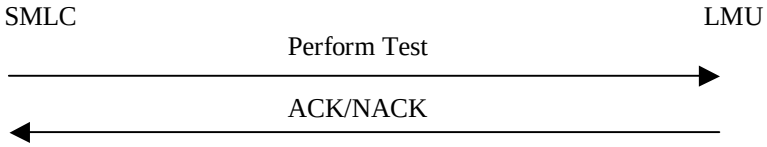
7.1.2.3.1 Perform Test

(See ITU Recommendation M.3400 [10] Fault Management/Fault Localisation/Running of Diagnostic and Configuration Management/Provisioning/NE Configuration/Start Transmission Test).

This message shall be used to tell the LMU to perform a test, if necessary to set a physical configuration for the SMLC to carry out a test on the LMU, or to perform a test using a particular configuration. Any measurements may be performed as specific tests. Duration for the test can be given, after which the test report may be autonomously sent if so requested. It is not assumed that the LMU will provide scheduling for recurring tests. Therefore, the recurring mechanism must be built into the test definition.

One test is defined:

A functional managed entity self-test shall be used to activate an internal self test procedure of a functional managed entity on the LMU made to test equipment that provides the services of the functional managed entity. By its nature this test and its results are proprietary.



Meaning of ACK message: Test configuration has been set (if necessary) and the specified test has been started.
Message specific NACK causes (see Subclause A.1.2.4.24): 28, 29, 30.

7.1.2.3.2 Test Report

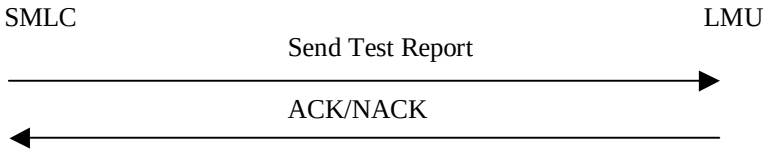
(See ITU Recommendation M.3400 [10] Fault Management/Fault Localisation/NE Fault Localisation/Diagnostic Report).

This message shall be sent by the LMU giving the result of a test ordered by the SMLC and is sent autonomously as soon as the result is available. A *Test Report* shall also be sent after a specific request from the SMLC by a *Send Test Report* message. The *Test Report* indicates what was tested, the test type, and the result. No ACK or NACK is returned to the LMU by the SMLC.

7.1.2.3.3 Send Test Report

(See ITU Recommendation M.3400 [10] Fault Management/Fault Localisation/NE Fault Localisation/Request Diagnostic Data).

This message shall be sent from the SMLC to ask for the result/report of a test which was not to be sent autonomously, but is now to start being reported. If the test result was already made to be autonomously reported, this message can also be used to have the present result of the test be reported immediately. The message must include identification of the test.

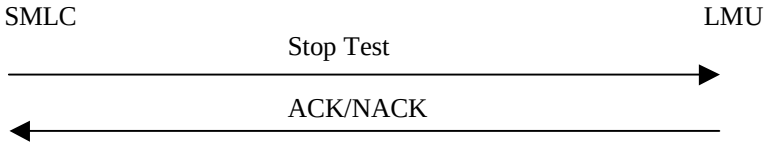


Meaning of ACK message: The specified test report will be sent.
Message specific NACK causes (see Subclause A.1.2.4.24): 28, 31.

7.1.2.3.4 Stop Test

(See ITU Recommendation M.3400 [10] Fault Management/Fault Localisation/NE Fault Localisation/Stop Diagnosis in Progress).

This message shall be used by the SMLC to stop a continuously recurring test at the LMU, to reset a physical test configuration to the normal configuration, or to stop the test and to restore to the normal physical configuration. The message must include identification of the test being performed.



Meaning of ACK message: The specified test has been stopped and test configuration reset to normal (if necessary).
Message specific NACK causes (see Subclause A.1.2.4.24): 32, 33, 34.

7.1.2.4 State Management Procedures

The State Management Procedures provide the capability to control state values.

7.1.2.4.1 State Changed Event Report

(See ITU Recommendation M.3400 [10] Configuration Management/Status and Control/Notification of state changes by NEs).

An unsolicited report shall be sent from the LMU to the SMLC whenever a change of the operational state of a managed entity defined in the present document occurs.

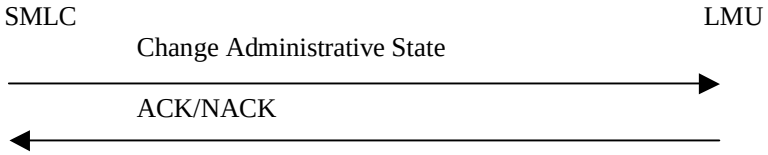
A failure causing change of operational state shall generate two event reports: *State Changed Event Report* and *Failure Event Report*.

No ACK or NACK is returned to the LMU.

7.1.2.4.2 Change Administrative State

(See ITU Recommendation M.3400 [10] Configuration Management/Provisioning/NE Configuration/Set Service State).

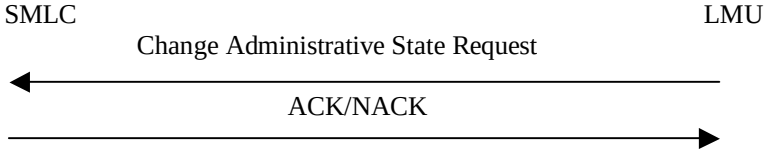
The Change Administrative State message shall be used by the SMLC to change the administrative state (as specified by specification GSM 12.20) of a managed entity.



Meaning of ACK message: The specified change of administrative state has been performed.
Message specific NACK causes (see Subclause A.1.2.4.24): None.

7.1.2.4.3 Change Administrative State Request

This request message shall be sent by the LMU when there is a need to change the administrative state of a managed entity at the LMU site. This message can only be initiated as a result of a local MMI command. This message is needed since there may be a need to change the administrative state from the LMU, yet only the agent can change the administrative state. To resolve this, the LMU requests the agent to change the administrative state.



Meaning of ACK message: The request is granted and a change administrative state message will be sent.
Message specific NACK causes (see Subclause A.1.2.4.24): 40, 41.

7.1.2.5 Event Report Procedures

Event Report Procedures provide event reporting and control.

7.1.2.5.1 Failure Event Report

(See ITU Recommendation M.3400 [10] Fault Management/Alarm Surveillance/Alarm Reporting/Report Alarm, Fault Management/Alarm Surveillance/Failure Event Detection and Reporting, Configuration Management/Status and Control/NE Status and Control/Control Event Report, and Fault Management/Fault Correction/NE Fault Correction/Automatic Restoration Report).

An unsolicited report shall be sent from the LMU to the SMLC whenever failure events occur in the LMU.

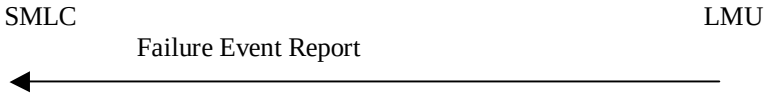
Such failure events are:

- fault in a resource resulting from passing a threshold but not constituting a failure;
- failure of a resource.

Pertaining to a failure, there shall be a report for its start and another for its end.

A failure causing change of operational state shall generate two event reports: *State Changed Event Report* and *Failure Event Report*.

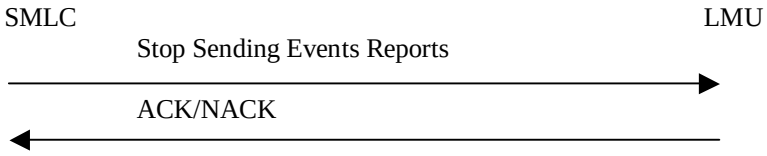
No ACK or NACK is returned to the LMU.



7.1.2.5.2 Stop Sending Event Reports

(See ITU Recommendation M.3400 [10] Fault Management/Alarm Surveillance/Alarm Reporting/Inhibit Alarm Reporting).

This inhibition of sending of event reports shall be used by the SMLC to prevent a flood of event reports which are of no benefit to the SMLC. One example of this occurs at an LMU restart following a power failure. The operational capability of the LMU hardware is unlikely to be different from what it was before the failure, and a flood of reports, each stating that a piece of hardware is operating, will delay the software download. Another example concerns the case of a frequently occurring transient fault.

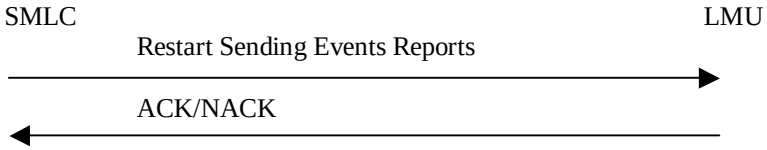


Meaning of ACK message: Sending of specified Event Report has been stopped.
Message specific NACK causes (see Subclause A.1.2.4.24): None.

7.1.2.5.3 Restart Sending Event Reports

(See ITU Recommendation M.3400 [10] Fault Management/Alarm Surveillance/Alarm Reporting/Allow Alarm Reporting).

When the LMU is back in normal operation or if it is of interest to check whether the LMU still generates a flood of Event Reports, a Restart Sending Event Reports shall be sent.

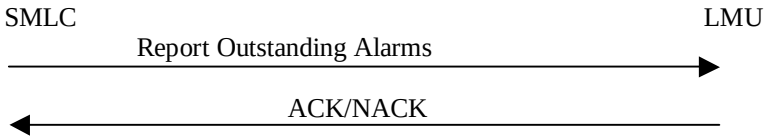


Meaning of ACK message: Sending of specified Event Report has been restarted.
Message specific NACK causes (see Subclause A.1.2.4.24): None.

7.1.2.5.4 Report Outstanding Alarms

(See ITU Recommendation M.3400 [10] Fault Management/Alarm Surveillance/Alarm Reporting/Request Alarm History).

This message shall be used by the SMLC to ask the LMU to report all outstanding alarms related to the managed entity instance indicated in the message. The LMU shall report alarms by sending a series of *Failure Event Report* messages for all outstanding alarms. Only those alarms previously reported and still outstanding shall be re-reported through this procedure. Any new alarms not yet reported but about to be reported shall be excluded and they shall be reported through a separate *Failure Event Report* procedure spontaneously initiated by the LMU itself. If there is no outstanding alarm, the LMU shall reply with a NACK with that cause indicated.



Meaning of ACK message: Sending of *Failure Event Report* will start.
Message specific NACK causes (see Subclause A.1.2.4.24): 40, 41, 42.

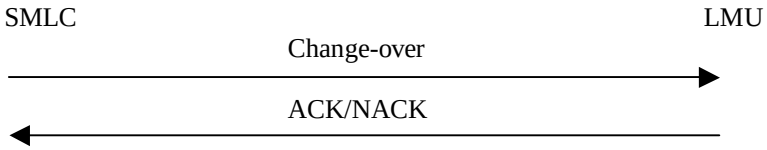
7.1.2.6 Equipment Management Procedures

Equipment Management Procedures provide the capability to control equipment during maintenance.

7.1.2.6.1 Change-over

(See ITU Recommendation M.3400 [10] Configuration Management/Status and Control/Status and Control of NEs).

This message shall be sent to change over between active and standby units of equipment. The action may be performed on any addressable functional managed entity and manufacturer-dependent HW units. Which type of HW unit to address and how to identify certain units of this type of HW are manufacturer-dependent.

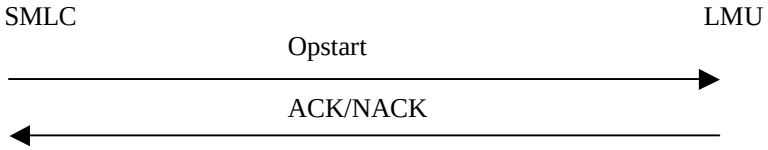


Meaning of ACK message: The specified change-over operation has been performed.
Message specific NACK causes (see Subclause A.1.2.4.24): 25, 26, 30, 35.

7.1.2.6.2 Opstart

(See ITU Recommendation M.3400 [10] Configuration Management/Status and Control/NE Status and Control).

This message shall be sent by the SMLC to tell the LMU to attempt to operate the identified managed entity putting it to an initial normal operational state (i.e., *enabled*, see Subclause 7.1.1.3.2). This message does not affect the managed entity's administrative state if there exists a value explicitly assigned by the SMLC. If there is yet no administrative state value explicitly set by the SMLC (e.g., at an initialisation time), the managed entity shall be presumed to be administratively locked by default. No LMU function is required to be responsible for testing the operability of the identified resource as a consequence of this message. Prior to this message being issued, all necessary physical and logical preparations (such as repair of equipment, software downloading, parameter setting, etc., as needed) are expected to have been completed. If the managed entity is in fact not ready to be in an enabled state, the managed entity will be in a fault condition as a consequence of this message, and the condition shall be handled by the managed entity's normal fault handling function as the condition is detected.



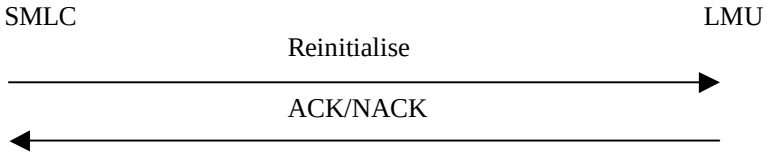
Meaning of ACK message: The LMU has reset the operational state of the specified managed entity to "enabled" state.
Message specific NACK causes (see Subclause A.1.2.4.24): 25, 26, 35.

NOTE: The manager cannot change the operational state, so this procedure allows a change of the operational state.

7.1.2.6.3 Reinitialise

(See ITU Recommendation M.3400 [10] Configuration Management/Provisioning/NE Configuration/Restart Request and Report).

This message shall be sent by the SMLC to tell the LMU to have specified hardware resource of the indicated managed entity start a re-initialisation procedure as sketched in Figure 3. The specifics of a re-initialisation procedure, which typically takes place at the time of a cold start of the resource, is manufacturer-dependent. For a software reinitialisation, *Activate SW* message shall be used.



Meaning of ACK message: The LMU has received the message and is about to start a reinitialisation of the specified resource.
Message specific NACK causes (see Subclause A.1.2.4.24): 25, 26, 35.

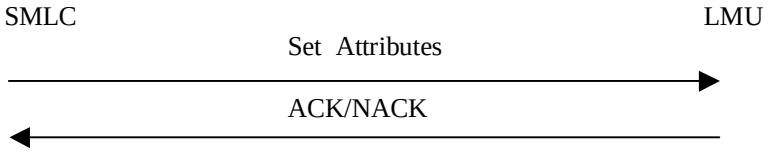
7.1.2.7 General Management Procedures

General Management Procedures are protocol-unique procedures that provide the capability to control attribute values.

7.1.2.7.1 Set Attributes

(See ITU Recommendation M.3400 [10] Configuration Management/Provisioning/NE Configuration/Set Service State and Set Parameters).

This message shall be sent to provide a managed entity instance in LMU with all the necessary attributes relating to that LMU managed entity. This message also includes common information for all logical channels of one type, e.g., CCCH parameters.

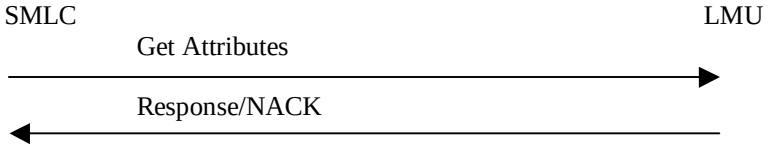


Meaning of ACK message: All specified LMU attributes have been set.
Message specific NACK causes (see Subclause A.1.2.4.24): 35.

7.1.2.7.2 Get Attributes

(See ITU Recommendation M.3400 [10] Configuration Management/Provisioning/NE Configuration/Request Configuration and Configuration Report, Configuration Management/Status and Control/NE Status and Control/Request Status and Status Report, and Configuration Management/Status and Control/Access to State Information in NEs).

This message shall be used by the SMLC to tell the LMU to send attributes which have previously been set by the LMU. It may be used as a check on accuracy and be incorporated into normal procedures, or may be used by the SMLC to recover information which it has lost.

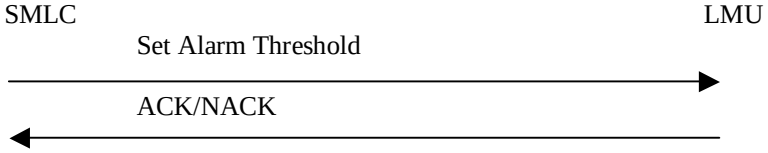


Message specific NACK causes (see Subclause A.1.2.4.24): None.

7.1.2.7.3 Set Alarm Threshold

(See ITU Recommendation M.3400 [10] Configuration Management/Provisioning/NE Configuration/Set Service Thresholds).

This message shall be used by the SMLC to tell the LMU some threshold parameters related to fault thresholds.



Message specific NACK causes (see Subclause A.1.2.4.24): None.

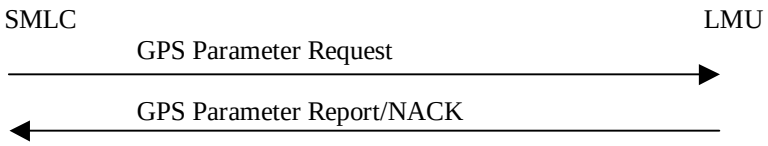
7.1.2.8 Report Management Procedures

(See ITU Recommendation M.3400 [10] Configuration Management/Status and Control/Status and Control of NEs).

Report Management Procedures provide access to GPS information.

7.1.2.8.1 GPS Parameter Request

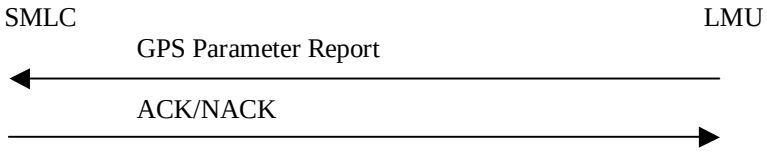
This message shall be used by the SMLC to request current GPS position from the LMU.



Message specific NACK causes (see Subclause A.1.2.4.24): None.

7.1.2.8.2 GPS Parameter Report

This message shall be used by the LMU as a solicited or unsolicited report to convey GPS position measurements which may be corrected by the SMLC.



Message specific NACK causes (see Subclause A.1.2.4.24): None.

7.1.3 Message Coding

This clause defines the OMMngrReq and OMAgentReq messages specified in 04.71 [9]. These messages contain the SMLC-LMU messages defined by ASN.1 and coded by PER (X.691 [12]). In this ASN.1 module, ASN.1/94 defined in ITU-T X.680 [11] recommendations (ASN.1 1994) is used.

```
LLP-OM-Protocol
--{ LLP-OM-Protocol Object Identifier }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

    ExtensionContainer
FROM MAP-ExtensionDataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version4 (4)}
;

-- OMMngrReq are message requests from the SMLC to the LMU

OMMngrReq   ::= CHOICE
{
    -- SW Download Message
    loadDataInitiate            LoadDataInitiate,
    loadDataSegment         LoadDataSegment,
    loadDataEnd         LoadDataEnd,
    loadDataAbort           LoadDataAbort,      -- Does not have ACK/NACK
    activateSW          ActivateSW,

    -- Diagnostic Test Procedures
    performTest         PerformTest,
    sendTestRep         SendTestRep,
    stopTest                StopTest,

    -- State Management Procedures
    chngAdminState          ChngAdminState,

    -- Event Report Procedures
    stopSendingEvntRep      StopSendingEvntRep,
    restartSendingEvntRep       RestartSendingEvntRep,
    repOuststandingAlarms       RepOuststandingAlarms,

    -- Equipment Management Procedures
    chngOver            ChngOver,
    opstart             Opstart,
    reinitialize            Reinitialize,

    -- General Management Procedures
    setAttributes           SetAttributes,
    getAttributes           GetAttributes,
    setAlarmThreshold       SetAlarmThreshold,

    -- Report Management Procedures
    gpsParameterReq         GPSParameterReq,

    -- Manufacture Dependent Procedures
    mngrManufDepReq     MngrManufDepReq,
    …
}


-- OMAgntReq are message requests from the LMU to the SMLC

OMAgntReq   ::= CHOICE
{
    -- SW Download Message
    loadDataAbort           LoadDataAbort,      -- Does not have ACK/NACK
    swActivateReq           SWActivateReq,
    swActivatedRep          SWActivatedRep,     -- Does not have ACK/NACK

    -- Diagnostic Test Procedures
    testRep             TestRep,        -- Does not have ACK/NACK
```

```
    -- State Management Procedures
    stateChngEvntRep        StateChngEvntRep,   -- Does not have ACK/NACK
    chngAdminStateReq       ChngAdminStateReq,

    -- Event Report Procedures
    failureEvntRep          FailureEvntRep,      -- Does not have ACK/NACK

    -- Report Management Procedures
    gpsParameterRep         GPSParameterRep,

    -- Manufacture Dependent Procedures
    agntManufDepReq     AgntManufDepReq,
    …
}


-- OMMngrRsp are responses from the LMU to the SMLC message requests

OMMngrRsp   ::= CHOICE
{
    activateSWRsp           ActivateSWRsp,
    loadDataInitiateRsp     LoadDataInitiateRsp,
    loadDataSegmentRsp      LoadDataSegmentRsp,
    loadDataEndRsp          LoadDataEndRsp,
    performTestRsp          PerformTestRsp,
    sendTestRepRsp          SendTestRepRsp,
    stopTestRsp         StopTestRsp,
    chngAdminStateRsp       ChngAdminStateRsp,
    stopSendingEvntRepRsp       StopSendingEvntRepRsp,
    restartSendingEvntRepRsp    RestartSendingEvntRepRsp,
    repOuststandingAlarmsRsp    RepOuststandingAlarmsRsp,
    chngOverRsp         ChngOverRsp,
    opstartRsp          OpstartRsp,
    reinitializeRsp         ReinitializeRsp,
    setAttributesRsp            SetAttributesRsp,
    getAttributesRsp            GetAttributesRsp,
    setAlarmThresholdRsp        SetAlarmThresholdRsp,
    mngrManufDepRsp     MngrManufDepRsp,
    gpsParameterReqRsp      GPSParameterReqRsp,
    …
}


-- OMAgntRsp are responses from the SMLC to the LMU message requests

OMAgntRsp   ::= CHOICE
{
    swActivateReqRsp        SWActivateReqRsp,
    chngAdminStateReqRsp        ChngAdminStateReqRsp,
    gpsParameterRepRsp      GPSParameterRepRsp,
    agntManufDepRsp     AgntManufDepRsp,
    …
}


--OMMngrReq Messages

ActivateSW          ::= SEQUENCE
{
    header          Header,
    swDescription       SWDescription   OPTIONAL
}

ChngAdminState          ::= SEQUENCE
{
    header          Header,
    administrativeState AdministrativeState
}

ChngOver            ::= SEQUENCE
{
    header          Header,
    source          Source,
```

```
    destination     Destination
}

GetAttributes           ::= SEQUENCE
{
    header          Header,
    list            SEQUENCE OF AttributeIdentifier
}

GPSParameterReq     ::= SEQUENCE
{
    header          Header
}

LoadDataAbort           ::= SEQUENCE
{
    header          Header
}

LoadDataEnd         ::= SEQUENCE
{
    header          Header
}

LoadDataInitiate            ::= SEQUENCE
{
    header          Header,
    swDescription       SWDescription,
    windowSize      WindowSize,
    numberOfSegments    NumberOfSegments
}

LoadDataSegment     ::= SEQUENCE
{
    header          Header,
    sequenceNumber      INTEGER (0..255),
    fileData            FileData
}

MngrManufDepReq     ::= SEQUENCE
{
    header          Header,
    …
}

Opstart             ::= SEQUENCE
{
    header          Header
}

PerformTest         ::= SEQUENCE
{
    header          Header,
    testNumber      TestNumber,
    autonomouslyRep AutonomouslyRep,
    testDuration        TestDuration        OPTIONAL,
    physicalConfiguration   PhysicalConfiguration   OPTIONAL
}

Reinitialize            ::= SEQUENCE
{
    header          Header,
    hwDescription       SEQUENCE OF HWDescription       OPTIONAL
}

RepOuststandingAlarms   ::= SEQUENCE
{
    header          Header
}

RestartSendingEvntRep   ::= SEQUENCE
{
    header          Header,
    eventType       EventType,
    perceivedSeverity   PerceivedSeverity   OPTIONAL,
    probableCause       ProbableCause       OPTIONAL,
    specificProblems        SpecificProblems        OPTIONAL
}
```

```
SendTestRep         ::= SEQUENCE
{
    header          Header,
    testNumber      TestNumber
}

SetAlarmThreshold       ::= SEQUENCE
{
    header          Header,
    probableCause       ProbableCause,
    manufacturerDependentThresholds     ManufacturerDependentThresholds   OPTIONAL
}

SetAttributes           ::= SEQUENCE
{
    header          Header,
    list            SEQUENCE OF SEQUENCE
{
    id  AttributeIdentifier,
    value   AttributeData
}
}

StopSendingEvntRep      ::= SEQUENCE
{
    header          Header,
    eventType       EventType,
    perceivedSeverity   PerceivedSeverity   OPTIONAL,
    probableCause       ProbableCause       OPTIONAL,
    specificProblems        SpecificProblems        OPTIONAL
}

StopTest    ::= SEQUENCE
{
    header          Header,
    testNumber      TestNumber
}


--OMAgntReq Messages

AgntManufDepReq     ::= SEQUENCE
{
    header          Header,
    …
}

ChngAdminStateReq       ::= SEQUENCE
{
    header          Header,
    administrativeState AdministrativeState
}

FailureEvntRep          ::= SEQUENCE
{
    header          Header,
    eventType       EventType,
    perceivedSeverity   PerceivedSeverity,
    probableCause       ProbableCause,
    eventTime       EventTime       OPTIONAL,
    specificProblems        SpecificProblems        OPTIONAL,
    hwDescription       HWDescription       OPTIONAL,
    swDescription       SWDescription       OPTIONAL,
    additionalText      AdditionalText      OPTIONAL,
    additionalInfo      AdditionalInfo      OPTIONAL,
    outstandingAlarmSequence    OutstandingAlarmSequence    OPTIONAL
}

GPSParameterRep     ::= SEQUENCE
{
    header          Header,
    pseudoRange     PseudoRange,
    timeOfFix       TimeOfFix,
    satelliteInfo       SatelliteInfo
}

StateChngEvntRep        ::= SEQUENCE
```

```
{
    header          Header,
    operationalState        OperationalState        OPTIONAL,
    availabilityStatus      AvailabilityStatus  OPTIONAL,
    manufacturerDependentState  ManufacturerDependentState  OPTIONAL
}

SWActivatedRep          ::= SEQUENCE
{
    header          Header,
    result          Result
}

SWActivateReq           ::= SEQUENCE
{
    header          Header,
    hwConfiguration     HWConfiguration,
    swConfiguration     SWConfiguration
}

TestRep             ::= SEQUENCE
{
    header          Header,
    testNumber      TestNumber,
    testRepInfo     TestRepInfo
}


-- OMMngrRsp Messages

ActivateSWRsp           ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

ChngOverRsp         ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

ChngAdminStateRsp       ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

GetAttributesRsp            ::= SEQUENCE  OF SEQUENCE
{
    attributeIdentifier     AttributeIdentifier,
    information     AttributeData
}

GPSParameterReqRsp      ::= CHOICE
{
gpsParameterRep     GPSParameterRep,    -- or a NACK is sent
empty       Empty
…
}

LoadDataEndRsp          ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

LoadDataInitiateRsp     ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

LoadDataSegmentRsp      ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}
```

```
MngrManufDepRsp     ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

OpstartRsp          ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

PerformTestRsp          ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

ReinitializeRsp         ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

RepOuststandingAlarmsRsp    ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

RestartSendingEvntRepRsp    ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

SendTestRepRsp          ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

SetAlarmThresholdRsp        ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

SetAttributesRsp            ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

StopSendingEvntRepRsp       ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

StopTestRsp         ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

-- OMAgntRsp Messages

AgntManufDepRsp     ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

ChngAdminStateReqRsp        ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
```

```
…
}

GPSParameterRepRsp      ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}

SWActivateReqRsp        ::= SEQUENCE
{
extensionContainer  ExtensionContainer  OPTIONAL,
…
}


-- Other Type Definition

AdditionalInfo          ::= OCTET STRING (SIZE (1..244))

AdditionalText          ::= OCTET STRING (SIZE (1..244))

AdministrativeState ::= INTEGER
{
locked (1),
unlocked (2),
shuttingDown (3),
null (64)
} (1..64)

AttributeIdentifier     ::= INTEGER
{
    administrativeState (1),
attenuatorEnable (2),
    autonomousSwap (3),
    availabilityStatus (4),
    calibrationRequired (5),
    diversity (6),
    hwConfiguration (7),
    manufacturerID (8),
    method (9),
    lmuPosition (10),
    operationalState (11),
    selfPositionCapability (12),
    setOwnPositionUponStartup (13),
    softwareDownloadCapability (14),
    swConfiguration (15),
    time (16),
    timingType (17),
    type (18)
} (1..255)

AttributeData           ::= CHOICE
{
    administrativeState     AdministrativeState,
    attenuatorEnable        AttenuatorEnable,
    autonomouslySwap    AutonomouslySwap,
    availabilityStatus      AvailabilityStatus,
    calibrationRequired CalibrationRequired,
    diversity           Diversity,
    hwConfiguration     HWConfiguration,
    lmuPosition     LMUPosition,
    manufacturerID      ManufacturerID,
    method          Method,
    operationalState        OperationalState,
    selfPositionCapabilty   SelfPositionCapabilty,
    setOwnPositionUponStartup   SetOwnPositionUponStartup,
    softwareDownloadCapability  SoftwareDownloadCapability,
    swConfiguration     SWConfiguration,
    time            Time,
    timingType      TimingType,
    type            Type,
    …
}

AttenuatorEnable            ::= BOOLEAN
    -- Enable (TRUE)
```

```
    -- Disable (FALSE)

AutonomouslyRep     ::= BOOLEAN
    -- Autonomously Report (TRUE)
    -- No Autonomous Report (FALSE)

AutonomouslySwap        ::= BOOLEAN
    -- Autonomous Swap (TRUE)
    -- No Autonomous Swap (FALSE)

Availability            ::= INTEGER
{
    inTest (1),
    failed (2),
    powerOff (3),
    offLine (4),
    unused (5),
    dependancy (6),
    degraded (7),
    notInstalled (8)
} (1..128)

AvailabilityStatus      ::= SEQUENCE SIZE (1..28) OF Availability

CalibrationRequired     ::= BOOLEAN
    -- Calibration Required (TRUE)
    -- Calibration Not Required ( FALSE)

Destination         ::= OCTET STRING (SIZE (1..244))

Diversity           ::= BOOLEAN
    -- Diversity (TRUE)
    -- No Diversity (FALSE)

Empty ::= SEQUENCE
{
emptyField          NULL,
extensionContainer  ExtensionContainer  OPTIONAL
}

EventTime           ::= INTEGER (0..604799)

EventType           ::= INTEGER
{
    communicationFailure (1),
    qualityOfServiceFailure (2),
    processingFailure (3),
    equipmentFailure (4),
    environmentFailure (5)
    -- reserved (6..15)
    -- manufacturerDependent (16..255)
} (1..255)

FileData                ::= OCTET STRING (SIZE (1..244))

FileID              ::= OCTET STRING (SIZE (1..244))

FileVersion         ::= OCTET STRING (SIZE (1..244))

Header              ::= SEQUENCE
{
    managedEntityType   ManagedEntityType,
    managedEntityInstance   ManageEntityInstance
}

HWConfiguration     ::= SEQUENCE SIZE (1..64) OF HWDescription

HWDescription           ::= SEQUENCE
{
    equipmentID     OCTET STRING (SIZE (1..244)),
    equipmentType       OCTET STRING (SIZE (1..244)),
    equipmentVersion    OCTET STRING (SIZE (1..244)),
    location            OCTET STRING (SIZE (1..244)),
    manufacturerInfo        OCTET STRING (SIZE (1..244)),
    …
}

Latitude    ::= SEQUENCE
```

```
{
    -- ddMM.mmmm
    degrees         INTEGER (0..90),
    minutes         INTEGER (0..59),
    fractionalMinuntes  INTEGER (0..9999),
    direction           BOOLEAN
        -- North (FALSE )
        -- South (TRUE)
}

LMUPosition         ::= SEQUENCE
{
    latitude            Latitude,
    longitude       Longitude,
    altitude            INTEGER (0..16383)
}

Longitude   ::= SEQUENCE
{
    -- ddMM.mmmm
    degrees         INTEGER (0..180),
    minutes         INTEGER (0..59),
    fractionalMinuntes  INTEGER (0..9999),
    direction           BOOLEAN
        -- East (FALSE)
        -- West (TRUE)
}

ManagedEntityType       ::= INTEGER
{
    lmu (1),
    uplinkTimingEstimator (2),
    downlinkTimingEstimator (3),
    networkTransceiver (4),
    null (255)
} (1..255)

ManageEntityInstance        ::= SEQUENCE
{
    lmuNumber       INTEGER (0..65535),
    firstTierNumber     INTEGER (0..255),

    …
}

ManufacturerDependentState  ::= INTEGER (1..64)

ManufacturerDependentThresholds ::= SEQUENCE SIZE (0..255) OF SEQUENCE
{
id          INTEGER (0..255),
threshold       Number
}

ManufacturerID          ::= OCTET STRING (SIZE (1..244))

Method              ::= BIT STRING
{
    toa (0),
    eotd (1),
    agps (2)
} (SIZE(1..32))

NACKCauses          ::= INTEGER
{
    -- General Nack

    incorrectMsgStruct (1),
    invalidMsgTypeValue (2),
    -- reserved (3-4)
    invalidManagedEntityClassValue (5),
    managedEntityClassNotSupported (6),
    lmuNumUnknown (7),
    basebandTransceiverNumUnknown (8),
    managedEntityInstanceUnknown (9),
    -- reserved (10-11)
    invalidAttributeIdentifierValue (12),
    attributeIdentifierNotSupported (13),
    parameterValueOutsidePermittedRange (14),
```

```
    inconsistencyInAttributeList (15),
    specifiedImplementationNotSupported (16),
    messageCannotBePerformed (17),
    -- reserved (18..24)

    -- Specific NACK

    resourceNotImplemented (25),
    resourceNotAvailable (26),
    frequencyNotAvailable (27),
    testNotSupported (28),
    capacityRestrictions (29),
    physicalConfigurationCannotBePerformed (30),
    testNotInitiated (31),
    physicalConfigurationCannotBeRestored (32),
    noSuchTest (33),
    testCannotBeStopped (34),
    messageInconsisitentWithPhysicalConfig (35),
    unableToReceiveFile (36),
    completeFileNotReceived (37),
    fileNotAvailableAtDestination (38),
    fileCannotBeActivated (39),
    requestNotGranted (40),
    wait (41),
    notAllSegmentMessageReceivedSuccessfully (42),
    windowSizeTooLarge (43),
    duplicateSequenceNumber (44),
    missingSequenceNumber (45),
    -- reserved (46..126)
    -- manufacturerDependent (127..254)
    null (255)
} (1..255)

Number      CHOICE
{
intNum      INTEGER (0..255),
realNum     REAL
}

NumberOfSegments        ::= INTEGER (0..65535)

OperationalState            ::= INTEGER
{
    disabled (1),
    enabled (2),
    null (255)
} (1..255)

OutstandingAlarmSequence    ::= INTEGER (0..255)

PerceivedSeverity       ::= INTEGER
{
    failureCeased (1),
    criticalFailure (2),
    majorFailure (3),
    minorFailure (4),
    warningLevelFailure (5),
    indeterminateFailure (6)
    -- reserved (7..63)
    -- manufacturerDependent (63..255)
} (1..255)

PhysicalConfiguration       ::= INTEGER (0..255)

ProbableCause           ::= SEQUENCE
{
    probableCauseType   ProbableCauseType,
    probableCauseValue  INTEGER (1..1024)
}

ProbableCauseType       ::= INTEGER
{
    x721 (1),
    gsmSpecific (2),
    manufacturerSpecific (3)
} (1..32)

PseudoRange         ::= SEQUENCE
```

```
{
    -- KKKKK.kkkkk
    kiloMeters      INTEGER (0..99999),
    factionalKM     INTEGER (0.99999)

}

Result              ::= BOOLEAN
    -- Success (TRUE)
    -- Failure (FLASE)

SatelliteInfo           ::= SEQUENCE SIZE (1..16) OF SEQUENCE
{
    id          INTEGER (1..32)
}

SelfPositionCapabilty       ::= BOOLEAN
    -- Capable Of Self Position (TRUE)
    -- Incapable Of Self Position (FLASE)

SetOwnPositionUponStartup   ::= BOOLEAN
    -- Set Own Position Upon Startup (TRUE)
    -- Do Not Set Own Position Upon Startup (FLASE)

SoftwareDownloadCapability  ::= BOOLEAN
    -- Software Download Capability (TRUE)
    -- No Software Download Capability (FLASE)

Source              ::= OCTET STRING (SIZE (1..244))

SpecificProblems            ::= INTEGER (0..255)
    -- reserved (0..15)
    -- manufacturerDependent (16..255)

SWConfiguration         ::= SEQUENCE SIZE (1..64) OF SWDescription

SWDescription           ::= SEQUENCE
{
    fileId          FileID,
    fileVersion     FileVersion
}

TestDuration            ::= INTEGER (0..16777215)

TestNumber          ::= INTEGER
{
    lmuFunctionalObjectSelfTest (1),
    allTestsAssociatedWithTheObject (255)
    -- reserved (2..63)
    -- manufacturerDependent (64..254)
} (1..255)

TestRepInfo         ::= Number

Time                ::= INTEGER (0..604800)

TimeOfFix           ::= INTEGER (0..604800)
    -- In GPS seconds

TimingSource            ::= BIT STRING
{
    gps (0),
    gsm (1),
    glonass (2),
    internalClock (3),
    network (4)
} (SIZE(0..63))

TimingType          ::= SEQUENCE
{
    timingSource        TimingSource,
    calibrationRequired CalibrationRequired
}

Type                ::= INTEGER
{
    typeALMU (1),
    typeBLMU (2)
```

```
} (1..32)

WindowSize          ::= INTEGER (1..65535)

END
```

7.2 SMLC LCS O&M Messages and Procedures

For future study.

7.3 GMLC LCS O&M Messages and Procedures

For future study.

Annex A (informative): Messages and Procedures Descriptions

A.1 LMU Messages

Messages in this section have been provided for information only. When there is a discrepancy between this section and the ASN.1 code, the ASN.1 code takes precedence.

A.1.1 Message Details

The formats of all messages in Subclauses 7.1.2.2 through 7.1.2.8 are each described by a table format illustration. No formal text description has been provided, because of the self-explanatory nature of the illustrations. ASN.1 coding does not require bit-level definitions. The following sections show bit-level coding for informational purposes only.

A.1.1.1 Message Categories

This subclause defines the transport format and coding of the two Network Management message categories sent over the LMU-SMLC interface. The various message categories may be sent in either direction. In each message, the message discriminator identifies the category and is transmitted first.

In the following subclauses, M and O denote whether information elements are mandatory or optional. V indicates that the length is different for each message.

A.1.1.1.1 Formatted O&M Messages

LCS O&M is transported using the container messages specified in 04.71 [9]. ASN.1 coding does not require bit-level definition of the DTAP messages. However, sections of 12.21 [5] have been included here to show how bit-level coding is performed on the Abis interface.

The message format and coding of these messages are as below:

INFORMATION ELEMENT	M/O	LENGTH	CODING 8 1
Message Discriminator	M	1	1 0 0 0 0 0 0 0
Placement Indicator	M	1	1)
Sequence Number	M	1	2)
Length Indicator	M	1	Binary, 3)
O&M Data Field	M	V	4)

NOTE 1: The meanings and codings of the Placement Indicator are:

Only: This message is contained within one segment 1 0 0 0 0 0 0 0

First: The first segment of a multi-segment message 0 1 0 0 0 0 0 0

Middle: A middle segment of a multi-segment message 0 0 1 0 0 0 0 0

Last: The last segment of a multi-segment message 0 0 0 1 0 0 0 0

NOTE 2: This is the sequence number of the segment in the message, modulo 256, starting with 00000000. Thus a single segment message is coded here as 00000000. The number can be incremented without limit by being wrapped around the modulo to transport very long multi-segment messages.

NOTE 3: The Length Indicator gives the length of the O&M data field in the message segment being transported which is less than or equal to 255 octets. This length indicator should not be confused with the actual length of the message at the logical level that may go over multiple segments. This length indicator should not be confused with attribute value length indicator described in Subclause A.1.1.1.3.

NOTE 4: Coding for O&M Data field is found in Subclause A.1.1.1.3 and the following subclauses.

A.1.1.1.2 Manufacturer-Defined O&M messages

LCS O&M is transported using the container messages specified in 04.71 [9]. ASN.1 coding does not require bit-level definition of the DTAP messages. However, sections of 12.21 [5] have been included here to show how bit-level coding is performed on the Abis interface.

The message format and coding of these messages is as below:

INFORMATION ELEMENT	M/O	LENGTH	CODING 8 1
Message Discriminator	M	1	0 0 0 1 0 0 0 0
Placement Indicator	M	1	Note 1 of Subclause A.1.1.1.1
Sequence Number	M	1	Note 2 of Subclause A.1.1.1.1
Length Indicator	M	1	Binary, 1)
Man. ID Length Indicator	M	1	Binary, 2)
Man. ID	M	V	3)
Man.-Def. O&M Data Field	M	V	Proprietary

NOTE 1: The Length Indicator gives the length of the Manufacturer-defined O&M data field in the message segment being transported which is less than or equal to 255 octets. See also Note 3 of Subclause A.1.1.1.1.

NOTE 2: The Length Indicator gives the length of the Manufacturer Identifier field which must be less than or equal to 255 octets.

NOTE 3: The Manufacturer Identifier is an octet string of maximally 255 octets. This value, to be appropriately determined by an arrangement between the operator and the manufacturer, may or may not be related to the value of the attribute *Manufacturer Id* (Attribute Id: 1E) listed in Subclause A.1.2.4.

Remarks: Since the Data Field of messages of this category is not subject to a GSM standardisation, it should be noted that a compliance to messages of this category does not guarantee an interoperability between different manufacturers.

A.1.1.1.3 Structure of Formatted O&M Messages

This subclause provides details of all the formatted O&M messages.

In every case when particular header octets provide no usable information at the receiver, they shall be coded all 1's.

All fields in the messages are marked with M for Mandatory or O for Optional. This indicates whether the field is mandatory or optional to be contained in a message, and **not** whether it is mandatory or optional to be used or set for every LMU. This allows changing a single attribute without having to repeat all the attributes not to be changed.

The header fields of formatted O&M messages (see below) are always mandatory. The attributes defined for a certain message supported by the LMU implementation are mandatory to be used if not stated otherwise in an explanatory note.

The first octet of the formatted O&M messages shall identify the message types. Some messages are replied by an ACK or a NACK response. The replies shall be distinguished by different codings of the message type (the first octet of formatted O&M messages). See Subclause A.1.2.1.

ACK messages shall return all the attributes in the original message. NACK messages shall add a *NACK cause* field (two octets) at the end of the message.

None of the messages concerned require all of the capacity available in a Layer 2 segment, so the NACK message will not need a second Layer 2 frame.

An ACK to a number of *Load Data Segments* shall consist of only the header with the *Load Data Segment ACK* message type.

All attributes shall overwrite those defined in an earlier message since startup or the last restart. Optional attributes provide new information if they have not been defined in an earlier message.

The message type and managed entity identification are given in the message header as is illustrated below:

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3

The Managed Entity Class information element shall be filled in with the correct information in accordance with the present document.

The Managed Entity Instance information element shall contain three fields:

1) The LMU Number identifies one LMU in a multi cell site.

2) The First Tier number identifies which Uplink Timing Estimator, Downlink Timing Estimator, or Network Transceiver is concerned in the message.

3) The third element is provided for future use.

For further information see Subclause A.1.2.3.

The FORMAT field describes the structure of each information element using T(Tag), L(Length) and V(Value) coding. *T* is the attribute identifier. *V* is the actual information presented. *L* must be indicated if the information element is of variable length and its prediction is not possible in the context. *L* shall binary-represent in a two octet space the number of octets in the remaining part of the information element. Note that this Length code differs from the "Length Indicator" described in Subclause A.1.1.1.

A.1.1.2 SW Download Management Messages

A.1.1.2.1 Load Data Initiate (No CMIP [13] equivalent)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
SW Description	A.1.2.4.41	M	TV	>=2
Window Size	A.1.2.4.49	M	TV	2
Number of Segments	A.1.2.4.26	M	TV	1

A.1.1.2.2 Load Data Segment (No CMIP equivalent)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Sequence Number		M 1)	V	1
File Data	A.1.2.4.13	M 2)	TLV	>=2

NOTE 1: The *Sequence Number* is incremented for each data segment and rolls over from 255 to 0.

NOTE 2: *File Data* is individual segments of the actual file to be transferred.

A.1.1.2.3 Load Data Abort (No CMIP equivalent)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3

NOTE: The LLP invoke ID will be used to associate segmented messages. One logical message will have one invoke ID regardless of how many segments it is spread over.

A.1.1.2.4 Load Data End (No CMIP equivalent)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3

NOTE: The LMU must maintain a counter and send an ACK when all the data has been received.

A.1.1.2.5 SW Activate Request (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
HW Configuration	A.1.2.4.16	M	TLV	>=2
SW Configuration	A.1.2.4.40	M	TLV	>=2

A.1.1.2.6 Activate SW (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
SW Description	A.1.2.4.41	O 1)	TV	>=2

NOTE 1: *SW Descriptions* may be repeated for multiple software activation. No SW Description entry implies all software for the managed entity instance.

A.1.1.2.7 SW Activated Report (Compare M-Event-Report)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Result	A.1.2.4.33	M	V	1

A.1.1.3 Test Management Messages

A.1.1.3.1 Perform Test (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Test Number	A.1.2.4.43	M	TV	2
Autonomously Report	A.1.2.4.6	M	TV	1
Test Duration	A.1.2.4.42	O	TV	3
Physical Configuration	A.1.2.4.30	O 1)	TLV	>=2

NOTE 1: Use of *Physical Configuration* depends on the need for extra information in setting up specific test configurations.

A.1.1.3.2 Test Report (Compare M-Event-Report)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Test Number	A.1.2.4.43	M	TV	2
Test Report Info	A.1.2.4.44	M 1)	TLV	>=2

NOTE 1: The test report information may give a numerical result or an indication of the range (e.g. pass/fail) into which the test report falls.

A.1.1.3.3 Send Test Report (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Test Number	A.1.2.4.43	M	TV	2

A.1.1.3.4 Stop Test (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Test Number	A.1.2.4.43	M	TV	2

A.1.1.4 State Management Messages

A.1.1.4.1 State Changed Event Report (Compare M-Event-Report)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Operational State	A.1.2.4.27	O	TV	2
Availability Status	A.1.2.4.7	O	TLV	>=2
Manufacturer Dependent State	A.1.2.4.21	O 1)	TLV	>=3

NOTE 1: Use of *Manufacturer Dependent State* depends on the need for extra information on the state change.

A.1.1.4.2 Change Administrative State (Compare M-Set)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Administrative State	A.1.2.4.3	M 1)	TV	2

NOTE 1: Required new administrative state for the specified managed entity.

A.1.1.4.3 Change Administrative State Request (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Administrative State	A.1.2.4.3	M 1)	TV	2

NOTE 1: The requested administrative state for the specified managed entity.

A.1.1.5 Event Report Messages

A.1.1.5.1 Failure Event Report (Compare M-Event-Report)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Event Type	A.1.2.4.12	M	TV	2
Perceived Severity	A.1.2.4.29	M	TV	2
Probable Cause	A.1.2.4.31	M	TV	4
Event Time	A.1.2.4.11	O	TV	2
Specific Problems	A.1.2.4.39	O 1)	TV	2
HW Description	A.1.2.4.17	O 1) 2)	TV	>=2
SW Description	A.1.2.4.41	O 1) 2)	TV	>=2
Additional Text	A.1.2.4.2	O 1)	TLV	>=2
Additional Info	A.1.2.4.1	O 1)	TLV	>=2
Outstanding Alarm Sequence	A.1.2.4.28	O 3)	TV	1

NOTE 1: Depending on the nature of the specific failure and the LMU implementation, only the needed and supported attributes shall be sent.

NOTE 2: This field shall be included to identify the specific associated equipment or software in case the addressed functional managed entity alone is not sufficient to localise the failure.

NOTE 3: This field shall be included if and only if this report is a response to a *Report Outstanding Alarms* message.

A.1.1.5.2 Stop Sending Event Reports (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
EventType	A.1.2.4.12	O 1)	TV	2
Perceived Severity	A.1.2.4.29	O 1)	TV	2
Probable Cause	A.1.2.4.31	O 1)	TV	4
Specific Problems	A.1.2.4.39	O 1)	TV	2

NOTE 1: Stop sending event reports concerning events with any of the parameter values in this attribute list. Depending on the type of event report that shall be stopped, one or some of the attributes shall be sent. The effect of multiple optional attributes in one message is that only those events that satisfy all the attributes simultaneously shall stop. The effect of repeated uses of this message with each different optional attribute is accumulative, thus, is different from the effect of putting all the optional attributes listed together at once in one message. If there occurs any inconsistency or confusion between the conditions for stopping and starting (see Subclause A.1.1.5.3), the event shall be reported instead of being stopped.

NOTE 2: This message with no optional attributes means that all event reports of this event type shall be stopped from now.

A.1.1.5.3 Restart Sending Event Reports (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
EventType	A.1.2.4.12	O 1)	TV	2
Availability Status	A.1.2.4.7	O 1)	TLV	>=2
Perceived Severity	A.1.2.4.29	O 1)	TV	2
Probable Cause	A.1.2.4.31	O 1)	TV	4
Specific Problems	A.1.2.4.39	O 1)	TV	2

NOTE 1: Restart sending event reports concerning events with any of the parameter values in this attribute list. Depending on the type of event report that needs to be restarted, one or some of the attributes shall be sent. The effect of multiple optional attributes is the same as multiple messages repeated with each attribute one by one and events that satisfy any one of the attribute set shall be reported. Note the difference from the condition stated in Note 1 of Subclause A.1.1.5.2.

NOTE 2: This message with no optional attributes means that all event reports of this event type shall be started from now.

A.1.1.5.4 Report Outstanding Alarms (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3

A.1.1.6 Equipment Management Messages

A.1.1.6.1 Change-over (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Source	A.1.2.4.38	M 1)	TLV	>=2
Destination	A.1.2.4.9	M 2)	TLV	>=2

NOTE 1: *Source* is the manufacturer-dependent identity of piece of equipment that shall be taken out of active servicing (changed-over from) and replaced by the *Destination*.

NOTE 2: *Destination* is the manufacturer-dependent identity of piece of equipment that shall be put into active servicing (changed-over to) in place of the *Source*.

A.1.1.6.2 Opstart (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3

A.1.1.6.3 Reinitialise (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
HW Description	A.1.2.4.17	O 1)	TV	>=2

NOTE 1: *HW Descriptions* may be repeated for multiple resources. If no *HW Description* is provided, all resources for the managed entity is implied. For a software reinitialisation, *Activate SW* message shall be used.

A.1.1.7 General Management Messages

A.1.1.7.1 Set Attributes (Compare M-Set)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Length		M	V	1
Attributes ID	A.1.2.4	M	TLV	1
Value	A.1.2.4	M	TLV	>=2
Attributes ID	A.1.2.4	M	TLV	1
Value	A.1.2.4	M	TLV	>=2
(cont.)				
(cont.)				

A.1.1.7.2 Get Attributes (Compare M-Get)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
List Attributes	A.1.2.4	M	TLV	>=2

A.1.1.7.3 Set Alarm Threshold (No CMIP equivalent)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Probable Cause	A.1.2.4.31	M	TV	4
Manufacturer-Dependent Thresholds	A.1.2.4.22	O	TLV	>=2

A.1.1.8 Report Messages

A.1.1.8.1 GPS Parameter Report (Compare M-Event-Report)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3
Pseudo-range	A.1.2.4.32	M	TLV	>=2
Time of Fix	A.1.2.4.46	M	TV	4
Satellite Info	A.1.2.4.34	M	TLV	>=2

A.1.1.8.2 GPS Parameter Request (Compare M-Action)

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	A.1.2.1	M	V	1
Managed Entity Class	A.1.2.2	M	V	1
Managed Entity Instance	A.1.2.3	M	V	3

A.1.2 Coding

This clause defines the bit-level coding of each field in the messages defined in earlier clauses.

The following conventions are required:

- The least significant bit shall be transmitted first, followed by bits 2, 3, 4, etc.
- In an element where octets are identified by an octet number, Octet 1 shall be transmitted first, then octet 2, etc.
- When a field extends over more than one octet, the order of bit values shall progressively decrease as the octet number increases. The least significant bit of the field shall be represented by the lowest numbered bit of the highest numbered octet of the field.
- For unpredictable variable length elements, a length indication coding method defined in Subclause A.1.1.1.3 shall be used. The length information shall always indicate the number of element units (which is octets) following the length indicator excluding the space for the length indicator itself.
- All defined values are indicated in the present document. Other values are reserved.

A.1.2.1 Message Type

The Message Type is coded with 1 octet as illustrated below:

Message Type	1

The following message types are used (all other values reserved).

NOTE: Codes do not match the ASN.1 code

Message Type	hexadecimal code
SW Download Management Messages:	
Load Data Initiate	01
Load Data Initiate ACK	02
Load Data Initiate NACK	03
Load Data Segment	04
Load Data Segment ACK	05
Load Data Abort	06
Load Data End	07
Load Data End ACK	08
Load Data End NACK	09
SW Activate Request	0A
SW Activate Request ACK	0B
SW Activate Request NACK	0C
Activate SW	0D
Activate SW ACK	0E
Activate SW NACK	0F
SW Activated Report	10
Test Management Messages:	
Perform Test	51
Perform Test ACK	52
Perform Test NACK	53
Test Report	54
Send Test Report	55
Send Test Report ACK	56
Send Test Report NACK	57
Stop Test	58
Stop Test ACK	59
Stop Test NACK	5A

State Management Messages:

State Changed Event Report	61
Change Administrative State	69
Change Administrative State ACK	6A
Change Administrative State NACK	6B
Change Administrative State Request	6C
Change Administrative State Request ACK	6D
Change Administrative State Request NACK	6E

Event Report Messages:

Failure Event Report	62
Stop Sending Event Reports	63
Stop Sending Event Reports ACK	64
Stop Sending Event Reports NACK	65
Restart Sending Event Reports	66
Restart Sending Event Reports ACK	67
Restart Sending Event Reports NACK	68
Report Outstanding Alarms	93
Report Outstanding Alarms ACK	94
Report Outstanding Alarms NACK	95

Equipment Management Messages:

Change-over	71
Change-over ACK	72
Change-over NACK	73
Opstart	74
Opstart ACK	75
Opstart NACK	76
Reinitialise	87
Reinitialise ACK	88
Reinitialise NACK	89

General Messages:

Set Attributes	77
Set Attributes ACK	78
Set Attributes NACK	79
Get Attributes	81
Get Attributes Response	82

Get Attributes NACK	83
Set Alarm Threshold	84
Set Alarm Threshold ACK	85
Set Alarm Threshold NACK	86

Report Messages:

GPS Parameter Report	87
GPS Parameter Report ACK	88
GPS Parameter Report NACK	89
GPS Parameter Request	90

A.1.2.2 Managed Entity Class

An Managed Entity Class shall be coded with 1 octet. The values of the managed entity class code are as defined below:

Managed Entity Class

Managed Entity Class	**Hexadecimal Code**
LMU	01
Uplink Timing Estimator	02
Downlink Timing Estimator	03
Network Transceiver	04
<reserved for future use>	<05-FE>
NULL	FF

A.1.2.3 Managed Entity Instance

The Managed Entity Instance shall be coded with 3 octets, addressing the specific managed entity of the given managed entity class as illustrated below:

LMU number	1-2
Second Tier number	3

All 3 octets are mandatory in the header of every message.

The LMU number distinguishes multiple LMUs at the same cell site.

The Second Tier number distinguishes functional managed entities at the second level under the LMU.

A Third Tier number may be used in the future to distinguish functional managed entities at the third level.

When the managed entity class is *LMU*, octets 1-2 shall be a binary presentation of the identifier of the addressed LMU. Octets 3 shall be coded NULL. If the LMU number is NULL, it shall be understood as referring to all LMUs at the site.

When the managed entity class is a function on the second tier, octet 3 shall be a binary presentation of the identifier of the addressed second-tier managed entity, and octet 1 is the identifier of the LMU above it. If the Second Tier number is NULL, it shall be understood as referring to all instances of the class under the LMU.

To avoid unnecessary complexity of LMU implementation, it shall not be allowed to assign a NULL value to any managed entity above the addressed managed entity. For example, if the addressed managed entity is Uplink Timing Estimator, it is not allowed to assign a NULL value to both LMU and Uplink Timing Estimator instances. (Without this constraint, this could be understood as referring to all the Uplink Timing Estimators of all the LMUs).

The value for NULL shall be <FF> in all the cases mentioned above in this Subclause.

A.1.2.4 Attributes and Parameters

The Attribute Identifier is coded with 1 octet. The number of parameters within an attribute is at least one. The length of the parameters within an attribute will vary. The attributes used and the coding of their Attribute Identifier fields are listed below. The values are in hexadecimal.

Attribute Name	Attribute ID
Administrative State	01
Attenuator Enable	02
Autonomous Swap	03
Availability Status	04
Calibration Required	05
Diversity	06
HW Configuration	07
Manufacturer ID	08
Method	09
LMU Position	0A
Operational State	0B
Self Position Capability	0C
Set Own Position Upon Startup	0D
Software Download Capability	0E
Software Configuration	0F
Time	10
Timing Type	11
Type	12

All other values are reserved for future use.

The data structures of the attributes and parameters are described in the remaining part of this subclause in tabular forms with no formal text description of the individual subclauses provided because of their self-explanatory nature.

Henceforth "Attribute Identifier" in this subclause means the identifier for an *attribute* or a *parameter*.

A.1.2.4.1 Additional Info

Attribute Identifier	1
Length	2-3
Additional Info <man.dep.>	4
(cont.)	
(cont.)	N

Additional Info is a manufacturer-dependent field.

A.1.2.4.2 Additional Text

Attribute Identifier	1
Length	2-3
Additional Text <man.dep.>	4
(cont.)	
(cont.)	N

Additional Text is a manufacturer-dependent field and shall be used to include fault localisation information.

A.1.2.4.3 Administrative State

Attribute Identifier	1
Administrative State	2

Administrative State shall be coded as follows:

Locked	01
Unlocked	02
Shutting Down	03
NULL (Adm. state not supported)	FF

A.1.2.4.4 Attenuator Enable

Attribute Identifier	1
Attenuator Enable	2

The toggle switch for *Attenuator Enable* shall be coded as follows:

Attenuator Disable	00
Attenuator Enable	01

A.1.2.4.5 Autonomous Swap

Attribute Identifier	1
Autonomous Swap	2

The toggle switch for *Autonomous Swap* shall be coded as follows:

Swap on command	00
Autonomously swap	01

This attribute enables three options for download software swapping:

- Swap on command:
  - The OSS directly controls swap by disabling autonomous swap and commanding a swap.
- Autonomously swap:
  - The LMU performs download status check and then swaps when there are no measurements pending.
  - The OSS indirectly controls swap by using restart, discontinuing further measurement assignments, or continuing measurements.

A.1.2.4.6 Autonomously Report

Attribute Identifier	1
Autonomously Report	2

The toggle switch for *Autonomous Report* shall be coded as follows:

Autonomously Report	01
Not Autonomously Report	00

NOTE: Autonomous reports may occur multiple times during the period specified by duration to support recurring tests reporting at the completion of each test cycle.

A.1.2.4.7 Availability Status

Attribute Identifier	1
Length	2-3
Availability Status	4
(cont.)	
(cont.)	N

Availability Status may contain one or more octets. Each octet shall have a single status value, which shall be coded as follows:

In test 01

Failed 02

Power off 03

Off line 04

<not used> 05

Dependency 06

Degraded 07

Not installed 08

A.1.2.4.8 Calibration Required

Attribute Identifier	1
Calibration Required	2

Calibration Required shall be coded as follows:

Calibration not required 00

Calibration required 01

A.1.2.4.9 Destination

Attribute Identifier	1
Length	2-3
Destination	4
(cont.)	
(cont.)	N

Destination identifies a unit of equipment that shall be the destination to be "changed to" on a Change-over operation. How to identify a type of equipment and how to identify a specific unit of this type is manufacturer-dependent.

A.1.2.4.10 Diversity

Attribute Identifier	1
Diversity	2

Diversity shall be coded as follows:

No Diversity 00

Diversity 01

A.1.2.4.11 Event Time

Attribute Identifier	1
Event Time	2-3

Event Time is taken from the *Time* attribute.

A.1.2.4.12 Event Type

Attribute Identifier	1
Event Type	2

Event Type shall be coded as follows:

communication failure	01
quality of service failure	02
processing failure	03
equipment failure	04
environment failure	05
<reserved for future use>	<06-0F>
<man.dep.>	<10-FF>

A.1.2.4.13 File Data

Attribute Identifier	1
Length	2
File Data <man.dep.>	3
(cont.)	
(cont.)	N

File Data is manufacturer-dependent, but must be consistent with the associated GSM 12.20 attribute.

A.1.2.4.14 File Id

Attribute Identifier	1
Length	2
File Id <man.dep.>	3
(cont.)	
(cont.)	N

File Id is manufacturer-dependent, but must be consistent with the associated GSM 12.20 attribute.

A.1.2.4.15 File Version

Attribute Identifier	1
Length	2
File Version <man.dep.>	3
(cont.)	
(cont.)	N

File Version is manufacturer-dependent, but must be consistent with the associated GSM 12.20 attribute.

A.1.2.4.16 HW Configuration

Attribute Identifier	1
Length	2
HW Description 1	3
...	
HW Description n	N

HW Configuration shall consist of a list of *HW Descriptions* related to a managed entity.

A.1.2.4.17 HW Description

Attribute Identifier	1
Equipment Id Length	2
Equipment Id	
(cont.)	
Equipment Type Length	
Equipment Type	
(cont.)	
Equipment Version Length	
Equipment Version	
(cont.)	
Location Length	
Location	
(cont.)	
Man. Dep. Info Length	
Man. Dep. Info	
(cont.)	N

All fields are manufacturer-dependent variable length character strings. They must be consistent with associated GSM 12.20 attributes.

Equipment Id distinguishes a piece of equipment from others of same type.

Equipment Type codes the type of piece of equipment (e.g., Baseband Transceiver Unit).

Equipment Version codes the version of the piece of equipment.

Location codes the place where the piece of equipment is found (e.g., row -rack - shelf - slot).

Man. Dep. Info codes additional manufacturer-dependent information.

A.1.2.4.18 Latitude

Attribute Identifier	1
Degrees	2
Minutes	3
Fractional Minutes	4-5
Direction	6

Latitude follows the format of DDMM.mmmm and use the following ranges:

Degrees	0 to 90
Minutes	0 to 59
Fractional Minutes	0 to 9999
Direction	North – 00, South - 01

A.1.2.4.19 LMU Position

Attribute Identifier	1
Latitude	2-7
Longitude	8-13
Altitude	14-15

Altitude shall be coded as 1.5 micro-meters from mean sea level.

A.1.2.4.20 Longitude

Attribute Identifier	1
Degrees	2
Minutes	3
Fractional Minutes	4-5
Direction	6

Latitude follows the format of DDMM.mmmm and use the following ranges:

Degrees	0 to 1800
Minutes	0 to 59
Fractional Minutes	0 to 9999
Direction	East – 00, West – 01

A.1.2.4.21 Manufacturer-Dependent State

Attribute Identifier	1
Manufacturer-Dependent State	2

The content *of Manufacturer-Dependent State* is manufacturer-dependent.

A.1.2.4.22 Manufacturer-Dependent Thresholds

Attribute Identifier	1
Length	2
Manufacturer-Dependent ID	3
Manufacturer-Dependent Thresholds	4
(cont.)	
(cont.)	N

The content *of Manufacturer-Dependent Thresholds* is manufacturer-dependent.

A.1.2.4.23 Manufacturer Id

Attribute Identifier	1
Length	2
Manufacturer Id	3
(cont.)	
(cont.)	N

The content of *Manufacturer Id* is manufacturer-dependent.

A.1.2.4.24 Method

Attribute Identifier	1
Method	2

Method is coded as a bit string with the bits indicated below:

TOA Bit 1

E-OTD Bit 2

A-GPS Bit 3

A zero indicates that the capability is not supported. A one indicates that the capability is supported.

A.1.2.4.25 NACK Causes

Attribute Identifier	1
NACK Cause	2

NACK Causes shall be coded as follows:

General NACK Causes:

Incorrect message structure	01
Invalid message type value	02
<reserved>	<03-04>
Invalid managed entity class value	05
Managed entity class not supported	06
LMU number unknown	07
Baseband transceiver number. unknown	08
Managed entity instance unknown	09
<reserved>	<0A-0B>
Invalid attribute identifier value	0C
Attribute identifier not supported	0D
Parameter value outside permitted range	0E
Inconsistency in attribute list	0F 1)
Specified implementation not supported	10
Message cannot be performed	11 2)

<reserved>	<12-18>

Specific NACK Causes:

Resource not implemented	19
Resource not available	1A
Frequency not available	1B
Test not supported	1C
Capacity restrictions	1D
Physical configuration cannot be performed	1E
Test not initiated	1F
Physical configuration cannot be restored	20
No such test	21
Test cannot be stopped	22
Message inconsistent with physical config.	23 3)
Unable to receive file	24
Complete file not received	25
File not available at destination	26
File cannot be activated	27
Request not granted	28
Wait	29
Not all segment messages received successfully	2A
Window Size Too Large	2B
Duplicate Sequence Number	2C
Missing Sequence Number	2D
<reserved>	<2E-7F>
<man.dep.>	<80-FE>
NULL	FF

NOTE 1: This NACK cause shall apply to conflicting or incomplete data in the attribute list which prevents the LMU from performing the message.

NOTE 2: This NACK cause shall apply when the message is valid and is supported by the LMU, but cannot be performed correctly for reasons not covered by other general or special NACK causes.

NOTE 3: This NACK cause shall apply to the case where the data in attribute list is valid, but is beyond the capabilities of the particular LMU implementation.

A.1.2.4.26 Number of Segments

Attribute Identifier	1
Number of Segments	2-3

Number of Segments is the binary representation of the number of segments contained in the overall file to be sent. This parameter is necessary for determining when to send the final ACK.

A.1.2.4.27 Operational State

Attribute Identifier	1
Operational State	2

Operational States are in accordance with GSM 12.20 and shall be coded as follows:

Disabled 01

Enabled 02

<reserved for future use> <03-FE>

NULL(Operat. state not supported)FF

A.1.2.4.28 Outstanding Alarm Sequence

Attribute Identifier	1
Pending Reports	2

The integer coded *Pending Reports* field indicates the number of pending *Failure Event Report* messages to follow the current message as a response to the associated *Report Outstanding Alarms* message. The value being 0 signals that it is the last message for the outstanding alarms.

A.1.2.4.29 Perceived Severity

Attribute Identifier	1
Severity Value	2

Severity Value shall be coded as follows:

failure ceased 01

critical failure 02

major failure 03

minor failure 04

warning level failure 05

indeterminate failure 06

<reserved> <07-3F>

<man, dep.> <40-FF>

A.1.2.4.30 Physical Configuration

Attribute Identifier	1
Length	2
Required Test Config <man.dep.>	3
(cont.)	
(cont.)	N

Required Test Config is manufacturer-dependent.

A.1.2.4.31 Probable Cause

Attribute Identifier	1
Probable Cause Type	2
Probable Cause Value	3
Probable Cause Value (cont.)	4

Probable Cause Type shall be coded as follows:

ISO/CCITT values (X.721) 01

GSM specific values 02

Manufacturer specific values 03

<reserved for future use> <04-FF>

For *Probable Cause Value* coding, the last numeric value of the managed entity identifier value specified in ASN.1 syntax coding shall be used if *Probable Cause Type* is either 01 or 02. (This will be eliminated when ASN.1 coding is performed).

A.1.2.4.32 Pseudo-range

Attribute Identifier	1
Kilometres	2-4
Fractional Kilometres	5-7

Pseudo-range is coded as KKKKK.kkkkk.

A.1.2.4.33 Result

Attribute Identifier	1
Result	2

Result is coded as follows:

Failure 0

Success 1

A.1.2.4.34 Satellite Info

Attribute Identifier	1
Length	2
Satellite ID	3
(cont.)	
(cont.)	N

Satellite ID is one octet.

A.1.2.4.35 Self-Position Capability

Attribute Identifier	1
Self-Position Capability	2

Self-Position Capability shall be coded as follows:

Incapable of Self-Position 00

Capable of Self-Position 01

A.1.2.4.36 Set Own Position Upon Startup

Attribute Identifier	1
Set Own Position Upon Startup	2

Set Own Position Upon Startup shall be coded as follows:

Do Not Set Own Position 00

Set Own Position 01

Note:

If the LMU contains a GPS receiver, the LMU may provide its own position. GPS timing may be improved if a more accurate position is provided to the GPS receiver than that which it can derive by itself. This more accurate position can be provided by a survey or by applying differential corrections to the initial measured position.

Since GPS may be available in the LMU for deriving LMU position, there must be flexibility for determining how LMU position is set. There must be the capability to request derivation of a new LMU position and send this new LMU position to the SMLC. There must be the possibility during the LMU position derivation process to update or leave unchanged the LMU position stored in the LMU. (The reason for this is that the LMU may not be able to derive its position directly, but may require differential correction by the SMLC.) The SMLC must have the capability to directly set the LMU position stored in the LMU. The SMLC must also be able to read the current LMU position stored in the LMU.

These capabilities are supported by this attribute.

A.1.2.4.37 Software Download Capability

Attribute Identifier	1
Software Download Capability	2

Software Download Capability shall be coded as follows:

No Software Download Capability 00

Software Download Capability 01

A.1.2.4.38 Source

Attribute Identifier	1
Length	2
Source	3
(cont.)	
(cont.)	N

Source identifies a unit of equipment that shall be "changed from" on a Change-over operation. How to identify a type of equipment and how to identify a specific unit of this type is manufacturer-dependent.

A.1.2.4.39 Specific Problems

Attribute Identifier	1
Specific Problems	2

Specific Problems shall be coded as follows:

<reserved for future use> <00-0F>

<man.dep> <10-FF>

A.1.2.4.40 SW Configuration

Attribute Identifier	1
Length	2
SW Description 1	
...	
SW Description n	N

SW Configuration shall contain a list of *SW Descriptions* related to the managed entity.

A.1.2.4.41 SW Description

Attribute Identifier	1
File Id	2
File Version	N

A.1.2.4.42 Test Duration

Attribute Identifier	1
Test Duration	2-4

Test Duration shall be a binary presentation of seconds in range <01-FFFF> indicating the time the test should last.

A.1.2.4.43 Test Number

Attribute Identifier	1
Test Number	2

Test Number shall be coded as follows:

LMU functional managed entity self test 00

<reserved> <01-3F>

<man.dep> <40-FE>

<all tests associated with the managed entity> <FF>

A.1.2.4.44 Test Report Info

Attribute Identifier	1
Length	2-3
Test Result Info	4
(cont.)	
(cont.)	N

If the test was LMU functional managed entity self test, octet 4 shall indicate pass or fail for the test of the functional managed entity on the LMU by value 1 or 0 where 0 is the code for fail.

In the defined test cases *Test Result Info* may also contain manufacturer-dependent information in subsequent octets. In other tests, *Test Result Info* is manufacturer-dependent.

A.1.2.4.45 Time

Attribute Identifier	1
Time	2-4

Time is elapsed time in seconds modulo 86400.

A.1.2.4.46 Time of Fix

Attribute Identifier	1
Time of Fix	2-4

Time of Fix shall be coded as GPS time in seconds modulo 604800.

A.1.2.4.47 Timing Source

Attribute Identifier	1
Timing Source	2

Timing Source shall be coded as:

GPS	00
GSM	01
GLONASS	02
Internal Clock	03
Network	04

A.1.2.4.48 Type

Attribute Identifier	1
Type	2

Type shall be coded as follows:

Type A	01
Type B	02

A.1.2.4.49 Window Size

Attribute Identifier	1
Window Size	2-3

Window Size shall be a binary presentation of the number of Layer 3 *Load Data Segment messages* to be sent before a Layer 3 acknowledgement needs to be issued. Value 0 is not used.

A.2 SMLC Messages

For future study.

A.3 GMLC Messages

For future study.

Annex B (informative): Change history

Document History	Version	Description
22 September 1999	0.0.1	Original contribution from Omnipoint Technologies
18 October 1999	0.0.2	Combined Omnipoint Technologies and Siemens Draft
3 December 1999	0.0.3	Comments incorporated from Boca Raton
22 December 1999	0.0.4	Comments incorporated from December 14 teleconference
17 January 2000	0.0.5	Comments incorporated from Savannah
28 April 2000	0.0.6	Added ASN.1 coding
9 May 2000	1.0.0	Accepted by T1P1.3

Change history					
TSG SA#	Version	CR	Tdoc SA	New Version	Subject/Comment
S_08	2.0.1	-	SP-000224	7.0.0	Transferred from T1P1.3's GSM 12.71 (LCS O&M) Release 98 v2.0.1. SA#8 decided to produce not only the GSM R98 version, as proposed by T1P1, but also an identical specification as GSM R99.

History

Document history		
V7.0.1	November 2000	Publication