Secure User Plane Location Requirements

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

[3GPP LPP] 3GPP 36.355 "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)"

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2.2 Informative References

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

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

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[X.S0002] 3GPP2 X.S0002-0_v2.0 "MAP Location Services Enhancements,"
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[IEEE 802.11] "IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications," IEEE Std 802.11™-2007.
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[RFC5139] "Revised Civic Location Format for Presence Information Data Format Location Object (PIDF-LO)" M. Thompson and J. Winterbottom, February 2008, URL:http://www.ietf.org/rfc/rfc5139.txt

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].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

Application Service Provider	A provider of software applications that interface with a SUPL server.
Change of Area	A change of area reflects when a SET crosses a geographic area. The SET may be crossing into or out of an area.
Control Plane	The Control Plane is a functional plane containing the signalling structure for the user bearer management. Typically the control plane designates the circuit switched and packet switched wireless signalling networks which enable voice, data, supplementary service operation, etc.
GMLC	The Gateway Mobile Location Center (GMLC) contains functionality required to support LCS. In one PLMN, there may be more than one GMLC (See [23.271]).
GNSS	A Global Navigation Satellite System (GNSS) is a network of satellites that broadcasts navigation signals including time and distance data. GNSS receivers pick up these signals and calculate their precise location anywhere around the globe. Examples of GNSS include Global Positioning System (GPS), Galileo, etc.
I-WLAN	The interworking WLAN refers to the system for interworking between 3GPP/3GPP2 systems and WLAN. The intent of 3GPP/3GPP2–WLAN Interworking is to extend 3GPP/3GPP2 services and functionality to the WLAN access environment. The 3GPP/3GPP2–WLAN Interworking System provides bearer services allowing a 3GPP/3GPP2 subscriber to use a WLAN to access 3GPP/3GPP2 PS based services.
I-WiMAX	The interworking WiMAX (I-WiMAX) refers to the system for interworking between 3GPP/3GPP2 systems and WiMAX. The intent of 3GPP/3GPP2–WiMAX Interworking is to extend 3GPP/3GPP2 services and functionality to the WiMAX access environment. The 3GPP/3GPP2–WiMAX Interworking System provides bearer services allowing a 3GPP/3GPP2 subscriber to use a WiMAX to access 3GPP/3GPP2 PS based services.
LCS	Provides the mechanisms to support mobile location services for operators, subscribers and third party service providers (See [23.271]).
Location Server	Software and/or hardware entity offering location capabilities.
MLS application	An application which requests and consumes the location information. Note: this could be further qualified by distinguishing the application provider and actual application consumer of the location information
Policy Owner	The privacy policy owner of the SET. Defines/configures the privacy rules to which the MLS applications will comply to.
Quality of Position	A set of attributes associated with a request for the geographic position of a SET. The attributes include the required horizontal accuracy, vertical accuracy, maximum location age, and response time of the SET position.
SET user	User of the SET. The SET user MAY differ from the Policy owner.
SUPL Agent	A Software and/or hardware entity accessing the SUPL enabler in order to obtain location information.
SUPL Enabled Terminal	A logical entity in a device that is capable of communicating with a SUPL network using the SUPL interface. Examples of this could be a UE in UMTS, an MS in GSM or CDMA, or a PC over an IP-based transport.
SUPL Location Platform	Entity responsible for SUPL Service Management and Position Determination.
SUPL Network	Access network which facilitates the Location determination functionality and provides the SUPL bearer.

SUPL Provider	Location information is sensitive personal information and requires specific care with privacy and security. The bearer related information (e.g., "Global Cell Identifier") should not be accessible without the network provider's consent. So it is important that whatever policy the network provider decides, when applicable on the provision of SUPL, cannot be breached. Valid scenarios would be: 1) The network provider is the single SUPL provider. 2) The network provider and roaming partners are the only SUPL providers. 3) The network provider out-sources the SUPL functionality and there is a single 3rd party SUPL provider. 4) The network provider has an open policy on the provision of SUPL functionality and there are multiple 3rd party SUPL providers.
Target SET	The SET that is being located as part of a SUPL session.
Third Party	A third party is an entity that receives the location information of a target SET from the location server (e.g., GMLC, MPC or SLP).
Triggered Location Request	A location request that is initiated due to a periodic time event, a change of area event, or a change of velocity event.
User Plane	The user plane designates the functional plane where the information is part of the wireless user data and is transported over user bearers such as the wireless packet data network or SMS.
WLAN	A local area network that provides wireless access [IEEE 802.11].

3.3 Abbreviations

3GPP	3rd Generation Partnership Project (3GPP)
3GPP2	3rd Generation Partnership Project 2 (3GPP2)
AFLT	Advanced Forward Link Trilateration
A-GNSS	Assisted Global Navigation Satellite System
A-GPS	Assisted Global Positioning System
API	Application Programming Interface
CDMA	Code Division Multiple Access
DoS	Denial of Service
DTD	Document Type Definition
E-CI	Enhanced Cell-ID
EOTD	Enhanced Observed Time Difference
GMLC	Gateway Mobile Location Center (see [23.271])
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global Systems for Mobile Communications
HRPD	High Rate Packet Data
I-WLAN	Interworking WLAN
I-WiMAX	Interworking WiMAX
LAN	Local area network
LCS	Location Services
LTE	Long Term Evolution

MLP	Mobile Location Protocol
MLS	Mobile Location Services
MS	Mobile Station
OMA	Open Mobile Alliance
OTDOA	Observed Time Difference of Arrival
P2M	Point-to-Multipoint
P2P	Point-to-Point
PS	Packet switched services
QoP	Quality of Position
RD	Requirement Document
SET	SUPL Enabled Terminal
SLP	SUPL Location Platform
SMS	Short Message Service
SUPL	Secure User Plane Location
TD-SCDMA	Time Division-Synchronous Code Division Multiple Access
UE	User Equipment
UMB	Ultra Mobile Broadband
UMTS	Universal Mobile Telecommunications Service
WCDMA	Wideband Code Division Multiple Access
WiMAX	Worldwide Interoperability for Microwave Access Forum
WLAN	Wireless Local Area Network

4. Introduction (Informative)

Location services based on the location of mobile devices are becoming increasingly widespread. SUPL (Secure User Plane Location) employs user plane data bearers for transferring location assistance information such as GPS assistance data, and for carrying positioning technology-related protocols between mobile terminal and the network. SUPL is intended as an alternative and complement to the existing standards based on signalling in the mobile network control plane.

SUPL assumes that the mobile network or other access network is capable of establishing a data bearer connection between terminal and location server.

SUPL utilises existing standards where available and possible, and SUPL should be extensible to enable more positioning technologies as the need arises so that they utilise the same mechanism. As an example, in the initial phase, SUPL provided full functionality of A-GPS with minimum changes of current network elements. From SUPL Release 2, A-GNSS concept was introduced to allow all possible Navigation Satellite System assisted positioning technology to be utilized, e.g., GPS, Galileo, and so on.

Note: Applicability of a particular A-GNSS is subject to the support in relevant 3GPP and 3GPP2 specifications that SUPL is reliant on.

This SUPL RD describes the high-level functional requirements for SUPL including SUPL-specific security, interoperability, and privacy.

SUPL is not an application interface protocol. It does not expose an API to LCS applications. Other OMA specifications such as MLP are designed for that function. Hence, any reference to an MLS application in this document is assumed to request location information via a specification such as MLP.

5. SUPL 3.0 release description (Informative)

The goal of SUPL Enabler Release V3.0 is to improve the user experience through better service (higher accuracy, lower latency and higher availability) and new features.

The purpose of this release is to develop the following:

- Improved Location support for LTE
- Improved location for IP emergency calls
- Improved location performance
- Triggered location enhancement
- Improved indoor location accuracy
- SET to SET location
- Authentication enhancements
- Additional access networks
- Support for extended location information

Improved Location Support for LTE introduces alignments to the LPP [3GPP LPP] protocol already defined in 3GPP RAN.

Improved Location for IP Emergency Calls supports additional emergency call scenarios and introduces enhancements to existing SUPL 2.0 emergency call positioning. It enables location support after IP emergency call release as required in some regulatory environments (e.g., Japan) and introduces improvements to SUPL INIT security.

Improved Location Performance supports improved location accuracy and availability.

Triggered Location Enhancement provides improvements to existing SUPL 2.0 trigger capabilities and adds velocity trigger as a new capability.

Improved Indoor Location Accuracy addresses the special requirements arising from indoor location issues. An example of such is the support for floor level information as well as the use of relative instead of global coordinates.

SET to SET Location supports SET-to-SET communication to continuously obtain absolute and/or relative location and measurements of other SETs for both immediate and triggered location requests.

Authentication Enhancements enables authentication of SIM-less devices (with SUPL subscription) in an IP network. The current security solution includes 3GPP GBA, which is not feasible for emerging device types.

Additional Access Networks aims to expand the coverage (applicability) of SUPL to other types of wireless and wireline access networks – e.g., fixed broadband access and private WiFi access.

Support for Extended Location Information enables the delivery of, for instance, sensor-derived information including motion state and SET orientation information.

5.1 Version 1.0

The objective of SUPL 1.0 is to enable an industry standard framework for positioning over the User Plane.

User Plane is bearer independent and intended to work on a number of different bearers in cellular and WLAN/Internet environments.It is intended that this mechanism could be implemented in a wide range of contexts (e.g., a controlled mobile network operator's environment or an open Internet/WLAN environment).

User plane solutions are not intended to replace control plane solutions but to provide an alternative.

The design aims for this framework are to provide a well-defined mechanism, which may have the following characteristics but not restricted or committed to:

CHARACTERISTICS	Examples
Bearer Independence	GSM/WCDMA/CDMA
Location Technology Independence	A-GPS or Cell-ID(as in example below)
Standardised message flows for Mobile originated and mobile terminated fixes	Fix calculation initiated by an action on the terminal or by an action on another entity
Positioning Methods - Mobile based or mobile assisted fixes	Send measurements/assistance data to/from terminal, calculate on the terminal or on a server
Message wrappers for existing Control Plane solutions	3GPP RRLP, RRC, 3GPP2 IS801 A-GPS messages
Message extension mechanisms to supplement defined payloads	Add implementation specific information elements as required
Mechanisms to enable an implementation to comply with the Supplier's business rules	For an implementation, which entities can initiate a fix, supply assistance data, obtain fix information
Mechanisms to enforce Privacy Requirements determined by applicable Standards, local Regulations, applicable International Regulations and either the Subscriber or the End User preferences dependent on the business rules implemented	Subscriber preferences, 3GPP defined Subscriber Privacy Profile Register, 3GPP defined interactions on the mobile, 3GPP2 location information restrictions, EC regulations

5.2 Version 2.0

This version adds new functionality, and based on experience with SUPL 1.0, enhances the existing functionality while maintaining the SUPL 1.0 requirements.

The new functionality includes triggered services (e.g., periodic and change of area), and network environments (e.g., I-WLAN). In addition, SUPL 2.0 addresses emergency services.

While SUPL 1.0 is restricted to facilitate the location process of a specific SET, SUPL 2.0 introduces new functionality for a SET, provided by the SUPL Location Platform (SLP):

- To request the location of a target terminal

- To send its location to a third party

SUPL 1.0 currently utilises a number of bearer and transport technologies. Adapting the architecture to other network technologies like I-WLAN provides the same level of service to these environments. Other alternative (wireless) bearer and transport technologies are also considered.

This release also enhances existing functionality including but not limited to positioning method, privacy, and security.

6. Requirements (Normative)

The requirements in this section define the full SUPL Enabler.

6.1 Modularisation

Module Descriptions:

Functional Module	Description
Position Determination	The Position Determination module contains all requirements around position request methods, measurement data and position calculation.
Position Conveyance	The Position Conveyance module contains all requirements around conveying a calculated position to an entity.
Security	The Security module contains all security requirements.
Privacy	The Privacy module contains all privacy requirements.
Network	The Network module describes all requirements surrounding the network types and network restrictions.
Emergency Services	The Emergency Services module contains all Emergency Services requirements.
Implementation	The Implementation module describes any requirements on how the SUPL release is to be implemented.
Charging	The Charging module contains all charging requirements.

6.2 High-Level Functional Requirements

Label	Description	Release	Functional module
SUPL-HLF-01	SUPL SHALL support positioning procedures performed in collaboration with the target SET and a network resident SUPL function.	SUPL V1.0	Position Determination
SUPL-HLF-02	SUPL SHALL support Network-initiated location requests. Network-initiated locating use cases SHALL support P2P (point-to-point) connections and they, if technically feasible, MAY support P2M (point-to-multipoint) connections for emergency. For example, a P2M connection which broadcasts to multiple devices/users is useful for emergency services, especially in a building or hot spot area.	SUPL V1.0	Position Determination
SUPL-HLF-03	SUPL SHALL support SET-initiated location requests.	SUPL V1.0	Position Determination
SUPL-HLF-04	Immediate location requests SHALL be supported.	SUPL V1.0	Position Determination
SUPL-HLF-05	Location information is the result of a successful SUPL location transaction, and SHALL at a minimum, consist of latitude, longitude and timestamp (time at which location estimate is made) but can contain other information, including shape, uncertainty, altitude, speed, direction, QoP, etc.	SUPL V1.0	Position Determination

SUPL-HLF-06	A SUPL Agent SHALL be able to specify the desired QoP, including but not limited to accuracy, response time and age of location, in requesting the location of a SET.	SUPL V1.0	Position Determination
SUPL-HLF-07	Where multiple transmission methods are available in a network, and the primary transmission method fails or is not available (e.g., GPRS in a voice call with a class B handset) then it SHALL be possible to use an alternative bearer to successfully perform a full session that has been interrupted by the primary transmission method becoming unavailable.	SUPL V1.0	Network
SUPL-HLF-08	The SUPL architecture and protocol specification SHOULD not be the limiting factor in the location reporting interval from the SUPL system. E.g., for an underlying Location Technology and Bearer Technology combination that provides a 10 second reporting interval, SUPL should not degrade this reporting interval.	SUPL V2.0	Position Determination
SUPL-HLF-09	Triggered location requests SHALL be supported. Triggered location requests are requests, which require event-based location reporting, or location reporting triggered by some other condition.	SUPL V2.0	Position Determination
SUPL-HLF-10	It SHALL be possible to differentiate between the priorities of different location requests. E.g., it may be necessary to differentiate emergency service requests from commercial services.	SUPL V2.0	Position Determination
SUPL-HLF-11	SUPL SHALL support SET-initiated location request for the transfer of the SET's position information to a third party.	SUPL V2.0	Position Conveyance
SUPL-HLF-12	SUPL SHALL support SET-initiated location request to obtain the location of another Target SET	SUPL V2.0	Position Determination
SUPL-HLF-13	The architecture SHALL support localized assistance data broadcasting.	Future Release	Position Determination
SUPL-HLF-14	SUPL SHALL support SET to SET Velocity. The SET to SET Velocity Service enables a SET to obtain the velocity of one or more Target SETs (either absolute or relative to its own velocity) on an ongoing – including one time event – basis.	Future Release	Position Determination
SUPL-HLF-15	SUPL SHALL support SET to SET Location. The SET to SET Location Service enables a SET to obtain the location of one or more Target SETs (either absolute or relative to its own location) on an ongoing – including one time event – basis.	Future Release	Position Determination
SUPL-HLF-16	SUPL SHALL support positioning data (any positioning-related data such as location information, AGNSS data, fingerprint data and radiomap) streaming (continuous, periodic exchange of data) between two or more SETs via the network-resident SUPL-function or between the network-resident SUPL-function and the SET.	Future Release	Position Determination
SUPL-HLF-17	SUPL SHALL support IETF "Revised Civic Location Format for Presence Information Data Format Location Object (PIDF-LO)" [RFC5139] Location info format.	Future Release	Position Determination
SUPL-HLF-18	SUPL SHALL support SLP service discovery.	SUPL V3.0	Network
SUPL-HLF-19	SUPL SHALL support position results in absolute and relative terms.	SUPL V3.0	Position Determination
SUPL-HLF-20	SUPL SHALL enable encoding of position results to sub-meter resolution.	SUPL V3.0	Position Determination
SUPL-HLF-21	SUPL SHALL support delivery of indoor context information to the SET.	SUPL V3.0	Position Determination
SUPL-HLF-22	SUPL SHALL support delivery of indoor context information from the SET to the H-SLP.	SUPL V3.0	Position Determination

SUPL-HLF-23	SUPL SHALL support the conveyance of a location URI from the SET to the SLP. The SLP MAY use the location URI as an additional source of location information.	SUPL V3.0	Position Determination

Table 1: High-Level Functional Requirements

6.2.1 Security

Label	Description	Release	Functional module
SUPL-SEC-01	SUPL SHALL ensure that any location information that is stored or exchanged is secure and thus is not accessible to unauthorized access, i.e., unauthorized disclosure, usage, loss or corruption of location data is prevented. - If SUPL provides the ability for the SET or SUPL network to store location information, the location data SHALL be stored in a secure manner and SHALL be available for retrieval by authorized applications. - Note that the authorization here is governed by the Policy owner privacy requirements (i.e., user privacy preferences/profile) and local regulations. Stored location data SHALL only be accessible to those applications that are authorized by the Policy owner. - Emergency services and lawful purposes are exempted from this requirement in that they can override any user privacy preference setting.	SUPL V1.0	Security
SUPL-SEC-02	SUPL SHALL deliver its content (data which facilitates the SUPL transaction) in a trustworthy and reliable manner, e.g., Location information SHALL be protected against eavesdropping or modification of the data traffic.	SUPL V1.0	Security
SUPL-SEC-03	It SHALL be possible to authenticate the SUPL Agent, SUPL network and SET user.	SUPL V1.0	Security
SUPL-SEC-04	SUPL 2.0 specifications SHOULD provide mechanisms to prevent Denial of Service (DoS) attacks	SUPL V2.0	Security

Table 2: High-Level Functional Requirements – Security Items

6.2.1.1 Authentication

Label	Description	Release	Functional module
SUPL-AUT-01	SUPL SHALL support authentication for all the supported access networks	SUPL V3.0	Authentication

6.2.1.2 Authorization

None identified.

6.2.1.3 Data Integrity

None identified.

6.2.1.4 Confidentiality

None identified.

6.2.2 Charging

Label	Description	Release	Functional module
SUPL-CRG-01	SUPL SHALL support the ability for the SUPL provider to apply different charging schemes depending on the service provided. Note that the cost of SUPL to a SET user may be a QoP parameter, which is negotiated between the SET user application and the SUPL Provider.	SUPL V1.0	Charging
SUPL-CRG-02	SUPL SHALL record the appropriate information to enable charging schemes, including but not limited to: SET identity, QoP requested, QoP provided, timestamp.	SUPL V1.0	Charging

Table 3: High-Level Functional Requirements – Charging Items

6.2.3 Administration and Configuration

Label	Description	Release	Functional module
SUPL-ADMC-01	The architecture SHALL enable SUPL service management and location information control in both the SET and the network, depending on the SUPL Provider's requirements.	SUPL V1.0	Position Determination
SUPL-ADMC-02	Where the SUPL provider supports the use case to supply the SET with assistance data only, the SET SHALL control the location information.	SUPL V1.0	Position Determination

Table 4: High-Level Functional Requirements – Administration and Configuration Items

6.2.4 Usability

Label	Description	Release	Functional module
SUPL-USAB-01	As SUPL is time-sensitive, all SUPL events and transactions SHALL be time-stamped and SHALL use the most recent up-to-date data available (High Data Quality). The content of the service SHALL be based on up-to-date data. Consistency and coherency are other important factors.	SUPL V1.0	Implementation
SUPL-USAB-02	SUPL SHALL be available for value-added commercial applications as well as for emergency service applications within the technical limitations of each access network (Service Support). Additionally, the SUPL architecture SHALL be able to differentiate between emergency services and commercial services. Note 1: In some networks it is not possible to support simultaneous voice and data communication; Hence if simultaneous communication is not supported, SUPL will not be available during voice communication.	SUPL V2.0	Position Determination

Table 5: High-Level Functional Requirements – Usability Items

6.2.5 Interoperability

Label	Description	Release	Functional module
SUPL-IOP-01	The SUPL reference architecture SHALL allow co-existence with existing location related standards specified by 3GPP2, 3GPP and IEEE, i.e., the SUPL architecture SHALL NOT negatively impact the operation and performance of existing standards in any way.	SUPL V1.0	Network

SUPL-IOP-02	SUPL SHALL support the positioning of roaming SET users. This will include roaming in the context of the bearer utilised for the secure user plane, the SET user, the MLS application and both the SET user and the MLS application. SUPL SHALL support SET roaming between a network which adopts SUPL and a network which adopts existing LCS standards (e.g., [X.S0002], [23.271]). The SUPL architecture needs to work within the framework of these roaming standards and provide support where gaps specific to SUPL are identified. If the roaming network does not have location capability such as A-GPS, alternative solutions MAY be applied. In order to provide seamless QoP to a SET user, it SHALL be possible for SET user roaming in a network which does not support A-GPS to be served by a SUPL provider via its home network.	SUPL V1.0	Position Determination
SUPL-IOP-03	The SUPL architecture SHALL provide backward compatibility mechanisms (e.g., protocol versioning).	SUPL V1.0	Implementation
SUPL-IOP-04	The architecture SHALL support the ability for a SET to provide its SUPL specific capabilities to the SUPL network.	SUPL V1.0	Position Determination
SUPL-IOP-05	The architecture SHALL support the ability for a SUPL provider to provide its SUPL specific capabilities to the SET.	SUPL V1.0	Position Determination
SUPL-IOP-06	SUPL SHALL provide the capability to negotiate between SUPL elements such that the SUPL session MAY fallback to an earlier version, if such fallback is allowed by the SUPL Provider and if the requested service is available in the earlier version.	SUPL V2.0	Implementation
SUPL-IOP-07	SUPL SHALL support the ability to negotiate positioning protocols versions	SUPL V2.0	Implementation
SUPL-IOP-08	The architecture SHALL support the ability for a SET to provide its SUPL-specific capabilities to another SET	Future Release	Position Determination

Table 6: High-Level Functional Requirements – Interoperability Items

6.2.6 Privacy

Label	Description	Release	Functional module
SUPL-PRIV-01	SUPL SHALL ensure that the end-user's privacy is protected in all transactions consistent with the user's privacy preferences, except for emergency or lawful purposes depending on local/regional regulations. Note that multiple layers of privacy protection MAY be provided.	SUPL V1.0	Privacy
SUPL-PRIV-02	SUPL SHALL support a general and synchronised privacy framework. Note that MLS application, SUPL Agent, SUPL network and SET can be part of several domains: Mobile Network Operator, IT domain or device domain. Therefore, several service architectures can be derived from these three domains. As the MLS application, SUPL Agent, SUPL network and SET can be part of the above-mentioned domains, the same level of privacy management SHALL be performed for all service architectures.	SUPL V1.0	Privacy
SUPL-PRIV-03	SUPL SHALL support privacy check after positioning if the Policy owner has defined different privacy settings for different geographical locations.	SUPL V2.0	Privacy

SUPL-PRIV-04	SUPL SHALL support a mechanism to limit the maximum duration of the data streaming session	SUPL V3.0	Network

Table 7: High-Level Functional Requirements – Privacy Items

6.2.7 Location Technology

Label	Description	Release	Functional module
SUPL-LOCT-01	The architecture SHALL support Cell ID positioning. Deployment of each technology option is a SUPL provider decision. However, in a Mobile Network, Cell ID SHALL always be the backup positioning method when other positioning methods fail.	SUPL V1.0	Position Determination
SUPL-LOCT-02	The architecture SHALL support Enhanced Cell ID positioning. Enhanced Cell-ID (E-CI) positioning is defined as enhancing Cell ID positioning by using additional measurements from the Mobile Network that are available in the SET.	SUPL V1.0	Position Determination
SUPL-LOCT-03	The architecture SHALL support A-GPS positioning.	SUPL V1.0	Position Determination
SUPL-LOCT-04	The architecture SHALL support standalone-positioning technologies, e.g., autonomous GNSS.	SUPL V2.0	Position Determination
SUPL-LOCT-05	The architecture SHALL support EOTD positioning if EOTD measurements are available.	SUPL V1.0	Position Determination
SUPL-LOCT-06	The architecture SHALL support OTDOA positioning if OTDOA measurements are available.	SUPL V1.0	Position Determination
SUPL-LOCT-07	The architecture SHALL support AFLT positioning if AFLT measurements are available.	SUPL V1.0	Position Determination
SUPL-LOCT-08	The architecture SHALL support the delivery of assistance data from the SUPL network to the SET.	SUPL V1.0	Position Determination
SUPL-LOCT-09	SUPL architecture SHALL support an extensible framework so that new location technologies, supported by the network, can be added efficiently and in-line with the overall architecture.	SUPL V1.0	Position Determination
SUPL-LOCT-10	The architecture SHALL support A-GNSS positioning according to 3GPP and 3GPP2 specifications.	SUPL V2.0	Position Determination
SUPL-LOCT-11	SUPL SHALL support assistance data change notification to the SET.	Future Release	Position Determination
SUPL-LOCT-12	SUPL SHALL support extended location information including, for instance, motion state (walking, running, driving, etc.) and SET orientation information.	Future Release	Position Determination
SUPL-LOCT-13	SUPL SHALL utilize the capabilities in 3GPP TS 36.355 [3GPP LPP].	SUPL V3.0	Position Determination

Table 8: High-Level Functional Requirements – Location Technology Items

6.2.8 Emergency Services

Label	Description	Release	Functional module
SUPL-EMER-01	SUPL SHALL allow support for location requests associated with emergency services where applicable by local regulatory requirements.	SUPL V2.0	Emergency Services
SUPL-EMER-02	It SHALL be possible for emergency services location requests to have a higher priority than other location requests based on local regulatory requirements.	SUPL V2.0	Emergency Services

SUPL-EMER-03	SUPL SHALL support SET Initiated and Network Initiated positioning for emergency location requests.	SUPL V3.0	Emergency Services
SUPL-EMER-04	SUPL SHALL support emergency location for unauthenticated SET.	SUPL V3.0	Emergency Services

Table 9: High-Level Functional Requirements – Emergency Services Items

6.2.9 Triggered Location Requests

Label	Description	Release	Functional module
SUPL-TRIG-01	SUPL SHALL support the periodic trigger of the triggered location request.	SUPL V2.0	Position Determination
SUPL-TRIG-02	SUPL SHALL support the area event trigger of the triggered location request. The area event is the event where the SET enters, leaves, is inside, or is outside a pre-defined geographical area.	SUPL V2.0	Position Determination
SUPL-TRIG-03	SUPL SHALL support Equidistant Trigger services. The Equidistant Trigger Service performs position determination of a Target SET at equidistant intervals (i.e., distance travelled since last report) and transmits event occurrence (Target SET has moved by the predefined distance) and calculated positions to requesting clients (SUPL Agents).	Future Release	Position Determination
SUPL-TRIG-04	SUPL SHALL support SET to SET Triggers. The Relative SET to SET Trigger Service provides area event trigger services for a Target SET relative to a Reference SET. A client (SUPL Agent) specifies a Reference SET and provides a geographical target area around the Reference SET which moves in sync with the position of the Reference SET. The SUPL Agent is informed when a trigger event occurs (i.e., when the Target SET enters or leaves the geographical target area around the Reference SET).	Future Release	Position Determination
SUPL-TRIG-05	SUPL SHALL support Velocity Triggers. The Velocity Trigger Service provides a trigger service to detect when a Target SET's velocity reaches a predefined level. The client (SUPL Agent) is notified when a velocity event is triggered.	SUPL V3.0	Position Determination
SUPL-TRIG-06	SUPL SHALL support T-D-V Combination Triggers. The T-D-V Combination Trigger service allows to combine time elapsed since last report (periodic) triggers ("T") (SUPL-TRIG-01), distance travelled since last report (equidistant) triggers ("D") (SUPL-TRIG-03) and maximum velocity reached since last report(velocity) triggers ("V") (SUPL-TRIG-05). A T-D-V Combination Trigger is defined as [(T) AND/OR (D) AND/OR (V)]. More complex combinations – if applicable – SHALL also be allowed (e.g. [(T) AND (D)] OR [(T) AND (V)], etc.).	Future Release	Position Determination
SUPL-TRIG-07	SUPL SHALL support the pause and the resume procedure for the triggered location session.	SUPL V3.0	Position Determination

Table 10: High-Level Functional Requirements – Triggered Location Requests Items

6.3 Overall System Requirements

Label	Description	Release	Functional module
SUPL-OSR-01	The SUPL reference architecture and specifications SHALL be compatible with all underlying network technologies (Data Bearer Independence). For example, air interface standards (GSM, WCDMA/TD-SCDMA, LTE, CDMA, HRPD, UMB, WLAN, WiMAX) and transport media (packet data services, SMS, etc.) MUST be supported.	SUPL V2.0	Network
SUPL-OSR-02	SUPL SHALL NOT impose any requirements on the underlying data bearer service. Hence it MUST NOT be necessary to modify the architecture or functionality in underlying network technology.	SUPL V1.0	Network
SUPL-OSR-03	The SUPL reference architecture will introduce new logical functions. It MUST be possible for these functions to be either hosted in existing LCS elements (for example the GMLC) or in completely new physical entities.	SUPL V1.0	Implementation
SUPL-OSR-04	The architecture SHALL support storage of location information for a SET user in order to provide it at a later time.	SUPL V1.0	Implementation
SUPL-OSR-05	SUPL SHALL be made adaptable to different legislative environments and variable security requirements so that it is legal to deploy and use SUPL, enabling applications utilizing location information under the laws of different countries.	SUPL V1.0	Implementation
SUPL-OSR-06	SUPL SHALL NOT prevent the Application Service Provider from choosing a SUPL provider.	SUPL V1.0	Implementation
SUPL-OSR-07	SUPL SHALL support the positioning of a SET attached to a WLAN network.	SUPL V3.0	Network
SUPL-OSR-08	SUPL SHALL support the positioning of a SET attached to an I-WLAN network.	SUPL V2.0	Network
SUPL-OSR-09	SUPL SHALL support the positioning of a SET attached to a WiMAX network.	SUPL V2.0	Network
SUPL-OSR-10	SUPL SHALL support the positioning of a SET attached to an I-WiMAX network.	SUPL V2.0	Network

Table 11: High-Level System Requirements

Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No prior version –or- No previous version within OMA

A.2 Draft/Candidate Version 3.0 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-RD-SUPL-V3_0	03 Feb 2009	All	Initial draft RD for V3.0
	13 Feb 2009	1, 2, 3, 6	Incorporates input to committee: OMA-LOC-2009-0038-CR_SUPL3_0_RD_Section1_Scope OMA-LOC-2009-0039-CR_SUPL3_0_RD_Section2_References OMA-LOC-2009-0040-CR_RD_Section3_Terminology_And_Conventions OMA-LOC-2009-0041-CR_SUPL3_0_RD_Section6_Requirements
	29 Apr 2009	4, 6	Incorporates input to committee: OMA-LOC-2009-0082-CR_SUPL3_0_RD_HLFR_Bugfix OMA-LOC-2009-0083-CR_SUPL3_0_RD_Section4_Introduction
	01 Jul 2009	6, Appendix B	Incorporates input to committee: OMA-LOC-2009-0063R02-CR_SUPL3_0_RD_equidistant_trigger OMA-LOC-2009-0064R02-CR_SUPL3_0_RD_relative_SET_to_SET_trigger OMA-LOC-2009-0065R02-CR_SUPL3_0_RD_velocity_trigger OMA-LOC-2009-0066R03-CR_SUPL3_0_RD_T_D_V_combination_trigger OMA-LOC-2009-0081R05-CR_SUPL3.0_GNSS_Assistance_Broadcasting_ OMA-LOC-2009-0102R04-CR_SUPL3_0_RD_SET_to_SET_velocity OMA-LOC-2009-0103R05-CR_SUPL3_0_RD_SET_to_SET_location OMA-LOC-2009-0116R01-CR_SUPL3_0_RD_support_of_SI_emergency_call_location OMA-LOC-2009-0177R03-CR_SUPL3_RD_Security OMA-LOC-2009-0178R03-CR_SUPL3_RD_Streaming
	02 Jul 2009	6	OMA-LOC-2009-0080R02-CR_SUPL30_RD_GEOPRIV_Location_Info_Format
	01 Sep 2009	6, Appendix B	Incorporates input to committee: OMA-LOC-2009-0098R05-CR_SLP_discovery_in_a_specific_access_network OMA-LOC-2009-0173R05-CR_SUPL3_RD_AssistanceDataPush OMA-LOC-2009-0185R02-CR_SUPL3_0_RD_Triggered_Session_Pause_Resume_Process OMA-LOC-2009-0216R02-CR_SUPL3_0_RD_SIMless_SET_support
	27 Oct 2009	3, 6	Incorporates input to committee: OMA-LOC-2009-0251R01-CR_SUPL3_0_RD_relative_position OMA-LOC-2009-0252R01-CR_SUPL3_0_RD_high_accuracy_reporting OMA-LOC-2009-0264R01-CR_SUPL3_0_RD_indoor_context_information OMA-LOC-2009-0268-CR_SUPL3_0_RD_Definitions_Abbreviations_Modification OMA-LOC-2009-0272R01-CR_SUPL3_0_RD_Location_URI_Conveyance OMA-LOC-2009-0291-CR_SUPL3_RD_ExtendedLocationInformation

Document Identifier	Date	Sections	Description
	16 Nov 2009	5, 5.1, 5.2, 6.1, 6.2, 6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.2.5, 6.2.6, 6.2.7, 6.2.8, 6.2.9, 6.3, Appendix C	Incorporates input to committee : OMA-LOC-2009-0307-CR_OMA_RD_SUPL_V3_0_Sect5_6_Updates
	05 Dec 2009	All	Editorial clean up following RD formal review Implemented CRs: OMA-LOC-2009-0316R01 OMA-LOC-2009-0318
	08 Jan 2010	All	Updated to 2010 template
CandidateVersions OMA-RD-SUPL-V3_0	26 Jan 2010	n/a	TP approved via R&A ref# OMA-TP-2010-0006-INP_SUPL_V3_0_RD_for_Candidate_Approval
Draft Versions OMA-RD-SUPL-V3_0	06 Sep 2010	All	Incorporates input to committee : OMA-LOC-2010-0196-CR_SUPL3_0_RD_Editorials
CandidateVersions OMA-RD-SUPL-V3_0	21 Sep 2010	n/a	Notified to TP: OMA-TP-2010-0418-INP_SUPL_V3_0_RD_for_Notification
Draft Versions OMA-RD-SUPL-V3_0	09 Aug 2011	All	Incorporated all changes identified in OMA-CONRR-SUPL-V3_0-20110804-D Updated to 2011 template
CandidateVersions OMA-RD-SUPL-V3_0	20 Sep 2011	All	TP approved via R&A: OMA-TP-2011-0332-INP_SUPL_3.0_ERP_for_Candidate_approval

Appendix B. Use Cases (Informative)

B.1 Triggered Location Request – Equidistant Trigger

B.1.1 Short Description

The Equidistant Trigger Service performs position determination of a Target SET at equidistant intervals (i.e. distance travelled since last report) and transmits event occurrence (Target SET has moved by the predefined distance) and calculated positions to requesting clients (SUPL Agents).

Actors:

A SUPL Agent requesting Equidistant Trigger Service of a Target SET from an SLP. The SUPL Agent resides in the network (Network Initiated case).

An SLP providing the Equidistant Trigger Service to the SUPL Agent.

A SET (the Target SET) which is capable of executing positioning procedures with the SLP and/or on its own and which collaborates with the SLP to provide the Equidistant Trigger Service to the SUPL Agent.

Actor Specific Issues:

The SUPL Agent specifies the trigger parameters of the Equidistant Trigger Service (e.g., equidistance interval, start time, stop time, etc.) and the identity of the Target SET.

The SUPL Agent's request for Equidistant Trigger Service of a Target SET requires authorization by the SLP.

An SLP's request for Equidistant Trigger Service of a Target SET requires notification and/or verification by the Target SET.

Mechanisms to initiate, terminate and pause/resume Equidistant Trigger sessions are provided by the SUPL elements in the SLP and the Target SET.

Normal Flow:

(1) The SUPL Agent requests Equidistant Trigger Service from the SLP for a particular Target SET. The SUPL Agent specifies the Target SET's identity and the trigger parameters (e.g., equidistance interval, start time, stop time, etc.).

(2) The SLP initiates an Equidistant Trigger session with the Target SET.

(3) SLP and the Target SET collaborate to determine the occurrence of a trigger event (i.e., the Target SET has travelled by a predefined distance) and the Target SET's position.

(4) The SLP notifies the SUPL Agent of each trigger event and may also include the position of the Target SET.

(5) When the end of the Equidistant Trigger session is reached (e.g., stop time reached, predefined final waypoint reached, etc.), the SLP and the Target SET terminate the session and the SLP notifies the SUPL Agent of the session end.

Alternative Flow:

When the SUPL Agent requests that the SLP terminate an ongoing Equidistant Trigger session, the SLP and the Target SET take action to terminate the session.

When the SLP and/or the Target SET decide to terminate an ongoing Equidistant Trigger session, the SLP and the Target SET take action to terminate the session.

When the SUPL Agent requests that the trigger service be paused, no position determination and/or trigger events detection occurs until the SUPL Agent requests resumption of the service.

When the Target SET's user requests that the trigger service be paused, no position determination and/or trigger events detection occurs until the Target SET's user requests resumption of the service.

B.1.2 Market benefits

The SUPL Agent can access Equidistant Trigger Services of a Target SET through a single service request to the SLP instead of making multiple requests and evaluating the results. The benefits are significantly lower signaling and processing for all actors (SUPL Agent, SLP and Target SET).

B.2 Triggered Location Request – Relative SET to SET Trigger

B.2.1 Short Description

The Relative SET to SET Trigger Service provides area event trigger services for a Target SET relative to a Reference SET. A client (SUPL Agent) specifies a Reference SET and provides a geographical target area around the Reference SET which moves in sync with the position of the Reference SET. The SUPL Agent is informed when a trigger event occurs (i.e., when the Target SET enters or leaves the geographical target area around the Reference SET).

Example: mother and child in a crowded shopping mall. The mother's terminal constitutes the "Reference SET" and the child's terminal the "Target SET". The geographical target area is defined as a circular area with radius r centered around the mother's geographical position. Whenever the child (i.e., the Target SET) leaves the geographical target area (i.e., the circular area centered around the mother), the SUPL Agent is notified and the SUPL Agent then notifies the mother that the child has been lost (i.e., has left the geographical target area around the Reference SET).

Actors:

A client (SUPL Agent) which requests the Relative SET to SET Trigger Service from the SLP. The SUPL Agent resides in the network (Network Initiated case).

An SLP which provides the Relative SET to SET Trigger Service to the SUPL Agent.

A Target SET which is capable of executing a positioning procedure with the SLP and/or on its own and which may be able to share its position with the Reference SET.

A Reference SET which is capable of executing a positioning procedure with the SLP and/or on its own and which may be capable of sharing its position with the Target SET.

Actor Specific Issues:

The SUPL Agent defines the Reference SET's identity and the relative target area around the Reference SET.

The SUPL Agent defines the Target SET's identity.

The Reference SET's location is determined on a continuous basis and may be shared with the Target SET.

The Target SET may have continuous access to the Reference SET's location, and detects either on its own or in collaboration with the SLP when a trigger event has occurred (i.e., Target SET entered or left the geographical target area). The Target SET may also share its location with the Reference SET.

A SUPL Agent's request for Relative SET to SET Trigger Service requires authorization by the SLP.

A SLP's request for Relative SET to SET Trigger Service requires notification and/or verification by the Target SET and Reference SET.

Mechanisms to initiate, terminate and pause/resume a Relative SET to SET Trigger session are provided by the SUPL elements in the SLP, the Reference SET and the Target SET.

Normal Flow:

(1) The SUPL Agent requests Relative SET to SET Trigger Service from the SLP for a particular Target SET and Reference SET. The SUPL Agent specifies the Target and Reference SETs' identities and the trigger parameters

(e.g., relative geographical target area around the Reference SET, trigger event parameters (e.g., entering, leaving, start time, stop time, etc)).

(2) The SLP initiates a Relative SET to SET Trigger session with the Target SET and Reference SET.

(3) SLP, Reference SET and Target SET collaborate to detect the occurrence of a trigger event (i.e., the Target SET has entered or left the geographical target area around the Reference SET).

(4) The SLP notifies the SUPL Agent of the occurrence of a trigger event.

Alternative Flow:

If the SUPL Agent requests that the SLP terminate a Relative SET to SET Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If the SLP requests to terminate the Relative SET to SET Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If Target SET and/or Reference SET request to terminate the Relative SET to SET Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If SLP, Target SET or Reference SET request to pause the Relative SET to SET Trigger session, the session will be paused (i.e., procedures to pause the session will be executed and no position determination and/or trigger event detection will occur until the session is resumed by the suspending actors).

B.2.2 Market benefits

The SUPL Agent receives trigger area events of the Target SET relative to a geographical target area defined around the Reference SET through a single service request to the SLP instead of making multiple requests for the positions of the Target SET and Reference SET and evaluating the results. This significantly improves the signaling between SUPL elements and reduces the number of location requests.

The Target SET can be informed of an area event relative to the position of a Reference SET triggered by itself.

The Reference SET can be informed of an area event relative to its own position triggered by the Target SET.

B.3 Triggered Location Request – Velocity Trigger

B.3.1 Short Description

The Velocity Trigger Service provides a trigger service to detect when a Target SET's velocity reaches (i.e., meets or exceeds) a predefined level. The client (SUPL Agent) is notified when a velocity event is triggered.

Actors:

A client (SUPL Agent) which requests the Velocity Trigger Service from the SLP. The SUPL Agent resides in the network (Network Initiated case).

A SLP which provides the Velocity Trigger Service to the SUPL Agent.

A Target SET which is capable of executing a positioning procedure (including velocity determination) with the SLP and/or on its own.

Actor Specific Issues:

The SUPL Agent specifies the trigger parameters of the Velocity Trigger Service (e.g., target velocity, start time, stop time, etc.) and the identity of the Target SET.

A SUPL Agent's request for Velocity Trigger Service requires authorization by the SLP.

An SLP's request for Velocity Trigger Service of a Target SET requires notification and/or verification by the Target SET.

Mechanisms to initiate, terminate and pause/resume a Velocity Trigger session are provided by the SUPL elements in the SLP and the Target SET.

Normal Flow:

(1) The SUPL Agent requests Velocity Trigger Service from the SLP for a particular Target SET. The SUPL Agent specifies the Target SET's identity and the trigger parameters (e.g., target velocity, start time, stop time, etc).

(2) The SLP initiates a Velocity Trigger session with the Target SET.

(3) SLP and Target SET collaborate to detect the occurrence of a trigger event (i.e., the Target SET has reached the target velocity).

(4) The SLP notifies the SUPL Agent of the occurrence of a trigger event.

Alternative Flow:

If the SUPL Agent requests that the SLP terminate a Velocity Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If the SLP requests to terminate the Velocity Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If the Target SET requests to terminate a Velocity Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If SLP or Target SET request to pause the Velocity Trigger session, the session will be paused (i.e., procedures to pause the session will be executed and no position determination and/or trigger event detection will occur until the session is resumed by the suspending actors).

B.3.2 Market benefits

The SUPL Agent has access to a Velocity Trigger Service, allowing it to make only one request to the SLP instead of making multiple requests and evaluating the results. This improves the signaling between SUPL elements and reduces the number of location requests.

B.4 Triggered Location Request – T-D-V Combination Trigger

B.4.1 Short Description

The T-D-V Combination Trigger service allows to combine time elapsed since last report (periodic) triggers ("T"), distance travelled since last report (equidistant) triggers ("D") and maximum velocity reached since last report (velocity) triggers ("V"). A T-D-V Combination Trigger is defined as [(T) AND/OR (D) AND/OR (V)]. More complex combinations – if applicable – are also allowed (e.g., [(T) AND (D)] OR [(T) AND (V)], etc.).

Example: a fleet management center wants updates on truck movement with an interest in reports whenever a truck has moved 10 miles since the last report but with no more than one report per truck every hour. The center would also like to be notified immediately if a truck reaches 75mph (e.g., company policy is keeping at or below 65mph). The associated trigger condition would be: ((t ≥ 60 minutes) AND (d ≥ 10 miles)) OR (s ≥ 75 mph). To avoid excessive reports for speeding drivers, the trigger condition might instead be: ((t ≥ 60 minutes) AND (d ≥ 10 miles)) OR ((t ≥ 10 minutes) AND (s ≥ 75 mph)).

This use case describes the Network-Initiated T-D-V Combination Trigger.

Actors:

A client (SUPL Agent) which requests the T-D-V Combination Trigger service from the SLP. The SUPL Agent resides in the network (Network Initiated case).

A SLP which provides the T-D-V Combination Trigger service to the SUPL Agent.

A Target SET which is capable of executing a positioning procedure (including velocity determination) with the SLP and/or on its own.

Actor Specific Issues:

The SUPL Agent specifies the trigger parameters of the T-D-V Combination Trigger (i.e., T trigger parameters, D trigger parameters and V trigger parameters if applicable), the desired combination of the triggers (e.g., [(T AND D) OR V], etc.) and the identity of the Target SET.

A SUPL Agent's request for T-D-V Combination Trigger Service requires authorization by the SLP.

A SLP's request for T-D-V Combination Trigger Service of a Target SET requires notification and/or verification by the Target SET.

Mechanisms to initiate, terminate and pause/resume a T-D-V Combination Trigger session are provided by the SUPL elements in the SLP and the Target SET.

Normal Flow:

(1) The SUPL Agent requests T-D-V Combination Trigger Service from the SLP for a particular Target SET. The SUPL Agent specifies the Target SET's identity, the T, D, V trigger parameters and the desired combination.

(2) The SLP initiates a T-D-V Combination Trigger session with the Target SET.

(3) SLP and Target SET collaborate to detect the occurrence of a trigger event (i.e. the individual triggers (T,D and V) are evaluated and the results are logically combined to yield the Combined Trigger result).

(4) The SLP notifies the SUPL Agent of the occurrence of a T-D-V Combination trigger event.

Alternative Flow:

If the SUPL Agent requests that the SLP terminate a T-D-V Combination Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If the SLP requests to terminate the T-D-V Combination Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If the Target SET requests to terminate a T-D-V Combination Trigger session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If SLP or Target SET requests to pause the T-D-V Combination Trigger session, the session will be paused (i.e., procedures to pause the session will be executed and no position determination and/or trigger event detection will occur until the session is resumed by the suspending actor).

B.4.2 Market benefits

The SUPL Agent has access to a T-D-V Combination Trigger Service, allowing it to make only one request to the SLP instead of making multiple requests and evaluating the results. This improves the signaling between SUPL elements and reduces the number of location requests.

B.5 Triggered Location Request – SET to SET Velocity

B.5.1 Short Description

The SET to SET Velocity Service enables a SET to obtain the absolute or relative velocity of one or more Target SETs on an ongoing – including one time event - basis.

Actors:

A client (SUPL Agent) which resides in a SET (the Requesting SET) and which requests the velocity of one or more Target SETs on an ongoing – including one time event - basis.

A Requesting SET which is capable of executing a positioning procedure (aimed at determining the velocity) with the SLP and/or on its own on an ongoing – including one time event - basis.

One or more Target SETs which are capable of executing a positioning procedure (aimed at determining the velocity) with the SLP and/or on their own on an ongoing – including one time event - basis.

An SLP which may collaborate with the Requesting SET and the Target SETs to calculate on an ongoing – including one time event - basis the velocity of the Target SETs and the Requesting SET and/or provide assistance to the Target SETs and the Requesting SET on an ongoing – including one time event - basis. The SLP may also be involved in sharing the velocity of the Target SETs with the Requesting SET and the velocity of the Requesting SET with the Target SETs on an ongoing – including one time event - basis.

Actor Specific Issues:

The SUPL Agent in the Requesting SET defines the Target SETs' identity.

The Target SETs may directly or indirectly (i.e., by way of the SLP) share their velocities with the Requesting SET on an ongoing – including one time event - basis.

The Requesting SET may directly or indirectly (i.e., by way of the SLP) share its velocity with the Target SETs on an ongoing – including one time event - basis.

Notification and verification may need to be applied for privacy reasons (i.e., to obtain explicit or implicit consent from the Target SETs for the SET to SET Velocity session).

Mechanisms to initiate, terminate and pause/resume a SET to SET Velocity session are provided by the SUPL elements (i.e., the SLP, the Requesting SET and the Target SETs). In particular, Target SETs may cancel an ongoing SET to SET Velocity session individually (i.e., without terminating the entire session).

Normal Flow:

(1) The SUPL Agent residing in the Requesting SET requests SET to SET Velocity Service from the SLP for one or more Target SETs. The SUPL Agent specifies the Target SETs' identities and the parameters of the SET to SET Velocity session (e.g., relative or absolute velocity, start time and stop time of the session, number of fixes, interval between fixes, etc.).

(2) The SLP initiates a SET to SET Velocity session with the Target SETs.

(3) SLP and Target SETs may collaborate to determine the velocity of the Target SETs. If needed, SLP and Requesting SET may collaborate to determine the velocity of the Requesting SET.

(4) The velocities of the Target SETs are shared with the Requesting SET either directly or indirectly (i.e., by way of the SLP).

(5) The Requesting SET shares the result of the SET to SET Velocity session with the SUPL Agent residing in the Requesting SET.

Alternative Flow:

If the SUPL Agent requests that the SET to SET Velocity session be terminated, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If the SLP requests to terminate the SET to SET Velocity session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If Target SET and/or Requesting SET request to terminate the SET to SET Velocity session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If SLP, Target SET or Requesting SET request to pause the SET to SET Velocity session, the session will be paused (i.e., procedures to pause the session will be executed and no position determination will occur until the session is resumed by the suspending actor).

B.5.2 Market benefits

The SUPL Agent which resides in the Requesting SET receives absolute and/or relative velocity of one or more Target SETs through a single service request instead of issuing multiple individual requests for the velocity of the Target SETs and the Requesting SET and evaluating the results. This significantly improves the signaling between SUPL elements and reduces the number of location (velocity) requests.

B.6 Location Request – SET to SET Location

B.6.1 Short Description

The SET to SET Location Service enables a SET to obtain the absolute or relative location of one or more Target SETs on an ongoing – including one time event - basis.

Actors:

A client (SUPL Agent) which resides in a SET (the Requesting SET) and which requests the location of one or more Target SETs on an ongoing – including one time event - basis.

A Requesting SET which is capable of executing a positioning procedure with the SLP and/or on its own on an ongoing – including one time event - basis.

One or more Target SETs which are capable of executing a positioning procedure with the SLP and/or on their own on an ongoing – including one time event - basis.

An SLP which may collaborate with the Requesting SET and the Target SETs to calculate on an ongoing – including one time event - basis the location of the Target SETs and the Requesting SET and/or provide assistance to the Target SETs and the Requesting SET on an ongoing – including one time event - basis. The SLP may also be involved in sharing the location of the Target SETs with the Requesting SET and the location of the Requesting SET with the Target SETs on an ongoing – including one time event - basis.

Actor Specific Issues:

The SUPL Agent in the Requesting SET defines the Target SETs' identities.

The Target SETs may directly or indirectly (i.e., by way of the SLP) share their locations with the Requesting SET on an ongoing – including one time event - basis.

The Requesting SET may directly or indirectly (i.e., by way of the SLP) shares its location with the Target SETs on an ongoing – including one time event - basis.

Notification and verification may need to be applied for privacy reasons (i.e., to obtain explicit or implicit consent from the Target SETs for the SET to SET Location session).

Mechanisms to initiate, terminate and pause/resume a SET to SET Location session are provided by the SUPL elements (i.e., the SLP, the Requesting SET and the Target SETs). In particular, Target SETs may cancel an ongoing SET to SET Location session individually (i.e., without terminating the entire session).

Normal Flow:

(1) The SUPL Agent residing in the Requesting SET requests SET to SET Location Service from the SLP for one or more Target SETs. The SUPL Agent specifies the Target SETs' identities and the parameters of the SET to SET Location session (e.g., relative or absolute position, start time and stop time of the session, number of fixes, interval between fixes, etc.).

(2) The SLP initiates a SET to SET Location session with the Target SETs.

(3) SLP and Target SETs may collaborate to determine the position of the Target SETs. If needed, SLP and Requesting SET collaborate to determine the position of the Requesting SET.

(4) The positions of the Target SETs are shared with the Requesting SET either directly or indirectly (i.e., by way of the SLP).

(5) The Requesting SET shares the result of the SET to SET Location session with the SUPL Agent residing in the Requesting SET.

Alternative Flow:

If the SUPL Agent requests that the SET to SET Location session be terminated, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If the SLP requests to terminate the SET to SET Location session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If Target SET and/or Requesting SET request to terminate the SET to SET Location session, the session will be terminated (i.e., termination procedures between SUPL elements will be executed).

If SLP, Target SET or Requesting SET request to pause the SET to SET Location session, the session will be paused (i.e., procedures to pause the session will be executed and no position determination will occur until the session is resumed by the suspending actor).

B.6.2 Market benefits

The SUPL Agent which resides in the Requesting SET receives absolute and/or relative location of one or more Target SETs through a single service request instead of issuing multiple individual requests for the Location of the Target SETs and the Requesting SET and evaluating the results. This significantly improves the signaling between SUPL elements and reduces the number of location requests.

B.7 Notification on the assistance data change

B.7.1 Short Description

GNSS assistance data typically have a well-defined lifetime and update rate. For instance, the short-term satellite orbit models in the GNSS satellite broadcasts typically span a few hours. As an example, in the case of GPS NAV broadcast the fit interval is typically 4 hours. The data expires at a given time and the SET can retrieve a new set of assistance data at that time.

However, some GNSS assistance data types have unpredictable life times and update rates. These volatile data also often contribute to the high positioning performance in terms of time-to-first-fix and accuracy. Examples of such data include long-term satellite navigation models that may become invalid due to the satellite being manoeuvred. Another example is an ionosphere model that may become invalid or inadequate to describe ionosphere due to a magnetic storm.

Assuming that the SET supports such volatile assistance data types and the SET wishes to always have data that it can use and rely on, it is preferable that the SET receives notifications that the data has changed somehow. Examples of such changes include the data becoming completely or partially invalid. Another type of change is that the SLP obtains updated (e.g., more accurate) data, but the old version the SET has is, however, still valid.

Having received the notification, the SET may decide whether to retrieve the changed data from the SLP or not. The SET might decide not to retrieve the changed data, for example, in the conditions that the SET has moved out of the geographical applicability area of the data of which change notification the SET received. Another example on such conditions is that in some cases it may be sufficient for the SET to simply know that the data it has is invalid and, hence, the SET does not need to retrieve the updated data.

The feature will be optional.

B.7.2 Market benefits

Supporting such a notification mechanism contributes to the SET always having the up-to-date and valid set of assistance data. The arrangement improves time-to-first-fix and integrity of the positioning.

Benefits also include savings in the SET and SLP resources due to the SET not needing to poll for the data changes.