Mobile Location Protocol (MLP)

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Open Mobile Alliance
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Continues the Technical Activities
Originated in the Location Interoperability Forum (LIF)

Contents

1. Scope

The Mobile Location Protocol (MLP) is an application-level protocol for getting the position of mobile stations (mobile phones, wireless personal digital assistants, etc.) independent of underlying network technology, i.e., independent of location derivation technology and bearer. The MLP serves as the interface between a Location Server and a Location Services (LCS) Client. This specification defines the core set of operations that a Location Server should be able to perform.

2. References

2.1 Normative References

[IOPPROC] "OMA Interoperability Policy and Process", Version 1.1, Open Mobile Alliance™. OMA-IOP-Process-V1_1, URL: http://www.openmobilealliance.org/

[RFC2119] "Key words for use in RFCs to Indicate Requirement Levels". S. Bradner. March 1997. URL: http://www.ietf.org/rfc/rfc2119.txt

[RFC2616] "Hypertext Transfer Protocol –HTTP/1.1"
June 1999. URL: http://www.ietf.org/rfc/rfc2616.txt

[RFC2246] "The TLS Protocol Version 1.0"
January 1999. URL: http://www.ietf.org/rfc/rfc2246.txt

[IANA] Internet Assigned Numbers Authority (IANA)
URL: http://www.iana.org/

[ASCII] US-ASCII. Coded Character Set - 7-Bit American Standard Code for Information Interchange. Standard ANSI X3.4-1986, ANSI, 1986.

2.2 Informative References

[22.071] 3GPP TS 22.071: "Location Services (LCS); Service description, Stage 1".

[23.271] 3GPP TS 23.271: "Functional stage 2 description of LCS"

[23.032] 3GPP TS 23.032: " Universal Geographical Area Description (GAD)"

[04.18] GSM 04.18: " Technical Specification Group GSM/EDGE Radio Access Network; Mobile radio interface layer 3 specification, Radio Resource Control Protocol"

[29.002] 3GPP TS 29.002: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[23.003] 3GPP TS 23.003: "Numbering, Addressing and Identification"

[RFC796] RFC 796: "Address mapping"

[RFC3513] RFC 3513: "Internet Protocol Version 6 (IPv6) Addressing Architecture"

[05.10] 3GPP TS 05.10, "Radio subsystem synchronization"

[J-STD-036] TR-45 J-STD-036 "Enhanced Wireless 9-1-1 Phase 2 Document"

[IS-41D] IS-41D: " Cellular Radiotelecommunications Intersystem Operations", June 1997

[AST] OpenGIS© Consortium Abstract Specification Topic 2: 01-063R2
URL: http://www.opengis.org/techno/abstract/02-102.pdf.

[CRS] OpenGIS© Consortium Recommendation Paper 01-014r5: Recommended Definition Data for Coordinate Reference Systems and Coordinate Transformations
URL: http://www.opengis.org/techno/discussions/01-014r5.pdf

[GML] OpenGIS© Consortium Impementation Specification: Geography Markup Language V 2.0
URL: http://www.opengis.net/gml/01-029/GML2.html

[GEO] OpenGIS© Consortium Abstract Specification Topic 1 Feature Geometry : 010101
URL: http://www.opengis.org/techno/abstract/01-101.pdf.

[UTC] ITU CCIR Recommendation "ITU-R-TF.460-4"

3. Terminology and Conventions

3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

3.2 All sections and appendixes, except “Scope” and “Definitions

3.3 Abbreviations

WAP	Wireless Application Protocol
ANSI	American National Standards Institute
DTD	Document Type Definition
GMLC	Gateway Mobile Location Center
GMT	Greenwich Mean Time
HTTP	Hypertext Transfer Protocol
HTTPS	HTTP Secure
LCS	Location Services
MLC	Mobile Location Center
MLP	Mobile Location Protocol
MPC	Mobile Positioning Center
MS	Mobile Station
MSID	Mobile Station Identifier
SSL	Secure Socket Layer
TLS	Transport Layer Security
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UTM	Universal Transverse Mercator
WGS	World Geodetic System
XML	Extensible Markup Language

”, are normative, unless they are explicitly indicated to be informative.

Notational Conventions and Generic Grammar

The following rules are used throughout this specification to describe basic parsing constructs.

- ANSI X3.4-1986 defines the US-ASCII coded character set, see [ASCII]

CR	= <US-ASCII CR, carriage return (13)>
LF	= <US-ASCII LF, linefeed (10)>
SP	= <US-ASCII SP, space (32)>

- A set of characters enclosed in brackets ([...]) is a one-character expression that matches any of the characters in that set e.g., "[lcs]" matches either an "l", "c", or "s". A range of characters is indicated with a dash, e.g., "[a-z]" matches any lower-case letter.
- The one-character expression can be followed by an interval operator, for example [a-zA-Z]{min,max} in which case the one-character expression is repeated at least min and at most max times, e.g., "[a-zA-Z]{2,4}" matches for example the strings "at", "Good", and "biG".

DTD Syntax Notation

The table below describes the special characters and separators used in the DTDs defining the different services.

Character	Meaning
+	One or more occurrence
*	Zero or more occurrences
?	Optional
(...)	A group of expressions to be matched together
|	OR...as in, "this or that"
,	Strictly ordered. Like an AND

3.4 Definitions

3.5 Abbreviations

WAP	Wireless Application Protocol
ANSI	American National Standards Institute
DTD	Document Type Definition
GMLC	Gateway Mobile Location Center
GMT	Greenwich Mean Time
HTTP	Hypertext Transfer Protocol
HTTPS	HTTP Secure
LCS	Location Services
MLC	Mobile Location Center
MLP	Mobile Location Protocol
MPC	Mobile Positioning Center
MS	Mobile Station
MSID	Mobile Station Identifier
SSL	Secure Socket Layer
TLS	Transport Layer Security
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UTM	Universal Transverse Mercator
WGS	World Geodetic System
XML	Extensible Markup Language

4. Introduction

The Mobile Location Protocol (MLP) is an application-level protocol for getting the position of mobile stations (mobile phones, wireless personal digital assistants, etc.) independent of underlying network technology, i.e., independent of location derivation technology and bearer. The MLP serves as the interface between a Location Server and a Location Services (LCS) Client. This specification defines the core set of operations that a Location Server should be able to perform.

5. Mobile Location Protocol

5.1.1 Overview

The Mobile Location Protocol (MLP) is an application-level protocol for querying the position of mobile stations independent of underlying network technology. The MLP serves as the interface between a Location Server and a location-based application. (cf. Figure 1)

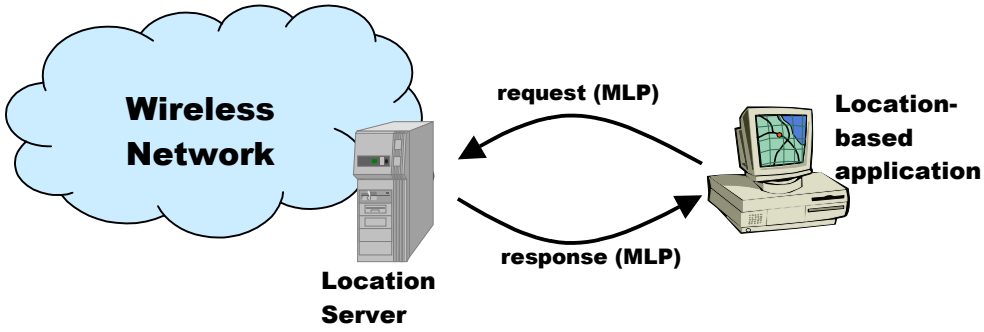

Figure 1: MLP in the context of the LCS Architecture

Possible realisations of a Location Server are the GMLC, which is the location server defined in GSM and UMTS, and the MPC, which is defined in ANSI standards. Since the location server should be seen as a logical entity, other implementations are possible.

In most scenarios (except where explicitly mentioned) an LCS client initiates the dialogue by sending a query to the location server and the server responds to the query.

5.1.2 MLP structure

Different devices may support different means of communication. A ubiquitous protocol for location services should support different transport mechanisms.

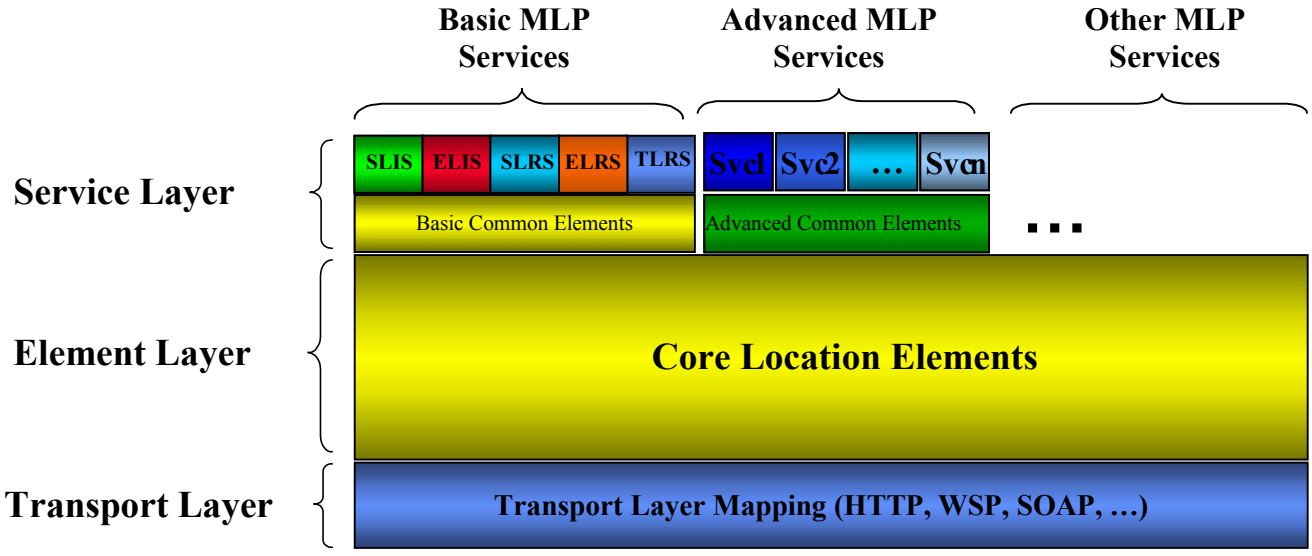

Figure 2: MLP Structure

In MLP, the transport protocol is separated from the XML content. Figure 2 shows a layered view of MLP.

On the lowest level, the transport protocol defines how XML content is transported. Possible MLP transport protocols include HTTP, WSP, SOAP and others.

The Element Layer defines all common elements used by the services in the service layer. Currently MLP defines the following set of DTDs making up the element layer of MLP:

MLP_ID.DTD	Identify Element Definitions
MLP_FUNC.DTD	Function Element Definitions
MLP_LOC.DTD	Location Element Definitions
MLP_SHAPE.DTD	Shape Element Definitions
MLP_QOP.DTD	Quality of Position Element Definitions
MLP_GSM_NET.DTD	GSM Network Parameters Element Definitions
MLP_CTXT	Context Element Definitions

The Service Layer defines the actual services offered by the MLP framework. Basic MLP Services are based on location services defined by 3GPP, and are defined by this specification. The "Advanced MLP Services" and "Other MLP Services" are additional services that either will be specified in other specifications or are specified by other fora that conform to the MLP framework.

Note: The boxes representing services in the Service Layer may contain more than one message. e.g. SLIS (Standard Location Immediate Service) consists of slir (Standard Location Immediate Request), slia (Standard Location Immediate Answer) and slirep (Standard Location Immediate Report) messages. Messages for each service are listed in the table below.

The Service Layer is divided into two sub-layers. The topmost defines the services mentioned in the previous paragraph. The lower sub-layer holds common elements, which are specific for that group of services. If an element is common to more than one group of services then that element is defined in the element layer. The present specification specifies no element sub-layer.

There are a number of different possible types of location services. Each implementation of location server can select which services it wants/needs to support. The services are described in the table below.

Service	**Description**
Standard Location Immediate Service	This is a standard query service with support for a large set of parameters. This service is used when a (single) location response is required immediately (within a set time) or the request may be served by several asynchronous location responses (until a predefined timeout limit is reached). This service consists of the following messages: - Standard Location Immediate Request - Standard Location Immediate Answer - Standard Location Immediate Report
Emergency Location Immediate Service	This is a service used especially for querying of the location of a mobile subscriber that has initiated an emergency call. The response to this service is required immediately (within a set time). This service consists of the following messages: - Emergency Location Immediate Request - Emergency Location Immediate Answer
Standard Location Reporting Service	This is a service that is used when a mobile subscriber wants an LCS Client to receive the MS location. The position is sent to the LCS Client from the location server. Which LCS application and its address are specified by the MS or defined in the location server. This service consists of the following message:

	- Standard Location Report
Emergency Location Reporting Service	This is a service that is used when the wireless network automatically initiates the positioning at an emergency call. The position and related data is then sent to the emergency application from the location server. Which LCS application and its address are defined in the location server. This service consists of the following message: - Emergency Location Report
Triggered Location Reporting Service	This is a service used when the mobile subscriber's location should be reported at a specific time interval or on the occurrence of a specific event. This service consists of the following messages: - Triggered Location Reporting Request - Triggered Location Reporting Answer - Triggered Location Report - Triggered Location Reporting Stop Request - Triggered Location Reporting Stop Answer

5.1.3 MLP extension mechanism

The MLP specification has been designed with extensibility in mind. Examples of design principles employed to achieve this include:

- Separate DTDs for definitions that are common to all messages, e.g. client address and shapes, so they can be re-used.
- A message extension mechanism allowing the addition of new messages (specific for the HTTP mapping). This mechanism works by specifying an entity parameter, '%extension;', referring to an extension DTD. The extension DTD MUST contain another entity parameter, '%extension.message', containing the definition of the extension as a string together with the actual parameters being added
- A parameter extension mechanism allowing the addition of new parameters to existing messages. This mechanism works by specifying an entity parameter, '%extension;', referring to an extension DTD. The extension DTD MUST contain another entity parameter, '%extension.param', containing the definition of the extension as a string together with the actual messages being added.
- Each extension parameters SHOULD have a vendor specific prefix in order to guarantee their uniqueness.

In order to use the extension, the extension DTD has to be explicitly referenced in the XML document.

The Location Server SHOULD ignore any extension that is not recognized and process the message as if the extension is not available.

Example 1: Message extension

```
<!—truckco_MLP_extension -->

<!ENTITY    % extension.message                                    "| truckco_message">

<!ELEMENT   truckco_message                                       (truckco_data)>
<!ATTLIST   truckco_message
            ver CDATA                                             #FIXED "x.y.z">
```

```
<?xml version = "1.0" ?>
<!DOCTYPE svc_init SYSTEM "MLP_SVC_INIT_300.DTD " [
  <!ENTITY % extension SYSTEM
      "http://www.truckco.com/truckco_MLP_extension.dtd">
  %extension;
]>
<svc_init ver="3.0.0">
  <hdr ver="3.0.0">
    ...
  </hdr>
```

```
    <truckco_message ver="x.y.z">
      <truckco_data>
        ...
      </truckco_data>
    </truckco_message>
  </svc_init>
```

Example 2: Parameter extension

```
<!-- truckco_MLP_extension -->

<!ENTITY    % extension.param                                    ", truckco_extension">

<!ELEMENT   trucko_extension                                    (#PCDATA)>
```

```
<?xml version = "1.0" ?>
<!DOCTYPE svc_init SYSTEM "MLP_SVC_INIT_310.DTD" [
  <!ENTITY % extension SYSTEM
      "http://www.truckco.com/truckco_MLP_extension.dtd">
  %extension;
]>
<svc_init ver="3.1.0">
  <hdr ver="3.0.0">
    ...
  </hdr>
  <slir ver="3.0.0">
    ...
    <truckco_extension>
      ...
    </truckco_extension>
  </slir>
</svc_init>
```

5.2 Mobile Location Service Definitions

5.2.1 Transport Protocol Layer Definitions

MLP can be implemented using various transport mechanism as stated in section 3.2. The following mappings are specified for MLP:

Mapping	Section
HTTP	HTTP Mapping

5.2.2 Element Layer Definitions

Identity Element Definitions

```
<!-- MLP_ID -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_xxx PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_xxx>
      ...
   </svc_xxx>

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http://www.openmobilealliance.org/useterms.html
-->

<!ELEMENT   msid                                              (#PCDATA)>
<!ATTLIST   msid
            type (MSISDN | IMSI | IMEI | MIN | MDN |          "MSISDN"
                  EME_MSID | ASID | OPE_ID | IPV4 | IPV6 |
                  SESSID)
            enc (ASC | CRP)                                   "ASC">
<!ELEMENT   msid_range                                        (start_msid, stop_msid)>
<!ELEMENT   msids                                             (((msid, codeword?, session?) |
                                                               (msid_range, codeword*))+)>
<!ELEMENT   codeword                                          (#PCDATA)>
<!ELEMENT   esrd                                              (#PCDATA)>
<!ATTLIST   esrd
            type (NA)                                         "NA">
<!ELEMENT   esrk                                              (#PCDATA)>
<!ATTLIST   esrk
            type (NA)                                         "NA">
<!ELEMENT   session                                           (#PCDATA)>
<!ATTLIST   session
            type (APN | DIAL)                                 #REQUIRED>
<!ELEMENT   start_msid                                        (msid)>
<!ELEMENT   stop_msid                                         (msid)>
```

Note: The type attributes of the msid elements that form the start_msid and stop_msid elements MUST be the same.

5.2.2.1 Function Element Definitions

```
<!-- MLP_FUNC -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_init PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_init>
      ...
   </svc_init>

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-->


<!ELEMENT   eme_event                                          (eme_pos+)>
<!ATTLIST   eme_event
            eme_trigger (EME_ORG | EME_REL)                    #REQUIRED>
<!ELEMENT   tlrr_event                                         (ms_action)>
<!ELEMENT   ms_action                                          EMPTY>
<!ATTLIST   ms_action
            type (MS_AVAIL)                                    #REQUIRED>
<!ELEMENT   interval                                           (#PCDATA)>
<!ELEMENT   loc_type                                           EMPTY>
<!ATTLIST   loc_type
            type (CURRENT | LAST |CURRENT_OR_LAST | INITIAL)   "CURRENT">
<!ELEMENT   prio                                               EMPTY>
<!ATTLIST   prio
            type (NORMAL | HIGH)                               "NORMAL">
<!ELEMENT   pushaddr                                           (url, id?, pwd?)>
<!ELEMENT   req_id                                             (#PCDATA)>
<!ELEMENT   start_time                                         (#PCDATA)>
<!ATTLIST   start_time
            utc_off CDATA                                      "0000">
<!ELEMENT   stop_time                                          (#PCDATA)>
<!ATTLIST   stop_time
            utc_off CDATA                                      "0000">
<!ELEMENT   url                                                (#PCDATA)>
<!ELEMENT   time_remaining                                     (#PCDATA)>
```

5.2.2.2 Location Element Definitions

```
<!-- MLP_LOC -->
<!--
MLP V3.1 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_xxx PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_xxx>
      ...
   </svc_xxx>

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-->


<!ELEMENT   pos                                          (msid, (pd | poserr),
                                                          gsm_net_param?)>
<!ELEMENT   eme_pos                                      (msid, (pd | poserr), esrd?,
                                                          esrk?)>
<!ELEMENT   trl_pos                                      (msid, (pd | poserr))>
<!ATTLIST   trl_pos
            trl_trigger (PERIODIC | MS_AVAIL)            #REQUIRED>
<!ELEMENT   pd                                           (time, shape, (alt, alt acc?)?,
                                                          speed?, direction?,
                                                          lev_conf?)>
<!ELEMENT   poserr                                       (result, add_info?, time)>
<!ELEMENT   time                                         (#PCDATA)>
<!ATTLIST   time
            utc_off CDATA                                "0000">
<!ELEMENT   alt                                          (#PCDATA)>
<!ELEMENT   alt_acc                                      (#PCDATA)>
<!ELEMENT   direction                                    (#PCDATA)>
<!ELEMENT   speed                                        (#PCDATA)>
<!ELEMENT   lev_conf                                     (#PCDATA)>
<!ELEMENT   geo_info                                     (CoordinateReferenceSystem)>
<!ELEMENT   CoordinateReferenceSystem                    (Identifier)>
<!ELEMENT   Identifier                                   (code, codeSpace, edition)>
<!ELEMENT   code                                         (#PCDATA)>
<!ELEMENT   codeSpace                                    (#PCDATA)>
<!ELEMENT   edition                                      (#PCDATA)>

<!ENTITY    % mlp_res.dtd                                SYSTEM "MLP_RES_300.DTD">
%mlp_res.dtd;
```

Examples of geo_info encoding.

The encoding for WGS84 is:

```
<CoordinateReferenceSystem>
    <Identifier>
        <code>4326</code>
```

```
            <codeSpace>EPSG</codeSpace>
            <edition>6.1</edition>
        </Identifier>
    </CoordinateReferenceSystem>
```

The encoding for the Transverse Mercator coordinate system based on the OSGB1936 is:

```
    <CoordinateReferenceSystem>
        <Identifier>
            <code>27700</code>
            <codeSpace>EPSG</codeSpace>
            <edition>6.1</edition>
        </Identifier>
    </CoordinateReferenceSystem>
```

Note that the GML V2.1.1 Implementation Specification is limited to use of only well-known CRSs, so this XML is currently abbreviated by a single attribute name and value:

srsName=http://www.opengis.net/gml/srs/epsg.xml#4326

Note also that GML uses crsName instead of srsName.

5.2.2.3 Result Element Definitions

```
<!-- MLP_RES -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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-->

<!ELEMENT   add_info                                        (#PCDATA)>
<!ELEMENT   result                                          (#PCDATA)>
<!ATTLIST   result
            resid CDATA                                     #REQUIRED>
```

5.2.2.4 Shape Element Definition

```
<!-- MLP_SHAPE -->
<!--
MLP V3.1 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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-->

<!ELEMENT   shape                                          (Point | LineString | Polygon |
                                                            Box | CircularArea |
                                                            CircularArcArea |
                                                            EllipticalArea |
                                                            MultiLineString | MultiPoint |
                                                            MultiPolygon)>
<!ELEMENT   distanceUnit                                   (#PCDATA)>
<!ELEMENT   angularUnit                                    (#PCDATA)>
<!ELEMENT   angle                                          (#PCDATA)>
<!ELEMENT   coord                                          (X, Y?, Z?)>
<!ELEMENT   X                                              (#PCDATA)>
<!ELEMENT   Y                                              (#PCDATA)>
<!ELEMENT   Z                                              (#PCDATA)>
<!ELEMENT   Point                                          (coord)>
<!ATTLIST   Point
            gid ID                                         #IMPLIED
            srsName CDATA                                  #IMPLIED>
<!ELEMENT   LineString                                     (coord, coord+)>
<!ATTLIST   LineString
            gid ID                                         #IMPLIED
            srsName CDATA                                  #IMPLIED>
<!ELEMENT   Box                                            (coord, coord)>
<!ATTLIST   Box
            gid ID                                         #IMPLIED
            srsName CDATA                                  #IMPLIED>
<!ELEMENT   LinearRing                                     (coord, coord, coord, coord*)>
<!ATTLIST   LinearRing
            gid ID                                         #IMPLIED
            srsName CDATA                                  #IMPLIED>
<!ELEMENT   Polygon                                        (outerBoundaryIs,
                                                           innerBoundaryIs*)>
<!ATTLIST   Polygon
            gid ID                                         #IMPLIED
            srsName CDATA                                  #IMPLIED>
<!ELEMENT   outerBoundaryIs                                (LinearRing)>
<!ELEMENT   innerBoundaryIs                                (LinearRing)>
<!ELEMENT   CircularArcArea                                (coord, inRadius, outRadius,
                                                            startAngle, stopAngle,
```

```
                                                        angularUnit?, distanceUnit?)>
<!ATTLIST   CircularArcArea
            gid ID                                      #IMPLIED
            srsName CDATA                               #IMPLIED>
<!ELEMENT   CircularArea                                (coord, radius, distanceUnit?)>
<!ATTLIST   CircularArea
            gid ID                                      #IMPLIED
            srsName CDATA                               #IMPLIED>
<!ELEMENT   EllipticalArea                              (coord, angle, semiMajor,
                                                         semiMinor, angularUnit?,
                                                         distanceUnit?)>
<!ATTLIST   EllipticalArea
            gid ID                                      #IMPLIED
            srsName CDATA                               #IMPLIED>
<!ELEMENT   inRadius                                    (#PCDATA)>
<!ELEMENT   outRadius                                   (#PCDATA)>
<!ELEMENT   radius                                      (#PCDATA)>
<!ELEMENT   semiMajor                                   (#PCDATA)>
<!ELEMENT   semiMinor                                   (#PCDATA)>
<!ELEMENT   startAngle                                  (#PCDATA)>
<!ELEMENT   stopAngle                                   (#PCDATA)>
<!ELEMENT   MultiLineString                             (LineString+)>
<!ATTLIST   MultiLineString
            gid ID                                      #IMPLIED
            srsName CDATA                               #IMPLIED>
<!ELEMENT   MultiPoint                                  (Point+)>
<!ATTLIST   MultiPoint
            gid ID                                      #IMPLIED
            srsName CDATA                               #IMPLIED>
<!ELEMENT   MultiPolygon                                ((Polygon| Box | CircularArea |
                                                         CircularArcArea |
                                                         EllipticalArea)+)>
<!ATTLIST   MultiPolygon
            gid ID                                      #IMPLIED
            srsName CDATA                               #IMPLIED>
```

Note also that GML uses crsName instead of srsName.

5.2.2.5 Quality of Position Element Definitions

```
<!-- MLP_QOP -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_ PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_init>
      ...
   </svc_init>

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-->
```

```
<!ELEMENT   eqop                                              (resp_req?, resp_timer?,
                                                               (ll acc | hor acc)?, alt acc?,
                                                               max_loc_age?)>
<!ELEMENT   qop                                               ((ll_acc | hor_acc)?,
                                                               alt_acc?)>
<!ELEMENT   ll_acc                                            (#PCDATA)>
<!ELEMENT   hor_acc                                           (#PCDATA)>
<!ELEMENT   max_loc_age                                       (#PCDATA)>
<!ELEMENT   resp_req                                          EMPTY>
<!ATTLIST   resp_req
            type (NO_DELAY | LOW_DELAY | DELAY_TOL)           "DELAY_TOL">
<!ELEMENT   resp_timer                                        (#PCDATA)>
```

5.2.2.6 Network Parameters Element Definitions

```
<!-- MLP_GSM_NET -->
<!--
MLP V3.1 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_xxx PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_xxx>
      ...
   </svc_xxx>

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-->

<!ELEMENT   gsm_net_param                                     (cgi?, neid?, nmr?, ta?,
                                                               lmsi?, imsi?)>
<!ELEMENT   cgi                                               (mcc, mnc, lac, cellid)>
<!ELEMENT   neid                                              (vmscid | vlrid |
                                                               (vmscid, vlrid))>
<!ELEMENT   vmscid                                            (cc?, ndc?, vmscno)>
<!ELEMENT   vlrid                                             (cc?, ndc?, vlrno)>
<!ELEMENT   nmr                                               (#PCDATA)>
<!ELEMENT   mcc                                               (#PCDATA)>
<!ELEMENT   mnc                                               (#PCDATA)>
<!ELEMENT   ndc                                               (#PCDATA)>
<!ELEMENT   cc                                                (#PCDATA)>
<!ELEMENT   vmscno                                            (#PCDATA)>
<!ELEMENT   vlrno                                             (#PCDATA)>
<!ELEMENT   lac                                               (#PCDATA)>
<!ELEMENT   cellid                                            (#PCDATA)>
<!ELEMENT   ta                                                (#PCDATA)>
<!ELEMENT   lmsi                                              (#PCDATA)>
<!ELEMENT   imsi                                              (#PCDATA)>
```

Note: The above table corresponds to GSM specific network element identifiers and network parameters. This information may be considered operator sensitive

5.2.2.7 Context Element Definitions

```
<!-- MLP_CTXT -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_xxx PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_xxx>
      ...
   </svc_xxx>

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http://www.openmobilealliance.org/useterms.html
-->

<!ELEMENT   client                                          (id, pwd?, serviceid?,
                                                            requestmode?)>
<!ELEMENT   sessionid                                       (#PCDATA)>
<!ELEMENT   id                                              (#PCDATA)>
<!ELEMENT   requestor                                       (id, serviceid?)>
<!ELEMENT   pwd                                             (#PCDATA)>
<!ELEMENT   serviceid                                       (#PCDATA)>
<!ELEMENT   requestmode                                     EMPTY>
<!ATTLIST   requestmode
            type (ACTIVE | PASSIVE)                         "PASSIVE">
<!ELEMENT   subclient                                       (id, pwd?, serviceid?)>
<!ATTLIST   subclient
            last_client (YES | NO)                          "NO">
```

5.2.3 Service Layer Definitions

Each message MAY have two main parts, namely a context or header part and a body part. The body part consists of the request/answer and is described in sections 5.2.3.2- 5.2.3.11. The context or header part consists of the information that identifies the client as defined in section 5.2.3.1.

5.2.3.1 Header Components

The **subclient** elements (if present) identify the ASPs, resellers and portals in the chain of service providers between the network and the end-user. The distinction between **client** and **subclient** elements is that the **client** element identifies the provider of the service that the Location Server has the initial relationship with, whereas the **subclient** elements identify the chain of other service providers up to the end-user. The final service provider in the chain is identified as such (last_client="YES"). The **requestor** indicates the initiator of the location request, so in this context besides an ASP it could also be an MS subscriber who is asking the position of another target MS. The identity of the **requestor** may be an MSISDN or any other identifier identifying the initiator of the location request.

The **sessionid** element is used to represent the current session between the LCS Client and the Location Server. It MAY be used to replace the id and pwd elements, used in the context by the LCS Client to "login" to the Location Server, for the transactions that make up a session. For the first transaction of the session the LCS Client SHALL "login" as usual. The Location Server MAY optionally return the **sessionid** in the response to this first transaction. If the Location Server does not return a **sessionid** the LCS Client SHALL continue to "login" for subsequent transactions. The LCS Client MAY ignore the **sessionid** if desired and continue to "login" for subsequent transactions.

The Location Server will decide the policy to be used to determine how the **sessionid** will be created and maintained. For example, the Location Server may determine the session as being just the transactions pertaining to a single service/MSID combination – this being restrictive and hence secure whilst still being useable, or the Location Server may allow the session to apply to a number of transactions between the Location Server and LCS Client. The Location Server may also allow the **sessionid** to be used for a particular period of time. The Location Server may also decide to return a different **sessionid** on each response, which the LCS Client will then use on the next transaction of the session.

The **sessionid** cannot be used instead of the **req_id** as this latter id refers to a set of reports that have been requested to be delivered from the Location Server to the LCS Client and do not form part of an existing LCS Client to Location Server connection. These reports are delivered by the Location Server "logging in" to the LCS Client for each delivery and the use of a **sessionid**, would allow the security of the LCS Client to be breached.

5.2.3.1.1 Context DTD

```
<!-- MLP_HDR -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_xxx PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_xxx>
      ...
   </svc_xxx>

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Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->

<!ELEMENT   hdr                        ((client | sessionid | (client , sessionid)), subclient*,
                                        requestor?)>
<!ATTLIST   hdr
            ver CDATA                  #FIXED "3.0.0">
```

Example 1: ASP as Initiator

```
<hdr ver="3.0.0">
  <client>
    <id>theasp</id>
    <pwd>thepwd</pwd>
    <serviceid>0005</serviceid>
    <requestmode type="PASSIVE"/>
  </client>
  <subclient last_client="YES">
    <id>thelastasp</id>
    <serviceid>0007</serviceid>
  </subclient>
  <requestor>
    <id>theoriginalasp</id>
    <serviceid>0003</serviceid>
  </requestor>
</hdr>
```

Example 2: MS as Initiator

```
<hdr ver="3.0.0">
  <client>
    <id>theasp</id>
    <pwd>thepwd</pwd>
    <serviceid>0005</serviceid>
    <requestmode type="ACTIVE"/>
  </client>
  <requestor>
    <id>461018765710</id>
  </requestor>
</hdr>
```

5.2.3.2 Standard Location Immediate Service

This is a standard service for requesting the location of one or more Mobile Subscribers. The service is used when a location response is required immediately (within a set time).

When a lot of positioning reports are requested, it may take an unacceptably long time to get all the responses from the network. If the Location Server supports it the LCS Client can define how to receive the location responses, either at the time of the response to the request, or individually using one or more connections initiated by the Location Server.

The extended service supports a number of different formats for describing the location of the mobile subscriber. It has also support for requesting a certain Quality of Service, Type of location and priority.

The service consists of the following messages:

- Standard Location Immediate Request
- Standard Location Immediate Answer
- Standard Location Immediate Report

The following message flow as depicted in Figure 3 encapsulates this service:

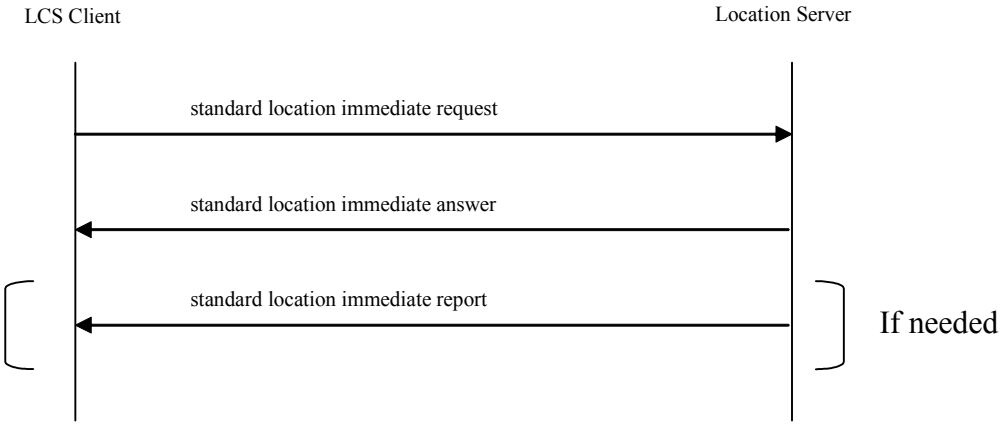

Figure 3: Message Flow for the Standard Location Immediate Service

5.2.3.3 Standard Location Immediate Request DTD

```
<!-- MLP_SLIR -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_init PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_init>
      ...
   </svc_init>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param          "">

<!ELEMENT   slir                      ((msids | (msid, codeword?, gsm net param)+), eqop?,
                                       geo_info?, loc_type?, prio?, pushaddr? %extension.param;)>
<!ATTLIST   slir
            ver CDATA                 #FIXED "3.0.0"
            res_type (SYNC | ASYNC)   "SYNC">
```

Example

```
<slir ver="3.0.0" res_type="SYNC">
  <msids>
    <msid type="IPV4">93.10.0.250</msid>
    <msid_range>
      <start_msid>
        <msid>461018765710</msid>
      </start_msid>
      <stop_msid>
        <msid>461018765712</msid>
      </stop_msid>
    </msid_range>
    <msid type="ASID">441728922342</msid>
    <msid_range>
      <start_msid>
        <msid>461018765720</msid>
      </start_msid>
      <stop_msid>
        <msid>461018765728</msid>
      </stop_msid>
    </msid_range>
  </msids>
  <eqop>
    <resp_req type="LOW_DELAY" />
    <hor_acc>1000</hor_acc>
  </eqop>
  <geo_info>
    <CoordinateReferenceSystem>
      <Identifier>
        <code>4004</code>
        <codeSpace>EPSG</codeSpace>
        <edition>6.1</edition>
      </Identifier>
```

```
        </CoordinateReferenceSystem>
      </geo_info>
      <loc_type type="CURRENT_OR_LAST" />
      <prio type="HIGH" />
    </slir>
```

5.2.3.3.1 Standard Location Immediate Answer DTD

```
<!-- MLP_SLIA -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param         "">

<!ELEMENT   slia                     ((pos+ | req_id | (result, add_info?)) %extension.param;)>
<!ATTLIST   slia
            ver CDATA                #FIXED "3.0.0">
```

Example 1: Successful positioning of multiple subscribers

```
    <slia ver="3.0.0" >
      <pos>
        <msid>461011334411</msid>
        <pd>
          <time utc_off="+0200">20020623134453</time>
          <shape>
                      <CircularArea srsName="www.epsg.org#4326">
                <coord>
                 <X>30 16 28.308N</X>
                 <Y>45 15 33.444E</Y>
                </coord>
                <radius>240</radius>
            </CircularArea>
          </shape>
        </pd>
      </pos>
      <pos>
        <msid>461018765710</msid>
        <pd>
          <time utc_off="+0300">20020623134454</time>
          <shape>
            <CircularArea srsName="www.epsg.org#4326">
              <coord>
                <X>30 12 28.296N</X>
                <Y>86 56 33.864E</Y>
              </coord>
```

```
            <radius>570</radius>
          </CircularArea>
        </shape>
      </pd>
    </pos>
    <pos>
      <msid>461018765711</msid>
      <pd>
        <time utc_off="+0300">20020623110205</time>
        <shape>
                <CircularArea srsName="www.epsg.org#4326">
            <coord>
              <X>78 12 34.308N</X>
              <Y>76 22 2.82E</Y>
            </coord>
            <radius>15</radius>
          </CircularArea>
        </shape>
      </pd>
    </pos>
    <pos>
      <msid>461018765712</msid>
      <poserr>
        <result resid="10">QOP NOT ATTAINABLE</result>
        <time>20020623134454</time>
      </poserr>
    </pos>
  </slia>
```

Example 2: Service not supported

```
  <slia ver="3.0.0" >
    <result resid="108">SERVICE NOT SUPPORTED</result>
    <add_info>'slir' is not supported by the location server</add_info>
  </slia>
```

5.2.3.3.2 Standard Location Immediate Report DTD

```
<!-- MLP_SLIREP -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param         "">

<!ELEMENT   slirep                   (req_id, pos+ %extension.param;)>
<!ATTLIST   slirep
            ver CDATA                #FIXED "3.0.0">
```

Example

```
<slirep ver="3.0.0">
  <req_id>25267</req_id>
  <pos>
    <msid type="IPV6">10:A1:45::23:B7:89</msid>
    <pd>
      <time utc_off="+0300">20020813010423</time>
      <shape>
        <CircularArea srsName="www.epsg.org#4326">
          <coord>
            <X>35 03 28.244N</X>
            <Y>135 47 08.711E</Y>
          </coord>
          <radius>15</radius>
        </CircularArea>
      </shape>
    </pd>
  </pos>
</slirep>
```

5.2.3.4 Emergency Location Immediate Service

The emergency location immediate service is used to retrieve the position of a mobile subscriber that is involved in an emergency call or have initiated an emergency service in some other way.

The service consists of the following messages:

- Emergency Location Immediate Request
- Emergency Location Immediate Answer

The following message flow as depicted in Figure 4 encapsulates this service:

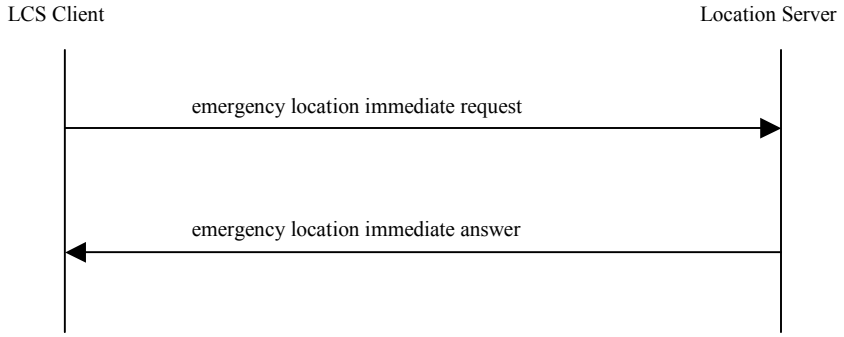

Figure 4: Message Flow for the Emergency Location Immediate Service

5.2.3.5 Emergency Location Immediate Request DTD

```
<!-- MLP_EME_LIR -->
<!--
MLP V3.1 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_init PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_init>
      ...
   </svc_init>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param          "">

<!ELEMENT   eme_lir                   ((msids | (msid, gsm net param)+), eqop?, geo info?,
                                      loc_type? %extension.param;)>
<!ATTLIST   eme_lir
            ver CDATA                 #FIXED "3.1.0">
```

Example

```
<eme_lir ver="3.0.0">
  <msids>
    <msid type="EME_MSID">520002-51-431172-6-06</msid>
  </msids>
  <geo_info>
    <CoordinateReferenceSystem>
      <Identifier>
        <code>4004</code>
        <codeSpace>EPSG</codeSpace>
        <edition>6.1</edition>
       </Identifier>
    </CoordinateReferenceSystem>
  </geo_info>
  <loc_type type="CURRENT_OR_LAST" />
</eme_lir>
```

5.2.3.6 Emergency Location Immediate Answer DTD

```
<!-- MLP_EME_LIA -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param         "">

<!ELEMENT   eme_lia                  ((eme_pos+ | (result, add_info?)) %extension.param;)>
<!ATTLIST   eme_lia
            ver CDATA                #FIXED "3.0.0">
```

Example

```
<eme_lia ver="3.0.0">
  <eme_pos>
    <msid type="EME_MSID">520002-51-431172-6-06</msid>
    <pd>
      <time utc_off="+0300">20020623134453</time>
      <shape>
        <CircularArea srsName="www.epsg.org#4326">
          <coord>
            <X>30 24 43.53N</X>
            <Y>45 28 09.534W</Y>
          </coord>
          <radius>15</radius>
        </CircularArea>
      </shape>
    </pd>
    <esrk>7839298236</esrk>
  </eme_pos>
</eme_lia>
```

5.2.3.7 Standard Location Reporting Service

When a mobile subscriber wants an LCS client to receive the MS location a standard location report is generated. The LCS Client that the location report should be sent to SHALL be specified by the MS or defined within the Location Server.

The service consists of the following message:

- Standard Location Report

The following message flow as depicted in Figure 5 encapsulates this service:

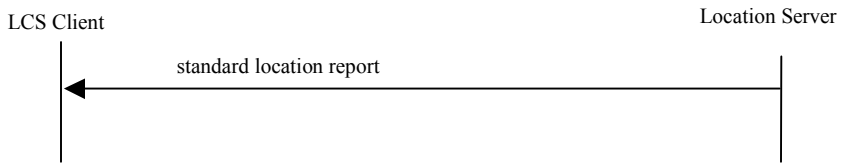

Figure 5: Message flow for the Standard Location Reporting Service

5.2.3.7.1 Standard Location Report DTD

```
<!-- MLP_SLREP -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param          "">

<!ELEMENT   slrep                     (pos+ %extension.param;)>
<!ATTLIST   slrep
            ver CDATA                 #FIXED "3.0.0">
```

Example

```
<slrep ver="3.0.0">
  <pos>
    <msid>461011678298</msid>
    <pd>
      <time>20020813010423</time>
      <shape>
        <CircularArea srsName="www.epsg.org#4326">
          <coord>
            <X>30 45 35.41N</X>
            <Y>45 32 55.02E</Y>
          </coord>
          <radius>15</radius>
        </CircularArea>
      </shape>
    </pd>
  </pos>
</slrep>
```

5.2.3.8 Emergency Location Reporting Service

If the wireless network initiates a positioning because a user initiates or releases an emergency call, an emergency location report is generated. The application(s) that the emergency location report should be sent to SHALL be defined within the location server. Data as required geographical format and address to application SHALL also be defined within the location server.

The service consists of the following message:

- Emergency Location Report

The following message flow as depicted in Figure 6 encapsulates this service:

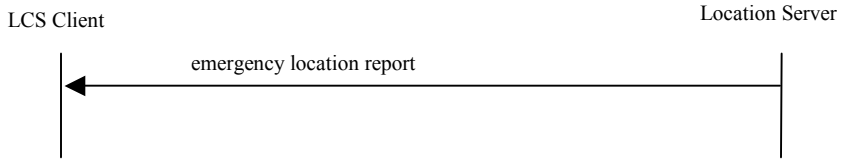

Figure 6: Message Flow for the Emergency Location Reporting Service

5.2.3.8.1 Emergency Location Report DTD

```
<!-- MLP_EMEREP -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param         "">

<!ELEMENT   emerep                   (eme_event %extension.param;)>
<!ATTLIST   emerep
            ver CDATA                #FIXED "3.0.0">
```

Example

```
<emerep ver="3.0.0">
  <eme_event eme_trigger="EME_ORG">
    <eme_pos>
      <msid>461011678298</msid>
      <pd>
        <time utc_off="+0300">20020623010003</time>
        <shape>
```

```
            <CircularArea srsName="www.epsg.org#4326">
              <coord>
                <X>30 27 45.3N</X>
                <Y>45 25 50.78E</Y>
              </coord>
              <radius>15</radius>
            </CircularArea>
          </shape>
        </pd>
      </eme_pos>
    </eme_event>
  </emerep>
```

5.2.3.9 Triggered Location Reporting Service

The triggered location reporting service is used when an application wants the position of several MSs to be tracked. The triggers could be:

- The periodicity of reporting defined by an interval time
- An MS action, defined as the event "UE available" in 3GPP [23.271].

The report will be triggered when one of the pre-defined MS's actions occurred or the time interval elapses. The service consists of the following messages:

- Triggered Location Reporting Request
- Triggered Location Reporting Answer
- Triggered Location Report
- Triggered Location Reporting Stop Request
- Triggered Location Reporting Stop Answer

The following message flow as depicted in Figure 7 encapsulates this service:

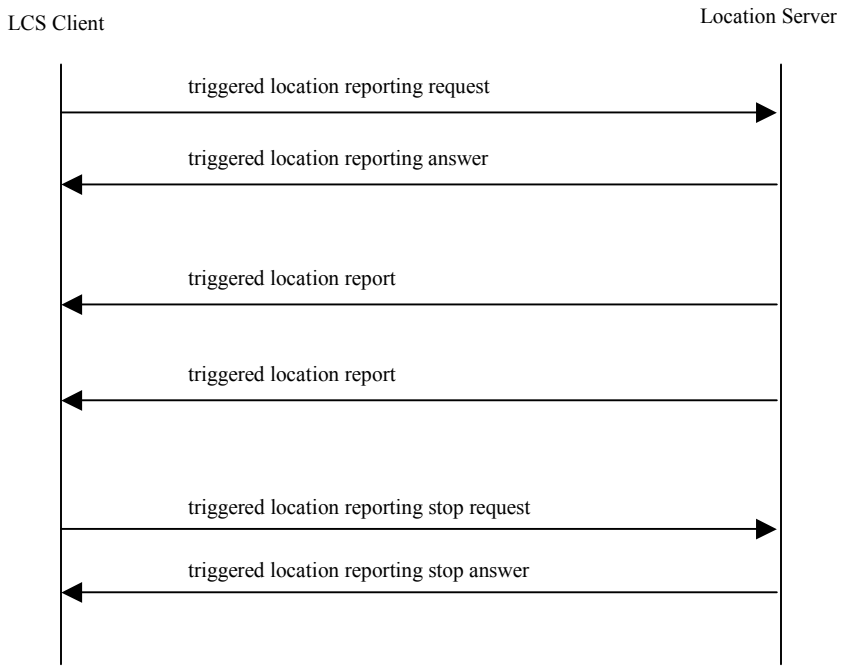

Figure 7: Message Flow for the Triggered Location Reporting Service

Note: It is the intention that a future release of Triggered services will support the reporting of MSs entering or leaving an area. An area may be defined as a specified geographical area, a city or locale, a country or a

network. Other triggers that may be supported are specific events not yet defined, such a subscriber being in proximity to a friend in a friend finding application. Other events are for further study within 3GPP and are targeted for Rel. 6.

5.2.3.9.1 Triggered Location Reporting Request DTD

```
<!-- MLP_TLRR -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_init PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_init>
      ...
   </svc_init>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param          "">

<!ELEMENT   tlrr                      (msids, interval?, start time?, stop time?, tlrr event?,
                                       qop?, geo info?, pushaddr?, loc type?, prio?
                                       %extension.param;)>
<!ATTLIST   tlrr
            ver CDATA                 #FIXED "3.0.0">
```

The following rules apply to the use of ‘start_time’, ‘stop_time’, ‘interval’ and ‘tlrr_event’:

- TLRR with ‘interval’ SHALL be interpreted as a request for periodic location reports, and TLRR with ‘tlrr_event’ SHALL be interpreted as a request for a location report on the occurrence of a specific event. ‘interval’ and ‘tlrr_event’ MAY be combined. When neither ‘interval’ nor ‘tlrr_event’ is specified in TLRR, the Location Server MUST reject the request with an error indication ‘106’ to the client.
- If no START_TIME is specified reporting SHALL start immediately.
- If no STOP_TIME is specified the reporting SHOULD occur until explicitly canceled with ‘Triggered Location Stop Request’ or a time out occurs (depending on system configuration). Timeout MAY be reported to the LCS client by 'time_remaining' in triggered location report.
- If START_TIME is ‘older’ than the current time then the Location Server MUST reject the request with an error indication ‘110’ to the client.
- If STOP_TIME is ‘older’ than the current time then the Location Server MUST reject the request with an error indication ‘110’ to the client.
- If STOP_TIME is earlier than START_TIME then the implementation MUST reject the request with an error indication ‘110’ to the client.
- If STOP_TIME is equal to START_TIME then the Location Server MUST return a single location report to the client at the specified time. Any interval specified MUST be ignored.

Example 1: TLRR for periodic location reports during a specified period

```
<tlrr ver="3.0.0">
  <msids>
    <msid>461011678298</msid>
  </msids>
  <interval>00003000</interval>
  <start_time utc_off="+0300">20021003112700</start_time>
  <stop_time utc_off="+0300">20021003152700</stop_time>
  <qop>
    <hor_acc>100</hor_acc>
  </qop>
  <geo_info>
    <CoordinateReferenceSystem>
      <Identifier>
        <code>4326</code>
        <codeSpace>EPSG</codeSpace>
        <edition>6.1</edition>
      </Identifier>
    </CoordinateReferenceSystem>
  </geo_info>
  <pushaddr>
    <url>http://location.application.com</url>
  </pushaddr>
  <loc_type type="CURRENT" />
  <prio type="HIGH" />
</tlrr>
```

Example 2: TLRR for single location report at a specified time. ‘stop_time’ is specified equal to ‘start_time’.

```
<tlrr ver="3.0.0">
  <msids>
    <msid>461011678298</msid>
  </msids>
  <interval>00003000</interval>
  <start_time utc_off="+0300">20021003112700</start_time>
  <stop_time utc_off="+0300">20021003112700</stop_time>
  <qop>
    <hor_acc>100</hor_acc>
  </qop>
  <geo_info>
    <CoordinateReferenceSystem>
      <Identifier>
        <code>4004</code>
        <codeSpace>EPSG</codeSpace>
        <edition>6.1</edition>
      </Identifier>
    </CoordinateReferenceSystem>
  </geo_info>
  <pushaddr>
    <url>http://location.application.com</url>
  </pushaddr>
  <loc_type type="CURRENT" />
  <prio type="HIGH" />
</tlrr>
```

Example 3: TLRR for a location report on the occurrence of a MS_AVAIL event after a specified time.

```
<tlrr ver="3.0.0">
  <msids>
    <msid>461011678298</msid>
  </msids>
  <start_time utc_off="+0300">20021003112700</start_time>
  <tlrr_event>
<ms_action type="MS_AVAIL"/>
</tlrr_event>
  <qop>
    <hor_acc>100</hor_acc>
  </qop>
```

```
    <geo_info>
      <CoordinateReferenceSystem>
        <Identifier>
          <code>4326</code>
          <codeSpace>EPSG</codeSpace>
          <edition>6.1</edition>
        </Identifier>
      </CoordinateReferenceSystem>
    </geo_info>
    <pushaddr>
      <url>http://location.application.com</url>
    </pushaddr>
    <loc_type type="CURRENT" />
    <prio type="HIGH" />
  </tlrr>
```

5.2.3.9.2 Triggered Location Reporting Answer DTD

```
<!-- MLP_TLRA -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param         "">

<!ELEMENT   tlra                     ((req_id | (result, add_info?)) %extension.param;)>
<!ATTLIST   tlra
            ver CDATA                #FIXED "3.0.0">
```

Example 1: TLRA if corresponding TLRR was successful

```
  <tlra ver="3.0.0">
    <req_id>25293</req_id>
  </tlra>
```

Example 2: TLRA if corresponding TLRR was in error

```
  <tlra ver="3.0.0">
    <result resid="4">UNKNOWN SUBSCRIBER</result>
  </tlra>
```

5.2.3.9.3 Triggered Location Report DTD

```
<!-- MLP_TLREP -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param         "">

<!ELEMENT   tlrep                    (req_id, trl_pos+, time_remaining? %extension.param;)>
<!ATTLIST   tlrep
            ver CDATA                #FIXED "3.0.0">
```

Example

```
<tlrep ver="3.0.0">
  <req_id>25267</req_id>
  <trl_pos trl_trigger="PERIODIC">
    <msid>461011678298</msid>
    <pd>
      <time utc_off="+0300">20020813010423</time>
      <shape>
        <CircularArea srsName="www.epsg.org#4326">
          <coord>
            <X>35 35 24.139N</X>
            <Y>139 35 24.754E</Y>
          </coord>
          <radius>15</radius>
        </CircularArea>
      </shape>
    </pd>
  </trl_pos>
  <time_remaining>00010000</time_remaining>
</tlrep>
```

5.2.3.10 Triggered Location Reporting Stop Request DTD

```
<!-- MLP_TLRSR -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_init PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_init>
      ...
   </svc_init>

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Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.param         "">

<!ELEMENT   tlrsr                    (req_id %extension.param;)>
<!ATTLIST   tlrsr
            ver CDATA                #FIXED "3.0.0">
```

Example

```
<tlrsr ver="3.0.0">
  <req_id>25293</req_id>
</tlrsr>
```

5.2.3.10.1 Triggered Location Reporting Stop Answer DTD

```
<!-- MLP_TLRSA -->
<!--
MLP V3.0 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result>

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Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->
```

```
<!ENTITY    % extension.param          "">

<!ELEMENT   tlrsa                     ((req_id | (result, add_info?)) %extension.param;)>
<!ATTLIST   tlrsa
            ver CDATA                 #FIXED "3.0.0">
```

Example

```
<tlrsa ver="3.0.0">
  <req_id>25293</req_id>
</tlrsa>
```

5.2.3.11 General Error Message Definition

When an LCS client attempts to invoke a service not defined in this specification, the location server SHOULD return a General Error Message. Sending a general error message (GEM) is no proper solution by itself because it can not always be expected that the client will understand this (MLP) response message, since - by sending an invalid request - the client shows that it may not be familiar with the proper set of MLP services. So additional error indications MAY be described in the appropriate transport layer mappings.

```
<!-- MLP_GEM -->
<!--
MLP V3.1 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE gem PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <gem>
      ...
   </gem>

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Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->

<!ELEMENT   gem                       (result, add_info?)>
<!ATTLIST   gem
            ver CDATA                 #FIXED "3.1.0">

<!ENTITY    % mlp_res.dtd             SYSTEM "MLP_RES_300.DTD">
%mlp_res.dtd;
```

Example

```
<gem ver="3.1.0">
  <result resid="108">SERVICE NOT SUPPORTED</result>
  <add_info>
    The server does not support a service named 'skir'
  </add_info>
</gem>
```

5.3 Elements and attributes in DTD

5.3.1 add_info

Description:	
A text string containing additional information about a certain result.	
Type:	Element
Format:	Char string
Defined values:	
Default value:	
Example:	`<add_info>EVENT</add_info>`
Note:	

5.3.2 alt

Description:	
The altitude of the MS in meters in respect of the ellipsoid which is used to be define the coordinates	
Type:	Element
Format:	Char String
Defined values:	[+|-]?[0-9]+
Default value:	
Example:	`<alt>1200</alt>`
Note:	This element is present if altitude is possible to attain by the used positioning method.

5.3.3 alt_acc

Description:	
Accuracy of altitude in meters	
Type:	Element
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<alt_acc>200</alt_acc>`
Note:	

5.3.4 angle

Description:	
Specifies the angle (in angularUnit) of rotation of an ellipse measured clockwise from north	
Type:	Element
Format:	Char String
Defined values:	
Default value:	
Example:	`<angle>24.30</angle>`
Note:	

5.3.5 angularUnit

Description:	
The angularUnit defines the unit for any angular value used in the shape description. For example the startAngle value in the CircularArcArea will be defined by this unit. If this unit is not included in a shape definition the angular unit defined in the CRS SHALL be used.	
Type:	Element
Format:	Char String
Defined values:	Degrees
	Radians
Default value:	Degrees
Example:	`<angularUnit>Degrees</angularUnit>`
Note:.	

5.3.6 Box

Description:	
The Box element is used to encode extents	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<Box srsName="www.epsg.org#4326" gid="some_thing">`
	`  <coord>`
	`  <X>30 27 45.3N</X>`
	`  <Y>45 25 52.9E</Y>`
	`  </coord>`
	`  <coord>`
	`  <X>31 27 45.3N</X>`
	`  <Y>46 25 52.9E</Y>`
	`  </coord>`
	`</Box>`

Note:	

5.3.6.1 gid

Description:	
The gid is of XML attribute type ID and is used for references to elements within a single XML document. It allows XML technologies such as XPointer and xref to be used.	
Type:	Attribute
Format:	Char String
Defined values:	
Default value:	
Example:	`<Box srsName="www.epsg.org#4326" gid="some_thing">`
Note:	This attribute is optional and is on all shape elements

5.3.6.2 srsName

Description:	
srsName is a short hand method of defining the CoordinateReferenceSystem. It is a URI datatype that contains the codeSpace and code values, which are defined in the same way as in the CoordinateReferenceSystem.	
Type:	Attribute
Format:	Char String
Defined values:	
Default value:	www.epsg.org/#4326
Example:	`<Box srsName="www.epsg.org/#4326">`
Note:	This attribute is optional and is on all shape elements. If the srsName is not included the WGS84 CRS SHOULD be assumed.

5.3.7 cc

Description:	
Specifies the country code.	
Type:	Element
Format:	Char String
Defined values:	1-3 digits e.g. 355 for Albania
Default value:	
Example:	`<cc>355</cc>`
Note:	

5.3.8 cellid

Description:	
Identifies the Cell Identity	
Type:	Element

Format:	Char String
Defined values:	0-65535
Default value:	
Example:	`<cellid>546</cellid>`
Note:	

5.3.9 CircularArcArea

Description:	
An arc is defined by a point of origin with one offset angle and one uncertainty angle plus one inner radius and one uncertainty radius.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<CircularArcArea srsName="www.epsg.org#4326" gid="some_thing">`
	`  <coord>`
	`  <X>30 27 45.3N</X>`
	`  <Y>45 25 52.9E</Y>`
	`  </coord>`
	`  <inRadius>280</inRadius>`
	`  <outRadius>360</outRadius>`
	`  <startAngle>5</startAngle>`
	`  <stopAngle>240</stopAngle>`
	`</CircularArcArea>`

Note:	

5.3.9.1 gid

See section 5.3.6.1.

5.3.9.2 srsName

See section 5.3.6.2.

5.3.10 CircularArea

Description:	
The set of points on the ellipsoid, which are at a distance from the point of origin less than or equal to “r”.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<CircularArea srsName="www.epsg.org#4326" gid="some_thing">`
	`  <coord>`
	`  <X>30 27 45.3N </X>`
	`  <Y>45 25 52.9E</Y>`

	</coord> <radius>240</radius> </CircularArea>
Note:	

5.3.10.1 gid

See section 5.3.6.1.

5.3.10.2 srsName

See section 5.3.6.2.

5.3.11 code

Description:	
This is the unique identifier for the Coordinate ReferenceSystem as used by the authority cited in codeSpace	
Type:	Element
Format:	Char String
Defined values:	
Default value:	
Example:	<code>4326</code>
Note:	.

5.3.12 codeSpace

Description:	
The codeSpace is the authority, which is responsible for the definition of the coordinate reference systems.	
Type:	Element
Format:	Char String
Defined values:	
Default value:	www.epsg.org/...
Example:	<codeSpace>www.epsg.org</codeSpace>
Note:	

5.3.13 codeword

Description:	
Codeword is an access code defined per MS, used to protect location information of MS against unwanted location request. Only location requests with the correct codeword of a target MS are accepted.	
Type:	Element
Format:	Char String

Defined values:	
Default value:	
Example:	<codeword>0918a7cb</codeword>
Note:	An error SHALL be returned if the number of codewords is not equal to the number of msid in an msid_range.

5.3.14 distanceUnit

Description:	
The distanceUnit defines the linear unit for any distance used in the shape description. For example the radius value in the CircularArea will be defined by this unit. If this unit is not included in a shape definition the distance unit defined in the CRS SHOULD be used.	
Type:	Element
Format:	Char String
Defined values:	
Default value:	meter
Example:	`<distanceUnit>surveyfoot</distanceUnit>`
Note:	values are defined by the CRS authority

5.3.15 direction

Description:	
Specifies the direction of movement (in degrees) of a positioned MS.	
Type:	Element
Format:	Char String
Defined values:	0-360
Default value:	
Example:	`<direction>120</direction>`
Note:	This element is present if direction is possible to attain by the used positioning method.

5.3.16 edition

Description:	
The edition defines which version of the CRS database, defined by the codeSpace authority, is used..	
Type:	Element
Format:	Char String
Defined values:	
Default value:	
Example:	`<edition>6.0</edition>`
Note:	

5.3.17 EllipticalArea

Description:	
A set of points on the ellipsoid, which fall within or on the boundary of an ellipse. This ellipse has a semi-major axis of length r1 oriented at angle A (0 to 180°) measured clockwise from north and a semi-minor axis of length r2.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<EllipticalArea srsName="www.epsg.org#4326" gid="some_thing">`
	`  <coord>`
	`  <X>30 27 45.3N</X>`
	`  <Y>45 25 52.9E</Y>`
	`  </coord>`
	`  <angle>240</angle>`
	`  <semiMajor>150</semiMajor>`
	`  <semiMinor>275</semiMinor>`
	`  <angularUnit>degrees</angularUnit>`
	`</EllipticalArea>`

Note:	

5.3.17.1 gid

See section 5.3.6.1.

5.3.17.2 srsName

See section 5.3.6.2.

5.3.18 eme_event

Description:	
Specifies the events that initiated the positioning of the MS at an emergency call.	
Type:	Element
Format:	
Defined values:	
Default value:	
Example:	`<eme_event eme_trigger="EME_ORG">`
Note:	

5.3.18.1 eme_trigger

Description:
Specifies the trigger that initiated the positioning of the MS at an emergency call.

Type:	Attribute	
Format:	Char string	
Defined values:	EME_ORG	An emergency service user originated an emergency call
	EME_REL	An emergency service user released an emergency call
Default value:		
Example:	`<eme_event eme_trigger="EME_ORG">`	
Note:		

5.3.19 esrd

Description:	
This element specifies Emergency Services Routing Digits (ESRD).	
Type:	Element
Format:	Char string
Defined values:	
Default value:	
Example:	`<esrd>761287612582</esrd>`
Note:	

5.3.19.1 type

Description:		
Defines the origin of the ESRD		
Type:	Attribute	
Format:	Char string	
Defined values:	NA	Indicates that the ERSD is defined as the North American ESRD (NA-ERSD). NA-ESRD is a telephone number in the North American Numbering Plan that can be used to identify a North American emergency services provider and it's associated Location Services client. The NA-ESRD also identifies the base station, cell site or sector from which a North American emergency call originates.
Default value:	NA	
Example:	`<esrd type="NA">12345678</ersd>`	
Note:	Currently only NA is specified. It is expected that other origins will be specified in the future	

5.3.20 esrk

Description:	
This element specifies the Services Routing Key (ESRK).	
Type:	Element
Format:	Char string
Defined values:	-

Default value:	-
Example:	`<esrk>928273633343</esrk>`
Note:	-

5.3.20.1 type

Description:		
Defines the origin of the ESRK		
Type:	Attribute	
Format:	Char string	
Defined values:	NA	Indicates that the ERSK is defined as the North American ESRK (NA-ERSK). NA-ESRK is a telephone number in the North American Numbering Plan that is assigned to an emergency services call for the duration of the call. The NA-ESRK is used to identify (e.g. route to) both the emergency services provider and the switch currently serving the emergency caller. During the lifetime of an emergency services call, the NA-ESRK also identifies the calling subscriber.
Default value:	NA	
Example:	`<esrk type="NA">12345678</ersk>`	
Note:	Currently only NA is specified. It is expected that other origins will be specified in the future	

5.3.21 hor_acc

Description:	
Horizontal accuracy in meters	
Type:	Element
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<hor_acc>200</hor_acc>`
Note:	

5.3.22 id

Description:	
A string defining the name of a registered user performing a location request. In an answer the string represents the name of a location server.	
Type:	Element
Format:	Char string
Defined values:	
Default value:	
Example:	`<id>TheTruckCompany</id>`

Note:	This element is implementation specific.

5.3.23 imsi

Description:	
The International Mobile Subscriber Identity number as specified in 3GPP TS 23.003 and ITU-T E212 Recommendation. This will only be provided and used in roaming cases.	
Type:	Element
Format:	Char String
Defined values:	-
Default value:	-
Example:	`<imsi>123456789012345</imsi>`
Note:	-

5.3.24 inRadius

Description:	
The inner radius is the geodesic distance (in distannceUnit) between the center of the circle (that the arc is a part of) and the arc closest to the center	
Type:	Element
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<inRadius>100</inRadius>`
Note:	If the inner radius is 0 (zero) the area described represents a sector of s circle.

5.3.25 interval

Description:		
Specifies the interval between two responses in case of a TLRR indicating timer controlled, periodic responses.		
Type:	Element	
Format:	Char string The interval is expressed as ddhhmmss where:	
	String	**Description**
	dd	Number of days between responses
	hh	Number of hours between responses
	mm	Number of minutes between responses
	ss	Number of seconds between responses
Defined values:		
Default value:		
Example:	`<interval>00010000</interval>`	
Note:		

5.3.26 lac

Description:	
Identifies the Location Area Code	
Type:	Element
Format:	Char String
Defined values:	1-65535
Default value:	
Example:	`<lac>234</lac>`
Note:	Location Area Code (LAC) is a fixed length code (of 2 octets) identifying a location area within a GSM PLMN. This part of the location area identification can be coded using a full hexadecimal representation, except for the following reserved hexadecimal values: 0000, and FFFE

5.3.27 lev_conf

Description:	
This parameter indicates the probability in percent that the MS is located in the position area that is returned.	
Type:	Element
Format:	Char String
Defined values:	0-100
Default value:	
Example:	`<lev_conf>80</lev_conf>`
Note:	

5.3.28 LinearRing

Description:	
A linear ring is a closed, simple piece-wise linear path which is defined by a list of coordinates that are assumed to be connected by straight-line segments.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<LinearRing srsName="www.epsg.org#4326" gid="some_thing">`
	`  <coord>`
	`  <X>30 27 45.3N</X>`
	`  <Y>45 25 52.9E</Y>`
	`  </coord>`
	`  <coord>`
	`  <X>40 27 45.3N</X>`
	`  <Y>48 25 52.9E</Y>`
	`  </coord>`
	`  <coord>`
	`  <X>33 27 45.3N</X>`

	<Y>46 25 52.9E</Y> </coord> <coord> <X>30 27 45.3N</X> <Y>45 25 52.9E</Y> </coord> </LinearRing>
Note:	

5.3.28.1 gid

See section 5.3.6.1.

5.3.28.2 srsName

See section 5.3.6.2.

5.3.29 LineString

Description:	
A line string is a piece-wise linear path which is defined by a list of coordinates that are assumed to be connected by straight-line segments.	
Type:	Element
Format:	
Defined values:	
Default value:	
Example:	<LineString srsName="www.epsg.org#4326" gid="some_thing"> <coord> <X>30 27 45.3N</X> <Y>48 25 52.9E</Y> </coord> <coord> <X>40 27 45.3N</X> <Y>48 25 52.9E</Y> </coord> <coord> <X>33 27 45.3N</X> <Y>48 25 52.9E</Y> </coord> </LineString>
Note:	

5.3.29.1 gid

See section 5.3.6.1.

5.3.29.2 srsName

See section 5.3.6.2.

5.3.30 ll_acc

Description:	
Longitude and latitude accuracy in seconds.	
Type:	Element
Format:	Char String
Defined values:	
Default value:	
Example:	`<ll_acc>7.5</ll_acc>`
Note:	

5.3.31 lmsi

Description:	
A local identity allocated by the VLR to a given subscriber for internal management of data in the VLR as defined in [29.002]	
Type:	Element
Format:	Char String
Defined values:	
Default value:	
Example:	
Note:	The LMSI consists of 4 octets

5.3.32 loc_type

Description:	
Defines the type of location requested.	
Type:	Element
Format:	Void
Defined values:	
Default value:	
Example:	`<loc_type type="INITIAL" />`
Note:	

5.3.32.1 type

Description:	
Defines the type of location requested	
Type:	Attribute
Format:	Char string

Defined values:	CURRENT	After a location attempt has been successfully delivered a location estimate, the location estimate is known as the current location at that point in time.
	LAST	The current location estimate is generally stored in the network until replaced by a later location estimate and is known as the last known location. The last known location may be distinct from the initial location, i.e. more recent.
	CURRENT_OR_LAST	If a location attempt has successfully delivered, the current location is returned. Otherwise the last known location stored in the network is returned.
	INITIAL	In an originating emergency call, the location estimate at the commencement of the call set-up is known as the initial location.
Default value:	CURRENT	
Example:	`<loc_type type="INITIAL" />`	
Note:		

5.3.33 max_loc_age

Description:	
This states the maximum allowable age in seconds of a location sent as a response to a location request. This location information may have been cached somewhere in the system from a previous location update.	
Type:	Element
Format:	Char string
Defined values:	Maximum number of seconds (must be >= 0)
Default value:	Implementation specific.
Example:	`<max_loc_age>3600</max_loc_age>`
Note:	

5.3.34 mcc

Description:	
Specifies the mobile country code (MCC).	
Type:	Element
Format:	Char String
Defined values:	3 digits, e.g. 234 for the UK
Default value:	
Example:	`<mcc>234</mcc>`
Note:	

5.3.35 mnc

Description:	
Specifies the mobile network code.	
Type:	Element
Format:	Char string
Defined values:	2 - 3 digits e.g. 15 for Vodafone
Default value:	
Example:	`<mnc>215</mnc>`
Note:	

5.3.36 ms_action

Description:	
Specifies the trigger that initiated the positioning of the MS.	
Type:	Element
Format:	Void
Defined values:	
Default value:	
Example:	`<ms_action type="MS_AVAIL" />`
Note:	

5.3.36.1 type

Description:		
Specifies the trigger that initiated the positioning of the MS.		
Type:	Attribute	
Format:	Char string	
Defined values:	MS_AVAIL	The positioning is triggered by the MS available notification when the MS regains radio connection with the network if the connection was previously lost. For more information refer to 3GPP [23.271].
Default value:		
Example:	`<ms_action type="MS_AVAIL" />`	
Note:		

5.3.37 msid

Description:	
This element represents an identifier of a mobile subscriber	
Type:	Element

Format:	Char string
Defined values:	
Default value:	
Example:	`<msid>460703057640</msid>`
Note:	When appropriate the MSID type format SHOULD confirm to the full standardised international representation of the MSID type, without any additional unspecified characters or spaces. As an example the GSM/3GPP identifiers SHOULD conform to 3GPP [23.003]

5.3.37.1 type

Description:		
Type of identifier for the mobile subscriber		
Type:	Attribute	
Format:	Char string	
Defined values:	MSISDN	Mobile Station International ISDN Number [23.003]
	IMSI	International Mobile Subscriber Identity [23.003], [J-STD-036]
	IMEI	International Mobile station Equipment Identity [23.003]
	MIN	Mobile Identification Number [IS-41D]
	MDN	Mobile Directory Number [IS-41D]
	EME_MSID	Emergency MSID
	ASID	Anonymous Subscriber Identity
	IPV4	Mobile station IP address (Version 4) [RFC796]
	OPE_ID	Operator specific Identity
	IPV6	Mobile station IP address (Version 6) [RFC3513]
	SESSID	Session identifier relating to the user, which MAY be anonymous
Default value:	MSISDN	
Example:	`<msid type="IMSI">`	
Note:		

5.3.37.2 enc

Description:		
Type of encoding of MSID identifier for the mobile subscriber		
Type:	Attribute	
Format:	Char string	
Defined values:	ASC	Normal textual format
	CRP	Encrypted format: In some countries private information of a MS (e.g. MSISDN) is not allowed to be sent to an LCS Client.. The Network Operator can send out to the LCS client an Encrypted MSID, since the Network Operator is the only entity able to decode this information, the LCS client will be never able to break the privacy of the MS.
Default value:	ASC	
Example:	`<msid type="IMSI" enc="ASC">`	
Note:		

5.3.38 MultiLineString

Description:	
A collection of line strings.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<MultiLineString srsName="www.epsg.org#4326" gid="some_thing">`
	`  <LineString>`
	`  ...`
	`  </LineString>`
	`</MultiLineString>`

Note:	

5.3.38.1 gid

See section 5.3.6.1.

5.3.38.2 srsName

see section 5.3.6.2.

5.3.39 MultiPoint

Description:	
A collection of points.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<MultiPoint srsName="www.epsg.org#4326" gid="some_thing">`
	`  <Point>`
	`  ...`
	`  </Point>`
	`</MultiPoint>`

Note:	

5.3.39.1 gid

See section 5.3.6.1.

5.3.39.2 srsName

See section 5.3.6.2.

5.3.40 MultiPolygons

Description:	
A collection of polygons.	
Type:	Element
Format:	
Defined values:	-
Default value:	-

Example:	`<MultiPolygon srsName="www.epsg.org#4326" gid="some_thing">`
	`  <Polygon>`
	`  ...`
	`  </Polygon>`
	`</MultiPolygon>`

Note:	

5.3.40.1 gid

See section 5.3.6.1.

5.3.40.2 srsName

see section 0.

5.3.41 ndc

Description:	
Specifies the national destination code.	
Type:	Element
Format:	Char string
Defined values:	Variable length depending upon the requirements of the destination country.
Default value:	
Example:	`<ndc>215</ndc>`
Note:	

5.3.42 nmr

Description:	
Network specific measurement result for the target MS.	
Type:	Element
Format:	Char string
Defined values:	For examples see relevant standards documents.
Default value:	
Example:	
Note:	Measurement Results are encoded as 34 hexadecimal characters representing, 17 binary octets,

	in accordance with the Measurement Result information element described in [04.18].

5.3.43 radius

Description:	
The uncertainty radius is the radius (in distanceUnit) of the uncertainty; this is the geodesic distance between the arc and the position point.	
Type:	Element
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<radius>850</radius>`
Note:	

5.3.44 startAngle

Description:	
The start angle is the angle (in angularUnit) between North and the first defined radius.	
Type:	Element
Format:	Char string
Defined values:	0-359°
Default value:	
Example:	`<startAngle>60</startAngle>`
Note:	

5.3.45 stopAngle

Description:	
The stop angle is the angle (in angularUnit) between the first and second defined radius.	
Type:	Element
Format:	Char string
Defined values:	1-360°
Default value:	
Example:	`<stopAngle>180</stopAngle>`
Note:	

5.3.46 Point

Description:	
A geographic coordinate	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<Point srsName="www.epsg.org#4326" gid="some_thing">`
	`  <coord>`
	`  <X>30 27 45.3N</X>`
	`  <Y>45 25 52.9E</Y>`
	`  </coord>`
	`</Point>`

Note:	

5.3.46.1 gid

See section 5.3.6.1.

5.3.46.2 srsName

See section 5.3.6.2.

5.3.47 Polygon

Description:	
A connected surface. Any pair of points in the polygon can be connected to one another by a path. The boundary of the Polygon is a set of LinearRings. We distinguish the outer (exterior) boundary and the inner (interior) boundaries; the LinearRings of the interior boundary cannot cross one another and cannot be contained within one another.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<Polygon srsName="www.epsg.org#4326" gid="some_thing">`
	`  <outerBoundaryIs>`
	`  ...`
	`  </outerBoundaryIs >`
	`</Polygon>`

Note:	

5.3.47.1 gid

See section 5.3.6.1.

5.3.47.2 srsName

See section 5.3.6.2.

5.3.48 prio

Description:	
Defines the priority of a location request	
Type:	Element
Format:	Void
Defined values:	
Default value:	
Example:	`<prio />`
Note:	

5.3.48.1 type

Description:		
Defines the priority of a location request		
Type:	Attribute	
Format:	Char string	
Defined values:	NORMAL	The request is handled with normal priority
	HIGH	The request is handled with high priority
Default value:	NORMAL	
Example:	`<prio type="HIGH" />`	
Note:		

5.3.49 pwd

Description:
The password for the registered user performing a location request. In this answer the string represents the password for a location server.
Type: Element
Format: Char string
Defined values:
Default value:
Example: `<pwd>the5pwd</pwd>`
Note:

5.3.50 outRadius

Description:	
The radius of a circle furthest away from the position in a CircularArcArea. The value is in the distanceUnit	
Type:	Element
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<outRadius>120</outRadius>`
Note:	

5.3.51 req_id

Description:	
Unique identification of a request	
Type:	Element
Format:	Char string
Defined values:	
Default value:	
Example:	`<req_id>435.23.01</req_id>`
Note:	

5.3.52 resp_req

Description:	
This attribute represents the response time required.	
Type:	Element
Format:	Void
Defined values:	
Default value:	
Example:	`<resp_req type="NO_DELAY" />`
Note:	

5.3.52.1 type

Description:		
This attribute represents the response time required		
Type:	Attribute	
Format:	Char String	
Defined values:	NO_DELAY	No delay: The server SHOULD immediately return any location estimate

		that it currently has.
	LOW_DELAY	Low delay: Fulfilment of the response time requirement takes precedence over fulfilment of the accuracy requirement.
	DELAY_TOL	Delay tolerant: Fulfilment of the accuracy requirement takes precedence over fulfilment of the response time requirement.
Default value:	DELAY_TOL	
Example:	`<resp_req />`	
Note:	The interpretation of these parameters is defined in 3GPP [22.071] and [29.002]. The use of this element together with resp_timer is for further study.	

5.3.53 resp_timer

Description:	
Defines a timer for the response time within which the current location SHOULD be obtained and returned to the LCS Client.	
Type:	Element
Format:	Char String
Defined values:	Maximum number of seconds (must be >= 0)
Default value:	The default value is defined in the location server and will be implementation specific
Example:	`<resp_timer>45</resp_timer>`
Note:	The use of this element together with resp_reg is for further study

5.3.54 result

Description:	
A text string indicating the result of the request or an individual positioning	
Type:	Element
Format:	Char string
Defined values:	See section 5.4 "Result codes"
Default value:	
Example:	`<result resid="0">OK</result>`
Note:	

5.3.54.1 resid

Description:	
This attribute represents a numeric representation of a result message	
Type:	Attribute
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<result resid="0">OK</result>`

Note:	See section 5.4.

5.3.55 semiMajor

Description:	
Specifies the length (in distanceUnit) of the semi-major axis of an ellipse.	
Type:	Element
Format:	Char String
Defined values:	[0-327675]
Default value:	
Example:	`<semiMajor>560</semiMajor>`
Note:	

5.3.56 semiMinor

Description:	
Specifies the length (in distanceUnit) of the semi-minor axis of an ellipse.	
Type:	Element
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<semiMinor>560</semiMinor>`
Note:	

5.3.57 serviceid

Description:	
Specifies an id that is used by an entity to identify the service or application that is accessing the network.	
Type:	Element
Format:	Char String
Defined values:	-
Default value:	-
Example:	`<serviceid>0005</serviceid>`
Note:	

5.3.58 requestmode

Description:	
Defines the type of the service that has been requested by the ASP.	
Type:	Element

Format:	Void
Defined values:	
Default value:	
Example:	`<requestmode />`
Note:	

5.3.58.1 type

Description:		
Defines the type of the service that has been requested by the ASP		
Type:	Attribute	
Format:	Char string	
Defined values:	PASSIVE	The service is one that is not directly initiated by the user.
	ACTIVE	The service is one that the user is initiating personally.
Default value:	PASSIVE	
Example:	`<requestmode type="ACTIVE" />`	
Note:	The default value is set to PASSIVE, as this is likely to be the one that is most restrictively defined by the user.	

5.3.59 session

Description:
This element SHOULD be presented in the location request when the LCS Client has an active session with the User Equipment, this will be either the number called by the UE or the APN on which the UE established the session.
Type: Element
Format: Char String
Defined values: -
Default value: -
Example: `<session>447073100177</session>`
Note: This information may be required for privacy validation of the location request by the VMSC, SGSN or MSC server

5.3.59.1 type

Description:		
Defines the type of session that is established between the User Equipment and LCS Client		
Type:	Attribute	
Format:	Char string	
Defined values:	APN	Access Point Name.
	DIAL	The number dialed by the user to access the LCS client.
Default value:		

Example:	`<session type="DIAL" />`
Note:	

5.3.60 sessionid

Description:	
Specifies an id that can be used by an LCS client to support privacy mechanisms. A sessionid may replace the need to use an ID and PWD to use the location services. In a request when a client and sessionid are present together, the sessionid may indicate the number dialed by the end user to access the service or the APN through which the original session was established that initiated the service. The response may contain a sessionid that the LCS client can use on subsequent requests. In this case the sessionid could be a generated alphanumeric string and can be time-limited.	
Type:	Element
Format:	Char String
Defined values:	
Default value:	
Example:	`<sessionid>34eg6.876.76h4</sessionid>`
Note:	

5.3.61 speed

Description:	
The speed of the MS in m/s.	
Type:	Element
Format:	Char String
Defined values:	[0-9]+
Default value:	
Example:	`<speed>23</speed>`
Note:	This element is present if speed is possible to attain by the used positioning method.

5.3.62 start_time

Description:	
This element defines the absolute start time in a time range.	
Type:	Element
Format:	Char String The time is expressed as yyyyMMddhhmmss where: String: yyyy = Year; MM = Month; dd = Day; hh = Hours

		mm	Minutes
		ss	Seconds
Defined values:			
Default value:			
Example:	<start_time>20010630142810</start_time>		
Note:			

5.3.62.1 utc_off

Description:	
Specifies the UTC [UTC] offset in hours and minutes. Positive values indicate time zones east of Greenwich.	
Type:	Attribute
Format:	Char string
Defined values:	[+|-]?0000-1400
Default value:	
Example:	<start_time utc_off="+0200">20020813010423</start_time>
Note:	utc_off is specified as 'HHMM', where 'HH' can range between 0-14 and 'MM' between '0-59'. All other values shall result in error 105, 'Format error'.

5.3.63 stop_time

Description:			
This element defines the absolute stop time in a time range.			
Type:	Element		
Format:	Char String The time is expressed as yyyyMMddhhmmss where:		
		String	Description
		Yyyy	Year
		MM	Month
		Dd	Day
		Hh	Hours
		Mm	Minutes
		Ss	Seconds
Defined values:			
Default value:			
Example:	<stop_time>20020630142810</stop_time>		
Note:			

5.3.63.1 utc_off

See section 5.3.62.1

5.3.64 subclient

Description:	
Identifies the ASPs, resellers and portals in the chain of service providers between the network and the end-user	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<subclient last_client="NO">`
	`  <id>TheASP</id>`
	`  <serviceid>0006</serviceid>`
	`</subclient>`

Note:	

5.3.64.1 last_client

Description:		
Identifies whether the SUBCLIENT is the last one in the chain or not		
Type:	Attribute	
Format:	Char String	
Defined values:	YES	This is the last client – the one that the end-user is actually communicating with
	NO	This is not the last client
Default value:	NO	
Example:	`<subclient last_client="YES">`	
Note:		

5.3.65 ta

Description:	
This Radio Access Network element that can arguably be used to offer enhanced positioning. (Timing Advance)	
Type:	Element
Format:	Char string
Defined values:	0-63
Default value:	0
Example:	`<ta>3</ta>`
Note:	Further Information regarding this element can be found in the relevant GSM Specifications [05.10]

5.3.66 time

Description:	
In a location answer this element indicates the time when the positioning was performed.	
Type:	Element
Format:	Char String The time is expressed as yyyyMMddhhmmss where: String: Description yyyy: Year MM: Month dd: Day hh: Hours mm: Minutes ss: Seconds
Defined values:	
Default value:	
Example:	`<time>20010630142810</time>`
Note:	

5.3.66.1 utc_off

See section 5.3.63.1

5.3.67 time_remaining

Description:	
Defines the time remaining until the location server terminates the current triggered location service. The time when the service is valid is either specified by the client using start time and stop time, or is a network operator specific default value where no stop time is defined or where the stop time exceeds the allowed value by the location server involved.	
Type:	Element
Format:	Char String The time is expressed as ddhhmmss where: String: Description dd: Day hh: Hours mm: Minutes ss: Seconds
Defined values:	
Default value:	The default value is defined in the location server
Example:	`<time_remaining>00010000</time_remaining>`
Note:	

5.3.68 trl_pos

Description:	
Specifies the position of the MS at a triggered location report.	
Type:	Element
Format:	
Defined values:	
Default value:	

Example:	`<tlr_pos trl_trigger="PERIODIC">`
	`<msid>4711</msid>`
	`<poserr>`
	`<result resid="1">SYSTEM FAILURE</result>`
	`<time utc_off="0100">20011127104532</time>`
	`</poserr>`
	`</trl_pos>`

Note:	

5.3.68.1 trl_trigger

Description:		
Specifies the trigger that initiated the positioning of the MS at a triggered location report.		
Type:	Attribute	
Format:	Char string	
Defined values:	PERIODIC	The positioning is triggered when the periodical timer expired
	MS_AVAIL	The positioning is triggered by the MS presence notification
Default value:		
Example:	`<tlr_pos trl_trigger="PERIODIC">`	
Note:		

5.3.69 url

Description:	
Specifies the location to which a response to a TLRR or an asynchronous SLIR should be sent to	
Type:	Element
Format:	Char string
Defined values:	
Default value:	
Example:	`<url>http://location.client.com/Response/</url>`
Note:	URL is part of pushaddr element which may also contain id and pwd. These elements are used by the LCS Client to inform the Location Server what credentials to use when ‘pushing’ a location report to the LCS Client in the case of an asynchronous service.

5.3.70 vlrno

Description:	
Uniquely specifies a VLR within a network.	
Type:	Element
Format:	Char String
Defined values:	In GSM this is the Global Title address. The Global Title is in the same format as an E.164 number.
Default value:	
Example:	<vlrno>1541154871</vlrno>
Note:	

5.3.71 vmscno

Description:	
Uniquely specifies a VMSC within a network.	
Type:	Element
Format:	Char String
Defined values:	In GSM this is the Global Title address. The Global Title is in the same format as an E.164 number.
Default value:	
Example:	<vmscno>1541154871</vmscno>
Note:	

5.3.72 X

Description:	
The first ordinate in a coordinate system	
Type:	Element
Format:	Char string
Defined values:	
Default value:	
Example:	<X>30 27 45.3N</X>
Note:	

5.3.73 Y

Description:	
Second ordinate in a coordinate.system. This is optional if it is a linear coordinate system.	
Type:	Element

Format:	Char string
Defined values:	
Default value:	
Example:	`<Y>45 25 52.9E</Y>`
Note:	

5.3.74 Z

Description:	
Third ordinate in a coordinate system which has at least three ordinates.	
Type:	Element
Format:	Char string
Defined values:	
Default value:	
Example:	`<Z>498</Z>`
Note:	

5.3.75 Service attributes

5.3.75.1 res_type

Description:		
Defines a response type for the Standard Location Immediate Service. This attribute applies to the Standard Immediate Location Request message.		
Type:	Attribute	
Format:	Char string	
Defined values:	SYNC	An LCS Client requests to receive the location response in one response
	ASYNC	An LCS Client allows to receive the location responses in pieces using several consecutive connections initiated by the Location Server
Default value:	SYNC	
Example:	`<slir ver="3.0.0" res_type="SYNC">`	
Note:		

5.3.75.2 ver

Description:	
Defines the version of the location protocol. This attribute is valid for ALL messages	
Type:	Element
Format:	Char string
Defined values:	[1-9]+[0-9]*.[0-9]+.[0-9]+
Default value:	

Example:	<slia ver="3.0.0">
Note:	

5.4 Result codes

5.4.1 Result codes

This table defines the result codes that indicate the result of the request or individual positioning. The error codes are divided in ranges:

0	-	99	Location server specific errors
100	-	199	Request specific errors
200	-	299	Network specific errors
300	-	499	Reserved for future use
500	-	599	Vendor specific errors

Note: For privacy reasons it might be needed to not report certain specific errors. In this case it is up to the implementation or configuration of the location server which errors will be reported.

Resid	Slogan	Description
0	OK	No error occurred while processing the request.
1	SYSTEM FAILURE	The request can not be handled because of a general problem in the location server or the underlying network.
2	UNSPECIFIED ERROR	An unspecified error used in case none of the other errors apply. This can also be used in case privacy issues prevent certain errors from being presented
3	UNAUTHORIZED APPLICATION	The requesting location-based application is not allowed to access the location server or a wrong password has been supplied.
4	UNKNOWN SUBSCRIBER	Unknown subscriber. The user is unknown, i.e. no such subscription exists.
5	ABSENT SUBSCRIBER	Absent subscriber. The user is currently not reachable.
6	POSITION METHOD FAILURE	Position method failure. The location service failed to obtain the user's position.
101	CONGESTION IN LOCATION SERVER	The request can not be handled due to congestion in the location server.
102	CONGESTION IN MOBILE NETWORK	The request can not be handled due to congestion in the mobile network.
103	UNSUPPORTED VERSION	The Location server does not support the indicated protocol version.
104	TOO MANY POSITION ITEMS	Too many position items have been specified in the request.
105	FORMAT ERROR	A protocol element in the request has invalid format. The invalid element is indicated in ADD_INFO.
106	SYNTAX ERROR	The position request has invalid syntax. Details may be indicated in ADD_INFO.
107	PROTOCOL ELEMENT NOT SUPPORTED	A protocol element specified in the position request is not supported by the Location Server. The element is indicated in ADD_INFO.

108	SERVICE NOT SUPPORTED	The requested service is not supported in the Location Server. The service is indicated in ADD_INFO.
109	PROTOCOL ELEMENT ATTRIBUTE NOT SUPPORTED	A protocol element attribute is not supported in the Location Server. The attribute is indicated in ADD_INFO.
110	INVALID PROTOCOL ELEMENT VALUE	A protocol element in the request has an invalid value. The element is indicated in ADD_INFO.
111	INVALID PROTOCOL ELEMENT ATTRIBUTE VALUE	A protocol element attribute in the request has a wrong value. The element is indicated in ADD_INFO.
112	PROTOCOL ELEMENT VALUE NOT SUPPORTED	A specific value of a protocol element is not supported in the Location Server. The element and value are indicated in ADD_INFO.
113	PROTOCOL ELEMENT ATTRIBUTE VALUE NOT SUPPORTED	A specific value of a protocol element attribute is not supported in the Location Server. The attribute and value are indicated in ADD_INFO.
201	QOP NOT ATTAINABLE	The requested QoP cannot be provided.
202	POSITIONING NOT ALLOWED	The subscriber does not allow the application to position him/her for whatever reason (privacy settings in location server, LCS privacy class).
203		Reserved for future use.
204	DISALLOWED BY LOCAL REGULATIONS	The location request is disallowed by local regulatory requirements.
207	MISCONFIGURATION OF LOCATION SERVER	The location server is not completely configured to be able to calculate a position.
500 -599		Vendor specific errors

5.5 Adaptation to 3GPP LCS (informative)

5.5.1 Version mapping between 3GPP TS23.271 and this specification

The following table shows the version number of this specification (OMA-LIF-MLP-V3_1) fully conforming to a certain version of 3GPP TS23.271, i.e. the version of this specification for the correct reference in a certain version of the 3GPP specification.

3GPP TS23.271 version number	**Conforming version number of** OMA-LIF-MLP
Release 5	Version 3.1

Note: In case there are versions not appearing in this table, it should be interpreted that such update did not affect the other specification. That is, the version number not appearing in the table should apply to the conformance mapping for the closest smaller version number in the table.

5.5.2 The terminology mapping table with 3GPP LCS Specifications

The following is a list of the terms in MLP used differently from the ones defined for 3GPP:

Term		**Notes**
MLP	**3GPP**	
Location Server	LCS Server	
MS (Mobile Station)	UE	
MSID (Mobile Station Identifier)	Identification of the target UE	

MPC (Mobile Positioning Centre)		There is no term applicable to 3GPP.

5.5.3 The corresponding terms used for the location procedures in 3GPP LCS Definition

The following is a list of terms defined in MLP corresponding to the 3GPP LCS definition [23.271] for the location procedures.

Location procedures defined in 3GPP[23.271]		**Services defined in MLP**
Circuit Switched Mobile Terminating Location Request CS-MT-LR	LCS Service Request	Standard Location Immediate Request
	LCS Service Response	Standard Location Immediate Answer
CS-MT-LR without HLR Query - applicable to North America Emergency Calls only	LCS Service Request	Emergency Location Immediate Request
	LCS Service Response	Emergency Location Immediate Answer
Packet Switched Mobile Terminating Location Request PS-MT-LR	LCS Service Request	Standard Location Immediate Request
	LCS Service Response	Standard Location Immediate Answer
Network Induced Location Request NI-LR	Location Information	Emergency Location Report
Packet Switched Network Induced Location Request PS-NI-LR	Location Information	Emergency Location Report
Mobile Terminating Deferred Location Request	LCS Service Request	Triggered Location Reporting Request
	LCS Service Response(Provide Subscriber Location ack)	Triggered Location Reporting Answer
	LCS Service Response(Subscriber Location Report)	Triggered Location Report
Combined Periodical/Deferred Mobile Terminating Location Request	LCS Service Request	Triggered Location Reporting Request
	LCS Service Response(Provide Subscriber Location ack)	Triggered Location Reporting Answer
	LCS Service Response(Subscriber Location Report)	Triggered Location Report
Cancellation of a Deferred Location Request	LCS Cancel Service Request	Triggered Location Reporting Stop Request
	LCS Cancel Service Response	Triggered Location Reporting Stop Answer
Mobile Originating Location Request, Circuit Switched CS-MO-LR	Location Information	Standard Location Report
Mobile Originating Location Request, Packet Switched PS-MO-LR	Location Information	Standard Location Report

5.5.4 Error Mapping (Informative)

The following list provides a mapping between the errors defined for LCS in MAP (see [29.002]) and MLP (see section 5.4)

MAP error	MLP resid
Unknown subscriber	4
Unidentified Subscriber	4
Absent Subscriber	5
System failure	1
Facility Not Supported	6
Unexpected Data Value	1
Data missing	1
Unauthorised LCS Client with detailed reason	3
Position method failure with detailed reason.	6
Illegal Subscriber	2
Illegal Equipment	2
Unauthorized requesting network	2

5.6 HTTP Mapping

This section describes how to use MLP over the HTTP transport mechanism using "HTTP/1.1".

HTTP is a request/response protocol involving a server and a client. In the context of MLP, the client is referred to as the LCS Client and the server is the Location Server (GMLC/MPC). For more information about HTTP, refer to [RFC2616] and http://www.w3.org.

The Location Server should provide two socket ports for operation, one for encryption with SSL/TLS and one without. The reason for having one insecure port is that encryption can consume resources, and if the client is in a secure domain there might not be a need for encryption. Applications residing in an insecure domain, i.e. on the Internet, may use the secure port to ensure the security and privacy of the location information.

For further information about SSL/TLS see [RFC2246].

Four port numbers have been selected and proposed as standard ports for location servers implementing MLP. These ports are registered with IANA (Internet Assigned Numbers Authority, see [IANA]). The four port numbers are:

lif-mlp	9210/tcp	LIF Mobile Locn Protocol
lif-mlp	9210/udp	LIF Mobile Locn Protocol
lif-mlp-s	9211/tcp	LIF Mobile Locn Secure
lif-mlp-s	9211/udp	LIF Mobile Locn Secure

A Location Server can choose to introduce any other socket based or HTTP transparent technology for secure transfers. Any such technology should be provided over a different port than the four mentioned above.

5.6.1 Location Services using HTTP

An LCS Client requests a Location Service by issuing an HTTP POST request towards the Location Server. For more information about HTTP POST, see [RFC2616]. The request line syntax is shown below.

```
Request-line:          POST SP host SP HTTP/1.1 CRLF
```

The request must include the entity-header Content-length field as part of the request. The message body of the request should include the XML formatted request and should have the length specified by the LCS Client in the Content-length field.

If the request is a deferred request (triggered or periodic) the result is delivered to the LCS client through an HTTP POST operation issued by the Location Server. This implies that the LCS client must be able to receive HTTP POST requests and be able to give a valid response.

All Location Services are invoked by sending a request using HTTP POST to a certain URI. An example of an URI is shown below.

http://host:port/LocationQueryService/

The response to the invocation of a Location Service is returned using an HTTP response.

If the LCS client requests standard location of asynchronous mode, triggered or periodic reporting of location, the Location Server will return the answer by performing an HTTP POST operation towards the client. The client must specify the URI that the answer should be posted to. This is done in the service request or by having it in the LCS client profile that can be stored in the Location Server.

The answer will be included in the message body and the Content-length entity will be set to the length of the answer.

When an LCS client attempts to invoke a service request that is not defined in this specification, the Location Server shall return a General Error Message (GEM) in a HTTP '404' error reponse:

```
Status-Line: HTTP/1.1 SP 404 SP Not Found CRLF
```

5.6.2 Request and Response Encapsulation

A request and a response consist of a header part and a body part so to be able to make a location request with a single XML document the header and the body are encapsulated in the same service initiation DTD. The context header holds the authentication and authorization data pertinent to a particular location request. Whenever a new HTTP connection is opended (by either the LCS Client or the Location Server) the first message MUST contain the header part to authenticate (and possibly authorize) the sender. The body part is described in the sections 5.2.3.2- 5.2.3.9.

5.6.2.1 Service Initiation DTD

```
<!-- MLP_SVC_INIT -->
<!--
MLP V3.1 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_init PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_init>
      ...
   </svc_init>

Terms and conditions of use are available from the
Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.message       "">
```

```
<!ELEMENT   svc_init                  (hdr, (slir | eme_lir | tlrr | tlrsr %extension.message;))>
<!ATTLIST   svc_init
            ver CDATA                 #FIXED "3.1.0">

<!ENTITY    % mlp_ctxt.dtd            SYSTEM "MLP_CTXT_300.DTD">
%mlp_ctxt.dtd;
<!ENTITY    % mlp_id.dtd              SYSTEM "MLP_ID_300.DTD">
%mlp_id.dtd;
<!ENTITY    % mlp_func.dtd            SYSTEM "MLP_FUNC_300.DTD">
%mlp_func.dtd;
<!ENTITY    % mlp_qop.dtd             SYSTEM "MLP_QOP_300.DTD">
%mlp_qop.dtd;
<!ENTITY    % mlp_loc.dtd             SYSTEM "MLP_LOC_310.DTD">
%mlp_loc.dtd;
<!ENTITY    % mlp_shape.dtd           SYSTEM "MLP_SHAPE_310.DTD">
%mlp_shape.dtd;
<!ENTITY    % mlp_gsm_net_param.dtd   SYSTEM "MLP_GSM_NET_310.DTD">
%mlp_gsm_net_param.dtd;

<!ENTITY    % mlp_hdr.dtd             SYSTEM "MLP_HDR_300.DTD">
%mlp_hdr.dtd;
<!ENTITY    % mlp_slir.dtd            SYSTEM "MLP_SLIR_300.DTD">
%mlp_slir.dtd;
<!ENTITY    % mlp_eme_lir.dtd         SYSTEM "MLP_EME_LIR_310.DTD">
%mlp_eme_lir.dtd;
<!ENTITY    % mlp_tlrr.dtd            SYSTEM "MLP_TLRR_300.DTD">
%mlp_tlrr.dtd;
<!ENTITY    % mlp_tlrsr.dtd           SYSTEM "MLP_TLRSR_300.DTD">
%mlp_tlrsr.dtd;
```

Example

```
<?xml version="1.0" ?>
<!DOCTYPE svc_init SYSTEM "MLP_SVC_INIT_310.DTD">
<svc_init ver="3.1.0">
  <hdr ver="3.0.0">
    ...
  </hdr>
  <slir ver="3.0.0">>
    ...
  </slir
</svc_init>
```

5.6.2.2 Service Result DTD

```
<!—MLP_SVC_RESULT -->
<!--
MLP V3.1 Document Type Definition

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MLP is an XML language. Typical usage:
   <?xml version="1.0"?>
   <!DOCTYPE svc_result PUBLIC "-//OMA//DTD {abbrev x.y}//EN"
             "http://www.openmobilealliance.org/DTD/{filename}"
             [<?oma-{ref}-ver supported-versions="{versions}"?>]>
   <svc_result>
      ...
   </svc_result}>

Terms and conditions of use are available from the
Open Mobile Alliance Ltd. web site at
http://www.openmobilealliance.org/useterms.html
-->

<!ENTITY    % extension.message       "">
<!ELEMENT   svc_result                (hdr?, (slia | slirep | slrep | eme_lia | emerep | tlra |
                                      tlrep | tlrsa %extension.message;))>

<!ATTLIST   svc_result
            ver CDATA                 #FIXED "3.1.0">

<!ENTITY    % mlp_ctxt.dtd            SYSTEM "MLP_CTXT_300.DTD">
%mlp_ctxt.dtd;
<!ENTITY    % mlp_id.dtd              SYSTEM "MLP_ID_300.DTD">
%mlp_id.dtd;
<!ENTITY    % mlp_func.dtd            SYSTEM "MLP_FUNC_300.DTD">
%mlp_func.dtd;
<!ENTITY    % mlp_qop.dtd             SYSTEM "MLP_QOP_300.DTD">
%mlp_qop.dtd;
<!ENTITY    % mlp_loc.dtd             SYSTEM "MLP_LOC_310.DTD">
%mlp_loc.dtd;
<!ENTITY    % mlp_shape.dtd           SYSTEM "MLP_SHAPE_310.DTD">
%mlp_shape.dtd;
<!ENTITY    % mlp_gsm_net_param.dtd   SYSTEM "MLP_GSM_NET_310.DTD">
%mlp_gsm_net_param.dtd;

<!ENTITY    % mlp_hdr.dtd             SYSTEM "MLP_HDR_300.DTD">
%mlp_hdr.dtd;
<!ENTITY    % mlp_slia.dtd            SYSTEM "MLP_SLIA_300.DTD">
%mlp_slia.dtd;
<!ENTITY    % mlp_slirep.dtd          SYSTEM "MLP_SLIREP_300.DTD">
%mlp_slirep.dtd;
<!ENTITY    % mlp_slrep.dtd           SYSTEM "MLP_SLREP_300.DTD">
%mlp_slrep.dtd;
<!ENTITY    % mlp_eme_lia.dtd         SYSTEM "MLP_EME_LIA_300.DTD">
%mlp_eme_lia.dtd;
<!ENTITY    % mlp_emerep.dtd          SYSTEM "MLP_EMEREP_300.DTD">
%mlp_emerep.dtd;
<!ENTITY    % mlp_tlra.dtd            SYSTEM "MLP_TLRA_300.DTD">
%mlp_tlra.dtd;
<!ENTITY    % mlp_tlrep.dtd           SYSTEM "MLP_TLREP_300.DTD">
```

```
%mlp_tlrep.dtd;
<!ENTITY    % mlp_tlrsa.dtd           SYSTEM "MLP_TLRSA_300.DTD">
%mlp_tlrsa.dtd;
```

Example

```
<?xml version="1.0" ?>
<!DOCTYPE svc_result SYSTEM "MLP_SVC_RESULT_310.DTD">
<svc_result ver="3.1.0">
  <slia ver="3.0.0">
    ...
  </slia>
</svc_result>
```

5.6.2.3 Message Sequence Diagram

The following HTTP sequence (cf. Figure 8) is used for all the defined service requests/responses in MLP.

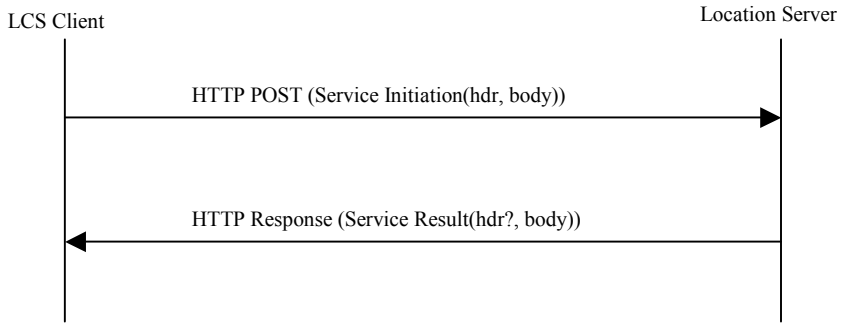

Figure 8: HTTP sequence for MLP request/response pairs

The following HTTP sequence diagram (cf. Figure 9) is used for all defined reports in MLP.

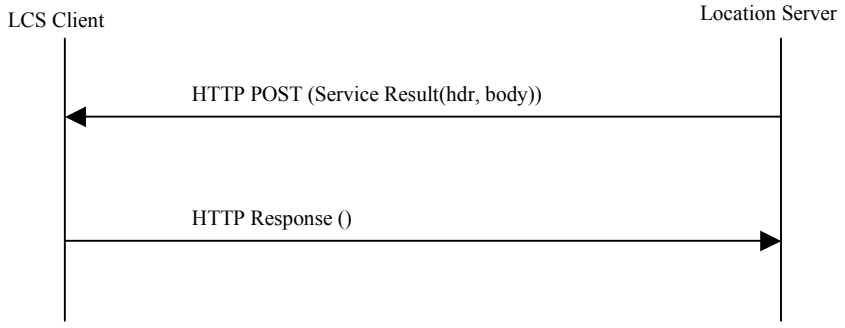

Figure 9: HTTP sequence for MLP reports

The following HTTP sequence diagram (cf. Figure 10) is used in the case of a General Error Message.

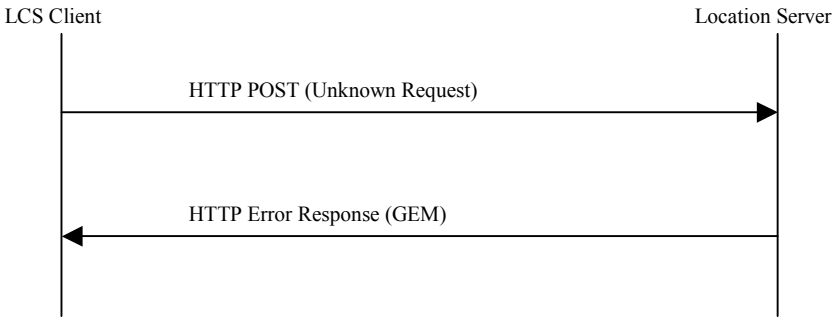

Figure 10: HTTP sequence for the General Error Message

5.7 Geographic Information

5.7.1 Coordinate Reference systems (Informative)

The study of determining the relative positions on or close to the surface of the earth is a complex science, referred to as geodesy. A complete definition of Coordinate Reference systems is not within the scope of this standard. This section includes a brief overview of the subject. For more details see the OpenGIS© Consortium Abstract Specification Topic 2 [AST].

5.7.1.1 The Geoid, ellipsoids and datums

The Geoid is a physically realizable surface defined by the set of points with equal gravity potential approximately at the Mean Sea Level. While this surface is measurable it is not easy to define mathematically. In order to use known mathematics, the Geoid is approximated by an ellipsoid (spheroid).

There are many ellipsoids, each defined to best approximate some part of the Geoid. These ellipsoids are defined by an ellipse that is rotated about the major axis. There are many methods for defining an ellipse, the most common used in Geodesy the length of the semi-major axis and the flattening. This defines a mathematical ellipsoid for calculations. it does not provide enough information to locate the ellipsoid with respect to the Geoid or other ellipsoids. To locate the ellipsoid in space a datum is defined. Some of the common ellipsoids are WGS84, Bessel1841, Clark 1866.

A datum is the ellipsoid with it's position in space. The position is defined by the origin and orientation of the ellipsoid with respect to the Geoid. Different datums locate latitude, longitude at different positions in space. For example ellipsoids Samboja, CH1903 and Stockholm are each based on Bessel1841, the National Geodetic Network and World Geodetic System 1984 are based on WGS84.

5.7.1.2 Coordinate systems

A coordinate system is the link between the datum and the coordinate values. It defines all of the information about the axes system that defines the values. The names of the axes, their units (formats), the order of ordinates ((Easting, Northing) versus (Northing, Easting)) and the angle between the axes are defined by the coordinate system.

5.7.1.2.1 Cartesian coordinate systems

A Cartesian coordinate system is defined by values of (x,y,(z)). x is the distance from the x-axis, y is the distance from the y-axis, z the distance from the z-axis.The axis are orthogonal to each other. The unit used for x, y, z are a distance unit, such as meter. These coordinate systems are used for flat 'planar' descriptions of points. In general they are used over small areas where a projection method has been used to minimize distortions of the geography in the area.

5.7.1.2.2 Ellipsoid coordinates

More global geographic calculations need to take the surface of the earth into account. So we need a second coordinate system that describes each position relative to other points and lines on the earth’s surface.

Each point can then be described as set of values (longitude, latitude) or (longitude, latitude, altitude) giving a point on the ellipsoid or relative to the ellipsoid we choose to describe the earth (cf. Figure 11). The longitude tells us how far east we have to move on the equator from the null-meridian, the latitude tells us how far north to move from the equator and the altitude tells us how far above the ellipsoid to go to finally reach the location. Negative values direct us to go in the opposite direction.

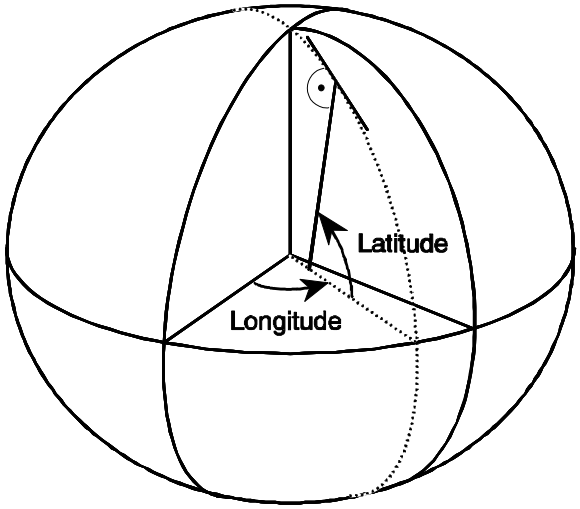

Figure 11: Ellipsoid Coordinates

5.7.1.3 Coordinate Reference Systems

The two coordinate reference systems relevant to this protocol are Geographic 2D Coordinate Reference Systems and Projected Coordinate Reference Systems.

Geographic 2D Coordinate Reference Systems describe locations on the ellipsoid. They are used for large national or continental geodetic networks. In particular GPS uses the Geographic 2D Coordinate Reference System WGS84. This uses the World Geodetic System 1984 based on the WGS84 ellipsoid. The coordinate axes have units of decimal degrees (or DMSH) with ordinate order (Northing, Easting). This Coordinate Reference System is the default for all basic MLP service requests and responses. A GMLC is only required to support WGS84. The GMLC geographies that are defined with altitude are modeled in this protocol as geographies in a Geographic 2D CRS with a separate altitude element, not as a Geographic 3D CRS. The geographies are planar and carrying a constant z value is not desirable.

There are several ways to convert ellipsoid coordinates to 2 dimensional cartesian coordinates. These are called projection methods. Each method is designed to minimize some type of distortion in the mapping for the ellipsoid to the 2D Cartesian coordinate system.

Projected Coordinate Reference Systems are used for map display, to allow Cartesian mathematics and for Advanced Location Services.

5.7.2 Coordinate Reference System Transformations (Informative)

A transformation is used to define a point in one CRS into the appropriate values in a second CRS. When the datums are the same, the transformation can frequently be defined by equations. A transformation from one datum to another is usually done with a least squares approximation. Transformation equations are available in from several places, transformation services are also available.

5.7.3 Methodology for defining CRSs and transformations in this protocol (Informative)

The MLP protocol defines the CRS by citing an authority and the unique reference identifier for the CRS defined by this authority. This leaves the definition of many CRS used over the world to be defined by a group of geodesy experts. This methodology is used by the OpenGIS© Consortium and the ISO TC 211 working group for well-known CRS. The encoding used is from the OpenGIS© Consortium Recommendation Paper 01-014r5: Recommended Definition Data for Coordinate Reference Systems and Coordinate Transformations [CRS].

The MLP protocol may use the {EPSG} authority as an example. Support of other authority is for further study. This database is defined by a Microsoft Access database which can be found at www.epsg.org. An xml version of this database will be available at http://www.opengis.net/gml/srs/epsg.xml in the future.

The default WGS84 CRS is defined to be 4326 by the EPSG authority. Other examples are 326xx define the UTM xx N zones.

Coordinate Reference System transformation are done by an advance Location Service request. The implementation of this service is determined by the provider.

5.7.4 Supported coordinate systems and datum (Normative)

All MLP implementations MUST support at least the WGS84 Coordinate Reference System.

5.7.5 Shapes representing a geographical position (Informative)

There are a number of shapes used to represent a geographic area that describes where a mobile subscriber is located. There are additional shapes that are required for advanced MLP services. The standards bodies for geographic data for advanced MLP services such as routing, geocoding, coordinate conversion, and map display are the Location Interoperability Forum, the OpenGIS© Consortium and the ISO TC211 working group. The current public XML specification defining geography from these groups is GML V211 [GML]. These two groups work together and are working towards a GML V3 with additional geometry and topology types. The geometry required for the MLP is the GMLV211 with additional polygon types with boundaries that contain circles, ellipses or circular arcs. GML V3 will define the linear curves segments to allow these polygons to be defined. These boundaries will be defined as special cases of polygons, using the given interpolation methods. The following geographies are defined in this protocol. The relevant OGC Abstract Specification is Topic 1 [GEO].

5.7.5.1 Ellipsoid point

This a point on the ellipsoid and is modeled as a point in a Geographic 2D Coordinate Reference Systems.

5.7.5.2 Ellipsoid point with uncertainty circle

An ellipsoid point with uncertainty circle is characterized by the coordinates of an ellipsoid point (the origin) and a radius, “r” (cf. Figure 12). It describes the set of points on the ellipsoid, which are at a distance from the point of origin less than or equal to “r”. This shape can be used to indicate points on the Earth surface, or near the Earth surface. This shape is a special case of a polygon with no interior boundaries.

The typical use of this shape is to indicate a point when its position is known only with a limited accuracy.

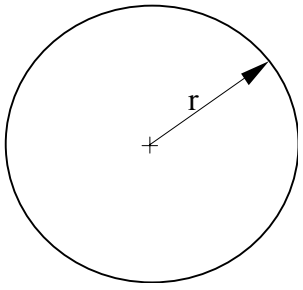

Figure 12: Ellipsoid point with uncertainty circle

5.7.5.3 Ellipsoid point with uncertainty ellipse

The shape of an "ellipsoid point with uncertainty ellipse" is characterized by the following (cf. Figure 13):

- The coordinates of an ellipsoid point (the origin)
- The distances r1 and r2
- The angle of orientation A

It describes formally the set of points on the ellipsoid, which fall within or on the boundary of an ellipse. This ellipse has a semi-major axis of length r1 oriented at angle A (0 to 180°) measured clockwise from north and a semi-minor axis of length r2. The distances being the geodesic distance over the ellipsoid, i.e., the minimum length of a path staying on the ellipsoid and joining the two points, as shown in figure below.

As for the ellipsoid point, this can be used to indicate points on the Earth's surface, or near the Earth's surface, of same latitude and longitude. This shape is a special case of a polygon with no interior boundaries.

The typical use of this shape is to indicate a point when its position is known only with a limited accuracy, but the geometrical contributions to uncertainty can be quantified.

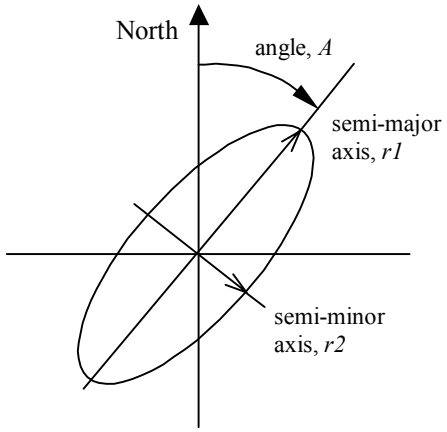

Figure 13: Ellipsoid point with uncertainty ellipse

5.7.5.4 Ellipsoid point with uncertainty arc

The shape of an "ellipsoid point with uncertainty arc" is characterized by the following (cf. Figure 14):

- The coordinates of an ellipsoid point (the origin)
- The inner radius(r) and uncertainty radius(r),
- The offset angle (θ) and included angle (β)

An arc is defined by a point of origin with one offset angle and one uncertainty angle plus one inner radius and one uncertainty radius. In this case the striped area describes the actual arc area. The smaller arc defines the inner radius(r) and the difference between inner and the outer arc defines the uncertainty radius(r). This shape is a special case of a polygon with no interior boundaries.

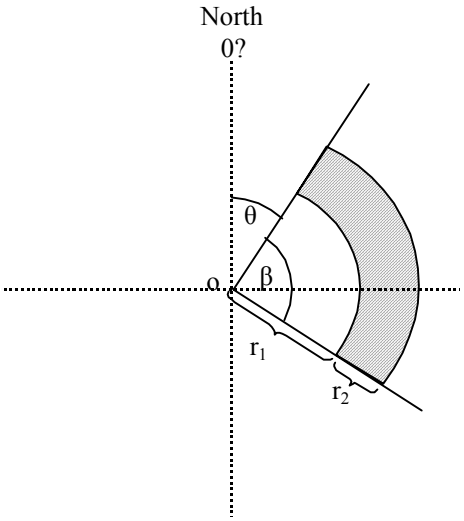

Figure 14: Ellipsoid point with uncertainty arc

5.7.5.5 Polygon

A Polygon is a connected surface. Any pair of points in the polygon can be connected to one another by a path. The boundary of the Polygon is a set of LinearRings. We distinguish the outer (exterior) boundary and the inner (interior) boundaries; the LinearRings of the interior boundary cannot cross one another and cannot be contained within one another. There must be at most one exterior boundary and zero or more interior boundary elements. The ordering of LinearRings and whether they form clockwise or anti-clockwise paths is not important. The minimum number of points allowed in a LinearRing is 3.

A LinearRing is a closed, simple piece-wise linear path which is defined by a list of coordinates that are assumed to be connected by straight line segments. The last coordinate must be coincident with the first coordinate and at least four coordinates are required (the three to define a ring plus the fourth duplicated one). This geometry is only used in the construction of a Polygon.

For basic MLP services polygons are the number of interior bondaries MUST be 0. Also to conform to [23.032] the maximum number of points allowed in an exterior boundary is 15. The points shall be connected in the order that they are given.

The described area is situated to the right of the exterior boundaries and left of the interior boundaries with the downward direction being toward the Earth's center and the forward direction being from a point to the next.

Note: This definition does not permit connecting lines greater than roughly 20 000 km. If such a need arises, the polygon can be described by adding an intermediate point.

Computation of geodesic lines is not simple. Approximations leading to a maximum distance between the computed line and the geodesic line of less than 3 meters are acceptable.

5.7.5.6 LineString

A LineString is a piece-wise linear path defined by a list of coordinates that are assumed to be connected by straight line segments. A closed path is indicated by having coincident first and last coordinates. At least two coordinates are required.

5.7.5.7 Box

The Box element is used to encode extents. Each <Box> element encloses a sequence of two <coord> elements containing exactly two coordinate tuples; the first of these is constructed from the minimum values measured along all axes, and the second is constructed from the maximum values measured along all axes

5.7.5.8 Geometries Collections

These are geometry objects that contain 2 or more primitive geometry objects. These collections can either be homogenous, a set of points, or heterogeneous, a point, circularArea and a LineString.

Geometry collections are not valid for the basic MLP services.

Appendix A. Static Conformance Requirements (Normative)

The notation used in this appendix is specified in [IOPPROC].

Item	Function	Reference	Status	Requirement

Note: As proposed in REL conference call, SCRs will be added from MLP 3.2 onwards.

Appendix B. Change History (Informative)

B.1 Approved Version History

Reference	Date	Description
n/a	n/a	No previous version within OMA

B.2 Draft/Candidate Version 3.1 History

Docu ment Identifiers	Date	Section	Description
Draft Versions OMA-LIF-MLP-V3_1_0	2003	n/a	The initial version of this document, based on LIF TS 101 v3.0.0
	08 May 2003	 4.18 n/a 5.3.37.1 n/a	Editorial changes: - Added new reference 04.18 (due to section 5.3.41) - Changed all mentioned references in the document from LIF style to OMA style. - Added references to all relevant msids (section 5.3.37.1) - Fixed all internal (section) references
	14 Nov 2003	before 1 3.2, 4 5.1.3, 5.2.2.1, 5.2.3, 5.2.3.1, 5.2.3.4, 5.2.3.5, 5.2.3.6.1, 5.2.3.7, 5.3.5, 5.3.6.2, 5.3.13, 5.3.14, 5.3.37, 5.3.37.1, 5.3.52.1, 5.3.53, 5.3.59, A, B.2	History table removed, TOC updated Template text removed RFC 2119 wording according to CR OMA-LOC-2003-0213 Template text removed History tables adapted to new template
	06 Feb 2004	almost every section affected	Changes based on the feedback from Consistency Review
Candidate Verion OMA-LIF-MLP-V3_1	16 Mar 2004	n/a	Status changed to Candidate by TP TP ref # OMA-TP-2004-0086-MLP-V3_1-for-Candidate-Approval