ATIS-1000043

LOCATION BASED COMMERCIAL SERVICES IN A NEXT GENERATION NETWORK (NGN) ENVIRONMENT

TECHNICAL REPORT

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ATIS-1000043, *Location Based Commercial Services in a Next Generation Network (NGN) Environment*

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ATIS-1000043

Technical Report on

Location Based Commercial Services in a Next Generation Network (NGN) Environment

Alliance for Telecommunications Industry Solutions

Approved February, 2011

Abstract
This Technical Report (TR) describes the support of Location Based Commercial Services in the IP environment of a Next Generation Network (NGN). Location Based Commercial Services acquire geographical location information about one or more targets and provide services, based on that location information, to the user invoking the service. Examples of Location Based Commercial Services include Directory Assistance, Information Services (e.g., weather), Navigation Services, Friends and Family Finder Services, and Vehicle Tracking Services. The Location Based Commercial Services may or may not support call center agents.

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The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages. The word *may* denotes a optional capability that could augment the standard. The standard is fully functional without the incorporation of this optional capability.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, PTSC, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time of consensus on this document, PTSC, which was responsible for its development, had the following roster:

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1 Introduction

This Technical Report (TR) describes the support of Location Based Commercial Services in the IP environment of a Next Generation Network (NGN). Location Based Commercial Services acquire geographical location information about one or more targets and provide services, based on that location information, to the user invoking the service. Examples of Location Based Commercial Services include Directory Assistance, Information Services (e.g., weather), Navigation Services, Friends and Family Finder Services, and Vehicle Tracking Services. The Location Based Commercial Services may or may not support call center agents.

This TR:

- Provides an example set of Location Based Commercial Services,
- Describes the NGN/IP architecture that supports such services,
- Provides end to end information flows based on existing ATIS, Open Mobile Alliance (OMA), and IETF Geographical Location/Privacy (GEOPRIV) standards, and
- Concludes that such services can be supported by existing standards.

The end-to-end information flows and the analysis focus on authorization (i.e., for the Location Based Commercial Service to obtain and use the location information) and privacy (i.e., the ability of the user to control the release and use of private location information.)

2 Normative References

[1] [ATIS-1000009] ATIS-1000009.2006, *IP Network-to-Network Interface (NNI) Standard for VoIP[1]*

[2] [ATIS-1000018] ATIS-1000018, *NGN Architecture [February 2007][1]*

[3] [RFC 3693] RFC 3693, *Geopriv Requirements[2]*

[4] [RFC 4119] RFC 4119, *A Presence-based GEOPRIV Location Object Format [2]*

[5] [RFC 4745] RFC 4745, *Common Policy: A Document Format for Expressing Privacy Preferences[2]*

[6] [RFC 5139] RFC 5139, *Revised Civic Location Format for Presence Information Data Format Location Object (PIDF-LO)[2]*

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[1] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS), 1200 G Street N.W., Suite 500, Washington, DC 20005. < https://www.atis.org/docstore/default.aspx >
[2] This document is available from the Internet Engineering Task Force (IETF). < http://www.ietf.org >

[7] [geopriv-loc-filters] draft-ietf-geopriv-loc-filters-02, *A Document Format for Filtering and Reporting Location Notifications in the Presence Information Document Format Location Object (PIDF-LO)* [2]

[8] [geopriv-lbyr-requirements] draft-ietf-geopriv-lbyr-requirements-05, *Requirements for a Location-by-Reference Mechanism* [2]

[9] [geopriv-http-location-delivery] draft-ietf-geopriv-http-location-delivery-09, HTTP Enabled Location Delivery (HELD) [2]

[10]   [RFC 5606] RFC 5606, *Implications of <retransmission-allowed> for SIP Location Conveyance* [2]

[11]   [OMA-TS-MLP-V3] OMA-TS-MLP-V3_3-20080627-C, *Mobile Location Protocol 3.3* [3]

[12]   [OMA-AD-LOCSIP-V1] OMA-AD-LOCSIP-V1_0-20080707-D, *Location in SIP/IP core Architecture*[3]

[13]   [OMA-RD-LOC_ArchOverview-V1] OMA-RD-LOC_ArchOverview-V1_0-20041118-C, *Location Architecture Overview Requirements*[3]

[14]   [OMA-RD-LOCSIP-V1] OMA-RD-LOCSIP-V1_0-20090818-C, *Location in SIP/IP core Requirements*[3]

[15]   [OMA-RD-MLS-V1] OMA-RD-MLS-V1_2-20080627-C, Mobile Location Service Requirements[3]

[16]   [OMA-AD-MLS-V1_2-20080627-C] OMA-AD-MLS-V1_2-20080627-C, Mobile Location Service Architecture[3]

[17]   [OMA-TS-MLP-V3_3-20091001-C] OMA-TS-MLP-V3_3-20091001-C, Mobile Location Protocol 3.3[3]

[18]   [OMA-TS-RLP-V1_1-20091001-C] OMA-TS-RLP-V1_1-20091001-C, Roaming Location Protocol[3]

[19]   [3GPP TS 22.071] 3GPP TS 22.071 V8.1.0 (2008-12), *Location Services (LCS) Services description*, [4]

[20]   3GPP TS 23.271 V7.9.0 (2007-09), Functional stage 2 description of Location Services (LCS).[4]

[21]   [3GPP TS 23.271] *Technical Specification 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Functional stage 2 description of Location Services (LCS) (Release 8)*[4]

[22]   [3GPP TS 24.030] 3GPP TS 24.030 V9.0.0 (2009-12), *Location Services (LCS) Supplementary service operations Stage 3*[4]

[23]   [3GPP TS 29.199-9] 3GPP TS 29.199-9 V9.0.0 (2009-12), *Technical Specification 3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Open Service Access (OSA); Parlay X Web Services; Part 9: Terminal location (Release 9)*[4]

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[3] This document is available from the Open Mobile Alliance (OMA). < http://openmobilealliance.org >
[4] This document is available from the Third Generation Partnership Project (3GPP) at
< http://www.3gpp.org/specs/specs.htm >.

3 Acronyms

A-GPS	Assisted Global Positioning System
AS	Application Server
ATIS	Alliance for Telecommunications Industry Solutions
CSCF	Call Session Control Function
db	Database
EOTD	Enhanced Observed Time Difference
GEOPRIV	Geographic Location/Privacy
HSS	Home Subscriber Server
IETF	Internet Engineering Task Force
IM	IP Multimedia
IMS	IP Multimedia System
IP	Internet Protocol
LI	Location Information
LBCS	Location Based Commercial Services (system)
LOCSIP	Location in Session Initiation Protocol
MRB	Media Resource Broker
MS	Media Server
NGN	Next Generation Network
SBC	Session Border Controller
TR	Technical Report
VoIP	Voice over IP

4 Description of Location Based Commercial Services

Location Based Commercial Services are Commercial Services that make use of a target location of interest to the user invoking the service. The location may or may not be the current (or even future) physical location of the user. When the information identifying the location of interest (the "target Location Information," or "TLI") reflects the current physical location of the user, it is obtained by a Location Server and is delivered to the Location Based Commercial Service. In this case, the TLI may be generated from one or more technologies, such as Assisted Global Positioning System (A-GPS), cell-ID, Enhanced Observed Time Difference (EOTD), and may be relatively fixed (as TLI for a wireline subscriber) or may vary over time (as TLI associated with a WIFI or Bluetooth.) When the TLI does not reflect the current physical location of the user, it may be obtained by a Location Server or by the Location Based Commercial Service itself.

Location Based Commercial Services include (but are not limited to) the following categories:

- Operator Services (e.g., Directory Assistance [DA])
- Information Services (operator assisted and automated)
- Navigation Services
- Finder Services

- Vehicle Tracking Services
- Social Networking Services.

4.1 Location Based Operator Services

Location Based Operator Services are the subset of Operator Services that make use of TLI. Operator Services include the services defined in the NGN Operator Services Standard [ATIS-1000036], Intercept, Busy Line Verification, Coin Services, and Handling of Restricted Lines. Most Operator Services do not make use of the target location. Examples of Operator Services that may process TLI include DA and Enhanced Directory Assistance (EDA).

4.2 Location Based Information Services

Location Based Information Services are the subset of Information Services that make use of TLI. Information Services in an NGN consist of a broad range of services that provide content to a user in response to a user request. The content may be provided in any format, such as graphic, text, video, and voice. The content may be delivered in a number of ways (e.g., voice may be delivered as a .wav file or may be streamed via a voice connection.) Example Information Services that could benefit from TLI include weather and other proximity-based searches (e.g., searching for a nearby gas station).

4.3 Navigation Services

Navigation are services that provide maps and directions to users based on the TLI. By their nature, navigation services are location-based.

4.4 Finder Services

Finder Services are services that provide the location of a target (e.g., child, pet) to the user. By their nature, finder services are location-based.

4.5 Vehicle Tracking Services

Finder Services are services that provide the location of the vehicle being tracked to an authorized tracker for that vehicle. By their nature, navigation services are location-based.

4.6 Social Networking Services

Social Networking Services are services that rely on the correlation of the locations of multiple users. These services help users answer questions such as:

- Which users who have registered as friends of mine (or as people with interests similar to mine) are nearby?
- Which customers who have registered with my store are currently inside the store?

By their nature, social networking services are location-based.

5 NGN/IP Architecture

In this TR, the network architecture that provides the context for Location Based Services is taken from the ATIS Technical Report on NGN Architecture [ATIS-1000018] with the assumption that the Location Based Commercial Service is provided from a Voice over IP (VoIP) network. With its focus on the Location Based Commercial Services AS, this standard does not address the Access SBC, Charging Function, or Home Subscriber Server (HSS). Therefore, the effective functional architecture for is as shown in Figure 1.
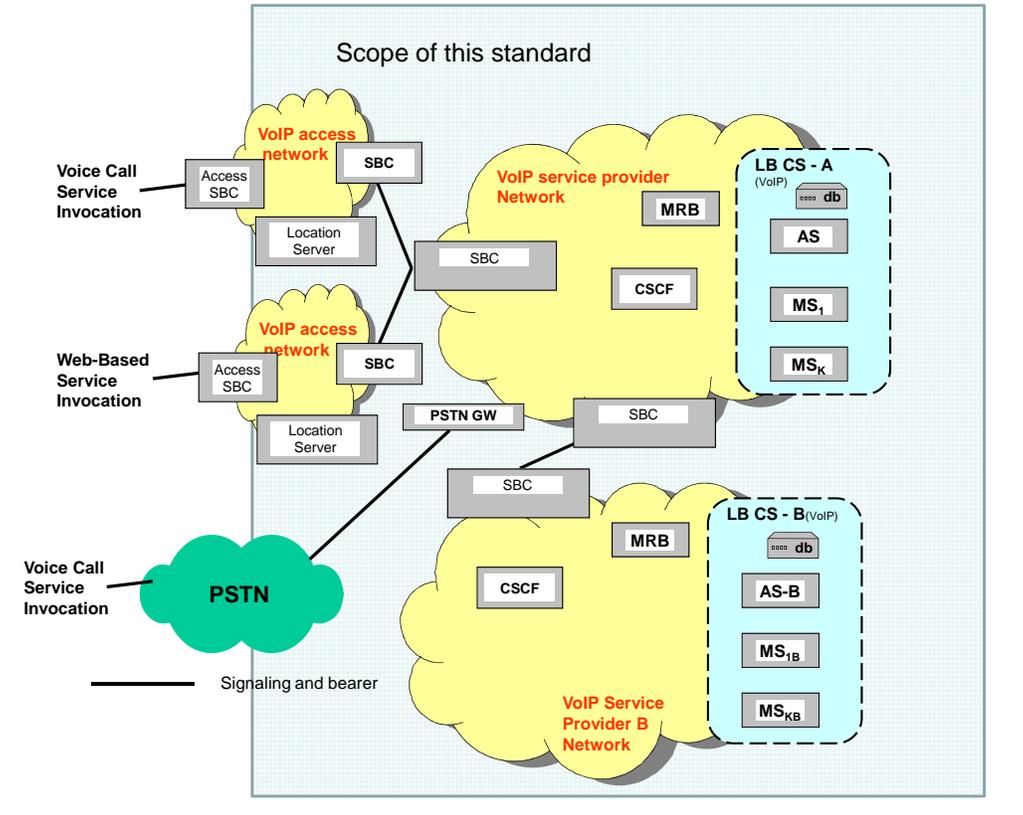
Figure 1- Functional Architecture

In Figure 1:
> AS   = Location Based Commercial Service Application Server, in this case containing the Location Based Commercial Service application
> MS   = Location Based Commercial Service Media Server, in this case supporting media interactions for the service
> LBCS = Location Based Commercial Service system
> Location Server = The database where location information is stored when it is initially obtained from the customer
> db   = One of the variety of databases supporting Location Based Commercial Services

MRB = Media Resource Broker, in this case responsible for identifying network resources required to support the service

SBC = Session Border Controller

CSCF = Call Session Control Function

The LBCS may have multiple of any of the AS, MS or database (db) components, i.e., any of these functions may be distributed across multiple physical elements. The LBCS may be hosted by or resident within a VoIP Provider network different from the one serving the caller.

Although call origination and completion may occur from/to VoIP or PSTN endpoints, location information is not assumed to be delivered into the PSTN. Location information may be delivered from one VoIP service provider network to another.

As for the details of the service logic for providing particular Location Based Commercial Services, discussion of the dbs is out of scope of this Technical Report. Note that the service logic may allow for one or more methods of obtaining permission to use the location information. Some examples of methods are:

1. The service may be subscribed to by the target party (e.g., a vehicle tracking service agrees to allow the service to obtain the location of a vehicle whenever the service is legitimately invoked.)

2. The service may obtain permission from the target party on a per-incident basis (e.g., by invoking a navigation service, the invoking party grants permission for the service to obtain the target location.)

TLI may be requested (pulled) as needed from the Location Server or the service may involve the periodic transmission (push) of current TLI from the Location Server. Typically, the information will be pulled from or pushed to an Application Server (AS) or a Media Server (MS).

The service description may allow or disallow the AS or MS that obtains TLI from the Location server to store the TLI. If storing TLI is allowed, the service may or may not allow the TLI to be pulled or pushed to another network entity or to an end user. Some services (e.g., vehicle tracking) require the ability to share the TLI with a third party.

Note that the target location may not be associated with either end of a call (and that there may not be any call associated with the service.)

5.1 Terminology

The following terms are used in this document.

- Civic Location – The civic location is comprised of the street address corresponding to a physical location.

- Geodetic Location – The geodetic location is comprised of geospatial coordinates corresponding to a physical location.

- Location Server   - The location server is the functional entity that handles location requests and responds with location (civic or geodetic) information associated with a target. For a mobile network using Open Mobile Alliance (OMA) Location Service in SIP/IP core network (LOCSIP), the Location Server corresponds to the Location Server and Location Resource List Server (L-RLS).

- Location Quality of Service (QOS) Information – The QOS information includes the required, desired, or achieved level of quality of Location Information in terms of minimum horizontal and vertical accuracy, maximum response time, and maximum age.

- Target – The person or entity whose location is communicated to one or more Recipients. Note that the Target may or may not be the calling or called party of a call.

- Recipient – The entity that receives the location of one or more targets.

- Target Location Information – The geodetic or civic location information that identifies the physical location of the target. This information may also include other information related to the location, such as usage rules.

- User – The person or entity invoking a Location Based Commercial Service.

6   Information Flows

This section includes example information flows.

6.1 *Simple Location Request*
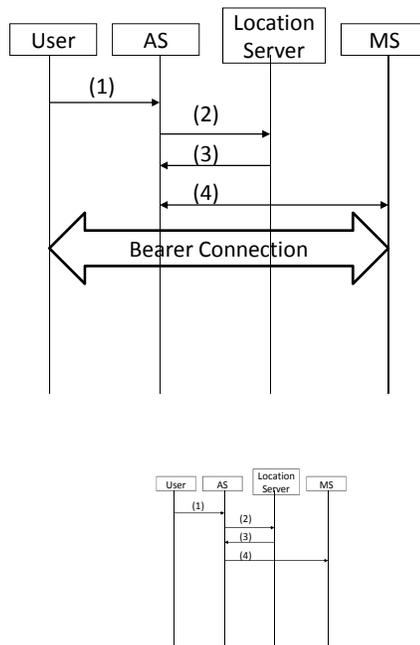
Figure 2 - Call Flow Simple Location Request

1. The User places a call for a Location-Based Commercial Service and call setup signaling information is sent from the user to the AS.

2. The AS requests TLI from the Location Server. Note that the request may be for TLI associated with the user (e.g., for navigation service), for a different entity (e.g., for finder service), or for multiple entities (e.g., for social networking service.)

3. The Location Server sends the TLI to the AS.

4. The AS sends call setup signaling and service information and (in this example) forwards the TLI to the Media Server (MS). After an exchange of protocol messages, a bearer connection is established between the user and MS. TLI is now available at the MS. TLI is now available at the AS (and at the MS) to affect the service provided to the user.

6.2 *Location Request– Multiple ASes*

Figure 3 - Call Flow for Location Request; User-Initiated; Multiple ASes
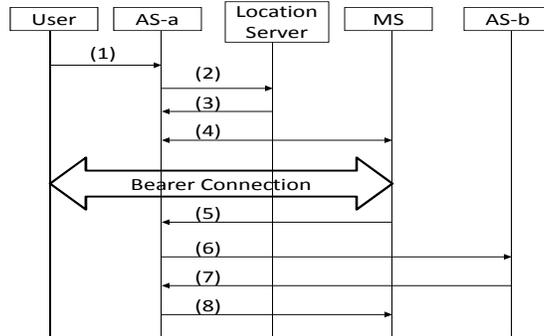
1. User places a call for a Location-Based Commercial Service and call setup signaling information is sent from the user to AS-a.

2. AS-a requests location information for the user (TLI) from the Location Server.

3. The Location Server sends the TLI to AS-a.

4. AS-a sends call setup signaling and service information and (in this example) forwards the TLI to the MS. After an exchange of protocol messages, a bearer connection is established between the user and MS. TLI is now available at the MS.

5. The MS interacts with the user (e.g., plays announcements) and provides information to AS-a based on the user interaction. Based on service definition and usage rules associated with the TLI, TLI may be delivered to the user.

6. After obtaining input from the MS, AS-a determines that interaction with a third party service is required. AS-a generates a service request to AS-b without establishing a bearer connection. The bearer connection remains between the user and MS. Based on the usage rules associated with the location information, in this example, the service request includes the TLI. The usage rules are expected to be consistent with the rules defined in RFC 4119. An example usage rule is a limit on retention and retransmission of the TLI.

7. TLI is now available at AS-b. AS-b provides the requested information to AS-a based on the service definition and the usage rules associated with the TLI (e.g., the expectation that this is the final interaction between AS-a and AS-b for this call, or an indication is delivered with the TLI that the TLI should not be stored), AS-b will discard the TLI.

8. AS-a sends the information to the MS, which plays the appropriate announcements to the user. Based on service definition and policy, AS-a will discard the TLI.

An example service that may be offered with multiple ASes in different networks is a movie listing service. In this case, the user dials a dialing sequence to a general information service. The information service obtains the specific request, which is a request for nearby movie theaters that are playing a user-specified movie. The general information service then requests the nearby movie theaters from a third party service. The third party service provides the information to the general information service, which provides the movie listings to the user. Another example would be if the user requests that the general information service identify a restaurant willing to deliver a particular cuisine. The general information service requires the user location to identify nearby restaurants. When delivering the call to the restaurant (so the order may be completed), if the general information service can deliver the user's location with the call, the caller will not need to repeat the location information for delivery of the meal.

6.3   Location Request– Multiple ASes and Multiple MSes
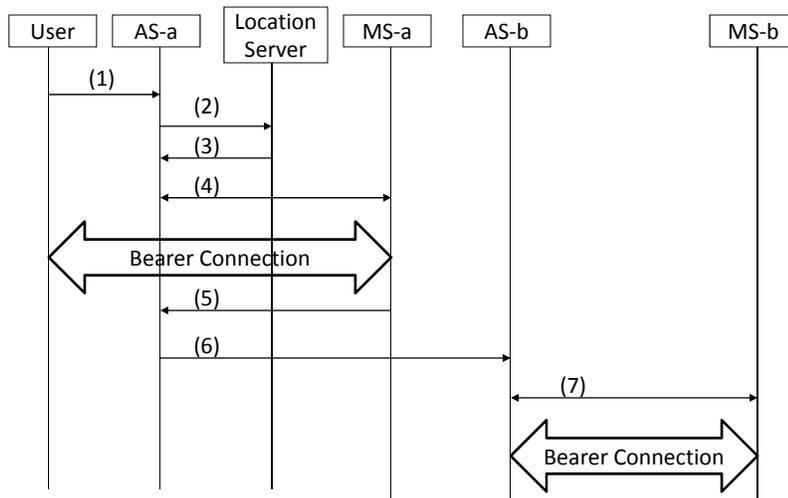

Figure 4 - Call Flow for Location Request for User-Initiated Call – Multiple ASes and Multiple MSes

1. User places a call for a Location-Based Commercial Service and call setup signaling information is sent from the user to AS-a.

2. AS-a requests location information for the user (TLI) from the Location Server.

3. The Location Server sends the TLI to AS-a.

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4. AS-a sends call setup signaling and service information and (in this example) forwards TLI to MS-a. After an exchange of protocol messages, a bearer connection is established between the user and MS-a. TLI is now available at the MS.

5. MS-a interacts with the user (e.g., plays announcements) and provides information to AS-a based on the user interaction. Based on service definition and usage rules associated with the TLI, TLI may be delivered to the user.

6. After obtaining input from MS-a, AS-a determines that interaction with a third party service is required. AS-a generates a service request to AS-b. Based on the usage rules association with the location information, in this example, the service request includes the TLI. TLI is now available at AS-b.

7. AS-b sends the call setup signaling and service information and may forward the TLI to MS-b. After an exchange of protocol messages, a bearer connection is established between the user and MS-b.

7 Applicable and Emerging Standards

Applicable and emerging standards that address the needs of Location Based Commercial Services include:

- LOCSIP
- IETF GEOPRIV
- MLS
- PARLAY
- 3GPP Location Services

This section provides a high-level overview of these standards.

7.1 LOCSIP

The Location in SIP/IP core network (LOCSIP) enabler supports functionality that allows a Location Client to retrieve location information of a Target from a Location Server via SIP. LOCSIP includes functionality that allows the user or the network to set permissions for obtaining TLI. The enabler focuses on the process of directly requesting TLI from the entity that has (directly or indirectly) derived the information and which stores the information. The enabler allows the Location Client to be provided from an Application Server or from User Equipment.

The enabler descriptions of particular interest to Location Based Commercial Services include:

- [OMA-RD-LOCSIP-V1], which identifies Use Cases and provides high level requirements for the LOCSIP enabler and describing subscription to services and the attendant network activity to obtain and use target location information. The document includes requirements:

  1. To limit the Location Server so that only authorized Location Clients may obtain target location information.

  2. To allow the Location Server to manage policies that defines what information a Location Client is authorized to receive for each target.

- [OMA-AD-LOCSIP-V1_0-20090818-C], which defines the architecture for the LOCSIP enabler based on the architecture defined for the OMA Presence enabler.

- [OMA-TS-LOCSIP-V1_0-20090818-C], which defines the detailed procedures that enable a Location Client to subscribe to a Location Server for TLI. The TLI is signaled via SIP in a XML-based Presence Information Data Format – Location Object (PIDF-LO) defined in the IETF Geographic Location/Privacy (GEOPRIV) working group. LOCSIP specifications define functionality that supports location authorization and privacy procedures. TLI is sent from the Location Server to the Location Client in response to a request from the Location Client or after a trigger event is detected by the Location Server.

The OMA standards do not explicitly address the use case of a Location Client that shares TLI with a peer application or, from the other perspective of this information exchange, of a Location Client that receives TLI from a source other than the Location Server that, by definition, "retrieves the location information of the Target". However, if a Location Client were to:

Also implement the Location Server interface to another Location Client, and

Consider that obtaining the TLI from the Location Server (indirectly) retrieves the location information of the Target,

Then the appropriate location authorization and privacy procedures would be included in the implementation and the TLI could be successfully signaled.

7.2 IETF GEOPRIV

IETF GEOPRIV defines several documents that identify the target location information, including usage rules, which may be included in or referenced by a PIDF-LO and that address authorization and privacy. PIDF-LO includes location-specific extension of the XML-based PIDF. The specific IETF GEOPRIV documents that define PIDF-LO and address authorization and privacy include:

- [RFC 4119], *A Presence-based GEOPRIV Location Object Format* - This document describes an object format for carrying geographical information via IP. The location object extends the XML-based PIDF, which was designed for communicating privacy-sensitive presence information. Presence information has similar properties as location information. The PIDF-LO includes the following information:
    - o Location Information - civic and/or geodetic location information
    - o Usage Rules – includes:
        - retransmission-allowed – indicates whether the recipient system may forward the location information to another system. There are open issues associated with this field. RFC [5606] discusses the open issues and provides recommendations for addressing the open issues.
        - retention-expires - specifies a date at which time the recipient is no longer permitted to keep the location information.
        - ruleset-reference – includes a URL that references a fuller set of usage rules
    - o Method – describes the way the location information was derived or discovered

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- o Provided-by - describes the entity or organization that supplied the location information

- [RFC 5139]. *Revised Civic Location Format for Presence Information Data Format Location Object (PIDF-LO)* - defines an XML format for the representation of civic location. The civic location defined in RFC 5139 replaces the civic location format in RFC 4119.

- [RFC 5606], *Implications of 'retransmission-allowed' for SIP Location Conveyance* - explores open issues associated with the interpretation of the 'retransmission-allowed' element of the PIDF-LO and provides recommendations for addressing the open issues.

- [RFC 4745], *Common Policy: A Document Format for Expressing Privacy Preferences* - defines a framework for authorization policies controlling access to application-specific data. This framework combines aspects of authorization systems that control access to target location information and authorization systems that control access to presence information.

7.3 MLS

The OMA Mobile Location Services (MLS) enabler consists of a set of specifications that comply with 3GPP Location Services (LCS) specifications. The 3GPP LCS specifications include procedures that allow a user or network to set permissions for obtaining TLI and the MLS enabler protocols pass the information required for the 3GPP LCS authorization procedures. The OMA MLS enabler documents include:

- [OMA-RD-MLS-V1_2-20080627-C] – defines the Use Cases and high level requirements for the MLS enablers. The Use Cases in the MLS requirements document include:

  - o Multiple Steps Location - An MLS client requests the location of a target with a high accuracy positioning. The Location Server may report one single position or multiple positions as they become available with increasing precision.

  - o Stopping Triggered Location Reporting for Individual Targets – An MLS Client may request the Location Server to report the location of one or more target when a trigger event (e.g., periodic reports, reports after change in area) occurs and may request the Location Server to stop the triggered location report for one or more targets.

- [OMA-AD-MLS-V1_2-20080627-C] – defines the architecture for the MLS enabler. The architecture complies with the 3GPP LCS specifications.

- [OMA-TS-MLP-V3_3-20091001-C] – provides the specifications for Mobile Location Protocol (MLP). MLP is an application protocol used by a Mobile Location Services (MLS) client to obtain the position of mobile stations (e.g., mobile phones, wireless personal digital assistants) from a Location Server. The latest version of the MLP protocol is defined in Mobile Location Protocol 3.3 Candidate Version 3.3, OMA-TS-MLP-V3_3-20091001-C.

- [OMA-TS-RLP-V1_1-20091001-C] – provides the specifications for Roaming Location Protocol (RLP). RLP is an application protocol that exchanges location information between two Location Servers in support of roaming.

7.4 *Parlay*

Parlay X web services consist of a set of APIs that exchange information between third party applications and network systems. One Parlay X web services API, named Parlay X Terminal Location, supports the exchange of target location information.

The Parlay X Terminal Location supports the following Use Cases:

- Request for the location of a terminal

- Request for the location of a group of terminal

- Notification of a change in the location of a terminal

- Notification of terminal location on a periodic basis.

- Notification when two or more terminals get within or beyond a specified distance.

The Parlay X Terminal Location API is defined in Technical Specification 3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Open Service Access (OSA); Parlay X Web Services; Part 9: Terminal location (Release 9), 3GPP TS 29.199-9 V9.0.0 (2009-12).

7.5 *3GPP Specifications*

The 3rd Generation Partnership Project (3GPP) Location Services (LCS) services are defined by the following documents:

- [3GPP TS 22.071 V8.1.0 (2008-12)] – Stage 1 description that defines the service from the user perspective

- [3GPP TS 23.271 V8.0.0 (2008-12)] – Stage 2 description that defines the architecture include the procedures at the architecture components

- [3GPP TS 24.030 V9.0.0 (2009-12)] – Stage 3 description that defines the application protocols between the Mobile Station and the network. The application protocol between the Location Client and Location Server in the network is defined by MLP.

LCS defines procedures and interfaces for enabling a Location Client to retrieve target location information from a Location Server. In LCS, the target location information may be requested by and reported to a client (application) associated with the target, or by a client within or attached to the Core Network.

LCS services include functionality that allows the user and the network to set permissions for obtaining target location information. 3GPP LCS includes a list of possible LCS services, such as location based charging, traffic monitoring, enhanced call routing, and location based information services.

8   Conclusion

Table 1 summarizes the applicability of the standards and specifications noted in Section 5 to the information flow needs noted in Section 3 and illustrated by the information flows in Section 4.

Table 1 - Applicability of Some Documents to Location Based Commercial Service Needs

	LOCSIP	GEOPRIV	MLS	Parlay	3GPP Specifications
Target location information pulled from location server	Yes [OMA-TS-LOCSIP-V1]	No [RFC 4119] and [RFC 5139] define information passed with TLI	Yes [OMA-TS-MLP-V3]	Yes [3GPP TS 29.199-9]	Yes [3GPP TS 23.271] and [3GPP TS 24.030]; Reference MLP for application protocol
Target location information pushed from location server	Yes [OMA-TS-LOCSIP-V1]	No [RFC 4119] and [RFC 5139] define information passed with TLI	Yes [OMA-TS-MLP]	Yes [3GPP TS 29.199-9]	Yes [3GPP TS 23.271] and [3GPP TS 24.030]; Reference MLP for application protocol
Security for interface to location server	Yes [OMA-TS-LOCSIP-V1]	Yes [RFC 4745]	No But complies with and relies on 3GPP procedures	No Assumes procedures from web infrastructure	Yes [3GPP TS 23.271]
Storing target location information (not at location server)	Yes Note 1 [OMA-TS-LOCSIP-V1]	Yes [RFC 5606]	No But complies with and relies on 3GPP procedures if location server functionality replicated (Note 1)	No	Yes Note 1 [3GPP TS 23.271]
Security for storing target location information	Yes [OMA-TS-LOCSIP-V1]	Yes [RFC 5606]	No But complies with and relies on 3GPP procedures	No	Yes [3GPP TS 23.271]
Pull target location information other than from the location server	Yes Note 1 [OMA-TS-LOCSIP-V1]	No [RFC 4119] and [RFC 5139] define information passed with TLI	Yes Note 1 [OMA-TS-MLP-V3]	Yes [3GPP TS 29.199-9]	Yes Note 1 [3GPP TS 23.271] and [3GPP TS 24.030]; Reference MLP for application protocol

	LOCSIP	GEOPRIV	MLS	Parlay	3GPP Specifications
Push target location information other than from the location server	Yes Note 1 [OMA-TS-LOCSIP-V1]	No [RFC 4119] and [RFC 5139] define information passed with TLI	Yes Note 1 [OMA-TS-MLP]	Yes Note 1 [3GPP TS 29.199-9]	Yes Note 1 [3GPP TS 23.271] and [3GPP TS 24.030]; Reference MLP for application protocol
Security for obtaining target location information other than from the location server	Yes Note 1 [OMA-TS-LOCSIP-V1]	Yes [RFC 4745]	No But complies with and relies on 3GPP procedures	No Assumes procedures from web infrastructure	Yes Note 1 [3GPP TS 23.271]

Yes   Supported by referenced document

No   Not addressed in referenced document

Note 1: See Sections 4.2 and 4.3 for example use cases where AS-a, rather than a Location Server, stores and provides the TLI to AS-b. In these cases, support for the functionality requires that AS-a supports the Location Server security and downstream interface functions when it provided TLI to AS-b. This does not imply support for Location Server interface functions to derive the TLI.

Based on the conclusions summarized in Table 1, existing standard and candidate standard descriptions for the exchange of target Location Information are sufficient to support the envisioned LBCS set. This is true for service implementations that directly query the Location Server from each network element that makes use of the target Location Information and for service implementations that share the target Location Information among the Application Servers and Media Servers, which may require the information to provide the desired service to the end user.