PertSol®
Simple Solutions for Complex World

iSMLC

Enabling TSP's To Fully Utilize The Hidden Potential Of Location Service.

PertSol®

Simple Solutions for Complex World

PertSol is a leading Telecom and IT solution provider for Telecom/ Internet Service Providers, Government and Law Enforcement Agencies providing explicit offering of capabilities starting with specialized solutions, customized software applications, professional and project management services with dedicated cross functional agile teams.

Our solutions have been shaped by our deep domain knowledge, built by harnessing our strength in next generation technologies across Telecom Regulatory Compliance Management, Telecom Core Network, Emergency Response System, Big Data Analytics & Internet of Things (IoT). Backed by our superior delivery experience with a key focus on quality.

9+ YEARS OF OPERATIONS

60+ R&D EXPERTS

25+ FUTURE READY SOLUTIONS

60+ PROJECTS DELIVERED

65+ HAPPY CLIENTS

23+ LOCATIONS WORLDWIDE

LOCATION BASED SERVICES

Introduction

Location Services provide information about the geographical coordinates of subscribers that enables the system to collect and share the information connected with UEs to support location services. Accurate location-based services (LBS) is the basic need for many public & business operations such as disaster management, emergency services, lawful interception and various value-added services to fulfill the market needs.

To mange location requests and share their respective location response to authorised LCS clients as well as VAS applications, operators would require a location based system which comprises of two LCS nodes i.e.

- ✓ GATEWAY MOBILE LOCATION CENTRE (GMLC)
- ✓ SERVING MOBILE LOCATION CENTRE (SMLC)

Whenever a GMLC receives a request to share the for location of the geographic coordinates of a mobile user from an authorised LCS client, the approximate location of the user is gathered by SMLC. The geographic location in terms of geo-coordinates (latitude and longitude) is reported back to GMLC via MSC.

iSMLC (INTELLIGENT SERVING MOBILE LOCATION CENTRE)

Overview

PertSol iSMLC is part of PertSol iLcoator product suite which caters CSP's location service requirements. iSMLC manages the overall coordination and scheduling of resources required for the accessing of the location of a UE (User Equipment) that is attached to RAN.

It calculates the final location of the subscribers along with their velocity estimates and also determines the degree of uncertainty/error in the final location. iSMLC supports both UE based and Network Based positioning methods. It interacts with both UEs as well as BSC/RNC/MME to retrieve location information as required by UE, LCS client or Network Based positioning methods respectively.

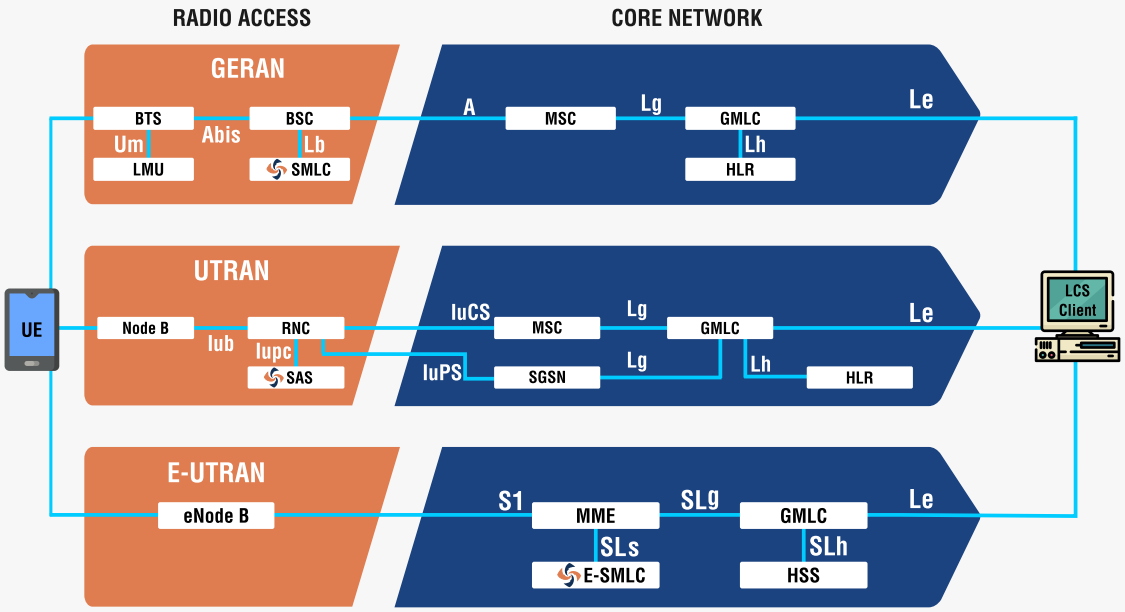
iSMLC either receives the location request from the UE, LCS client **(in the case of mobile-initiated location requests)** or relays the location requests to the UE **(in the case of network-initiated location requests).**

iSMLC along with iGMLC can fulfil complete location service requirement of an operator across all technologies.

Depending upon the RAN technology of the operator, iSMLC can be used as :

- **SMLC**
  For GSM network
- **Evolved SMLC (E-SMLC)**
  For LTE network
- **Standalone SMLC (SAS)**
  For UMTS network

SMLC Architecture



For GSM and UMTS network, iSMLC resides in RAN (GERAN and UTRAN) and integrates with BSC and RNC/SGSN over Lb interface Iu interface respectively. The communication with the BSC or RNC is done through PCAP for tunneling RRLP (Radio Resource LCS Protocol) messages. Results are sent back via RANAP between the RNC and MSC/SGSN or BSSAP between the BSC and the MSC/SGSN.

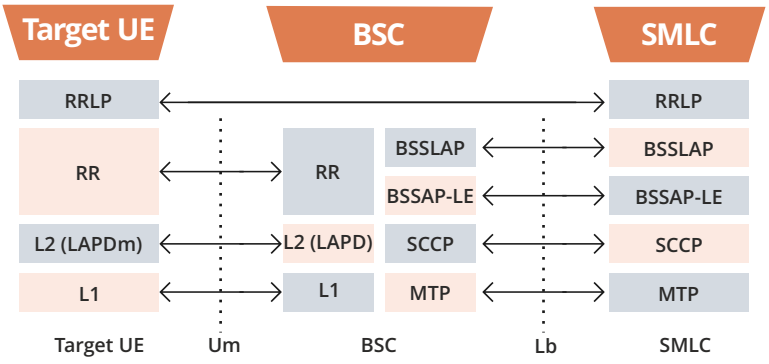
Whereas for LTE network, iSMLC is attached to E-UTRAN and integrated with MME over SLs interface. The SLs interface is used to transmit LCS-AP messages and parameters between the MME and E-SMLC.

SMLC Interfaces

LBS Node	Interface	To (Other Node)	Protocol	Standard Ref.
SMLC	Lb	BSC	BSS-MAP-LE	3GPP TS 23.271 3GPP TS 29.002 3GPP TS 48.071 3GPP TS 49.031
SAS	Iupc	RNC	PCAP	3GPP TS 25.453
E-SMLC	SLs	MME	LCSAP	3GPP TS 29.171 3GPP TS 36.355

Signalling Protocol

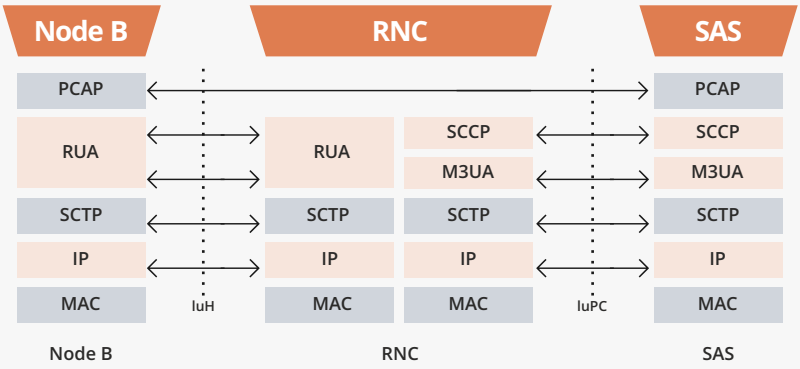
For transmitting location information & paramters between LCS, UE and other network devices many signaling protocols are used depending upon the wireless communication technology being used & the bearer (either Control Plane or User Plane) that is being used to tramit location data. The different signalling protocols used by iSMLC to convey message to other LCS capable components are described below:



SMLC Signalling stack for GSM Network

For GSM network, iSMLC supports Lb interface with BSSMAP-LE PERFORM LOCATION service primarily over Ss7-SCCP protocol.

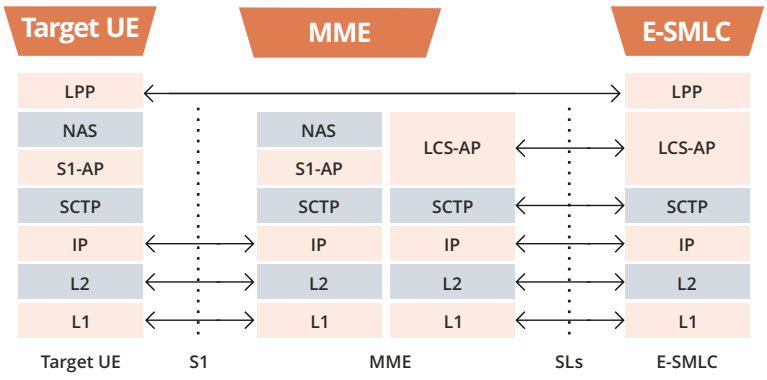
An extension of BSSAP signalling is BSSAP-LE which carries location messages and parameters over M3UA/ SCTP and SCCP on Lb interface.



SMLC Signalling stack for UMTS network

For UMTS network, iSMLC suppots PCAP (Positioning Calculation Application Part) protocol which is a functional part of SCCP. PCAP handles the messaging between RNC and SAS. PCAP helps tranmit location messages and parameters over M3UA/SCTP and SCCP on IuPC interface.

For LTE network, iSMLC supports LCS Application Protocol (LCS-AP) which supports the location services over SCTP in E-UTRAN. The SLs interface conveys the LCS-AP messages and parameters between the MME and iSMLC (E-SMLC). LCS-AP is also used for tunnelling LTE Positioning Protocols.



SMLC Signalling stack for LTE Network

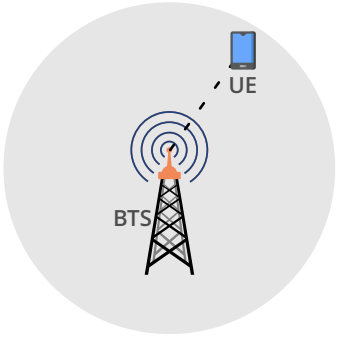
The Location Positioning Protocol (LPP) has been introduced in LTE for the exchange of information during an LBS session between the UE and the LCS. It is a point to point protocol between the UE and the E-SMLC. LPPa is an extension of LPP which is used only for control plane procedures between e-NodeB and E-SMLC.

CONTROL PLANE

Positioning Methods

iSMLC is capable of performing control plane and user plane localization methods. iSMLC selects the methods to be used for getting location information depending upon the location request requirement defined by the LCS clients or the capability of the network like the number of available LMUs, cell size & other paramteres.

2G	3G	4G
Cell ID	Enhanced Cell ID (CI + Round Trip Time)	Enhanced Cell ID (CI + Round Trip Time)
Enhanced Cell ID (CI + Timing Advance)	OTDOA	OTDOA or UTDOA
E-OTD	A-GPS	A-GPS



Cell ID

Cell ID is the most rudimentary method of identifying location of the subscribers. Cell Identity (Cell-ID) localization method returns the geo-coordinates of the serving sector as the location estimate of the subscriber.

It is dependent upon the cell radius & the angle of coverage (if available). Its accuracy can vary from few hundred meters to few Kilometers depending upon the size of the cell.

Enhanced Cell ID (CI+TA)

This positioning method is an enhancement of Cell-ID method and is used in GSM network. This method uses Timing Advance parameter which restrict the location of subscriber by pointing the subscriber within a 550 meter wide angular ring.

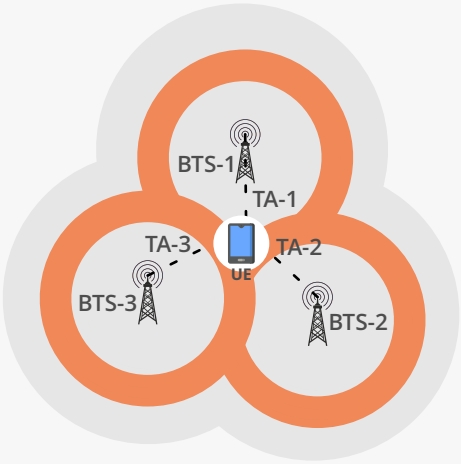
The accuracy of this method will decrease as the device moves farther away from the serving cell.

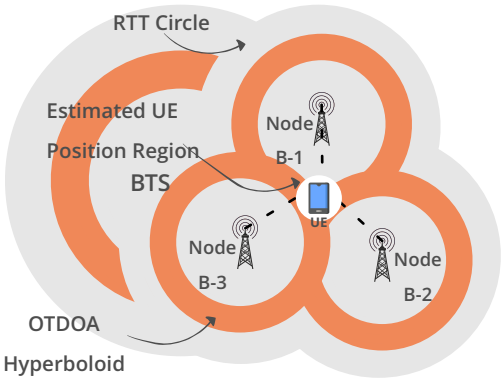
In UMTS & LTE network Round Trip Time (RTT) parameter is used which corresponds to Timing Advance in GSM. Cell Identitiy with RTT achieves a much higher precision in UMTS than in GSM networks, due to its much higher bandwidth. This improves the spatial resolution of RTT values due to which the system is able to reduce the confidence region and generate location coordinates with higher positioning accuracy.

E-OTD

It is a hyperbolic multilateration positioning method. It relies on the time difference of arrival (TDOA) measurements to estimate the location of the target subscriber/UE.

There is a TDOA measurement for each pair of reference nodes, yielding a hyperbolic line-of-position, with multiple reference stations as focuses. The accuracy of this method depends upon the number of reference nodes.





OTDOA

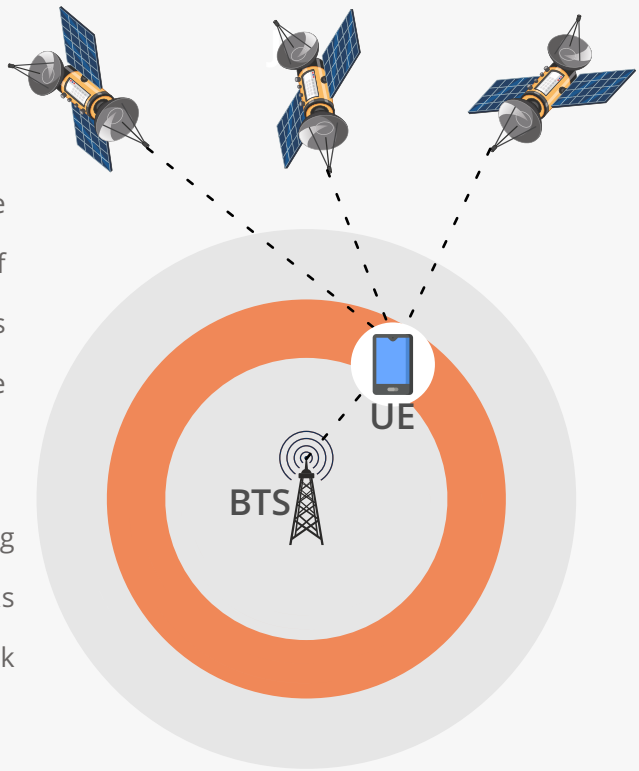
It is a multilateration based positioning method. In this method the User Equipment (UE) measures the time of arrival (TOA) of signals received from multiple base stations.

The TOAs from several neighbouring base stations are subtracted from a TOA of a reference base station to form Observed Time Difference of Arrival.

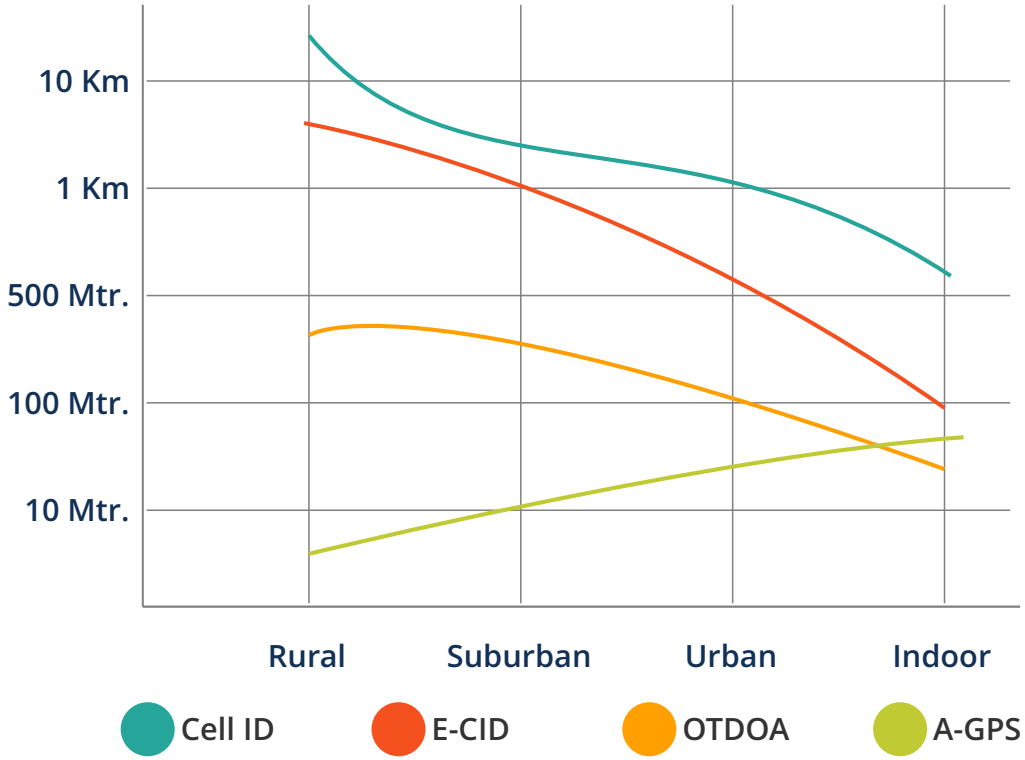
A-GPS

Assited GPS (A-GPS) – It is an enhancement of standalone GNSS/GPS. It provides the most accurate location information of a UE with an approximate range of 10 meters. This methods depends upon the radio signals sent by satellite to user's mobile device.

The cellular network assists the GPS receiver by providing assistance data for the visible satellites. This method works best when used outdoors as it need a good view of sky to work properly.



Positioning Methodology Accuracy

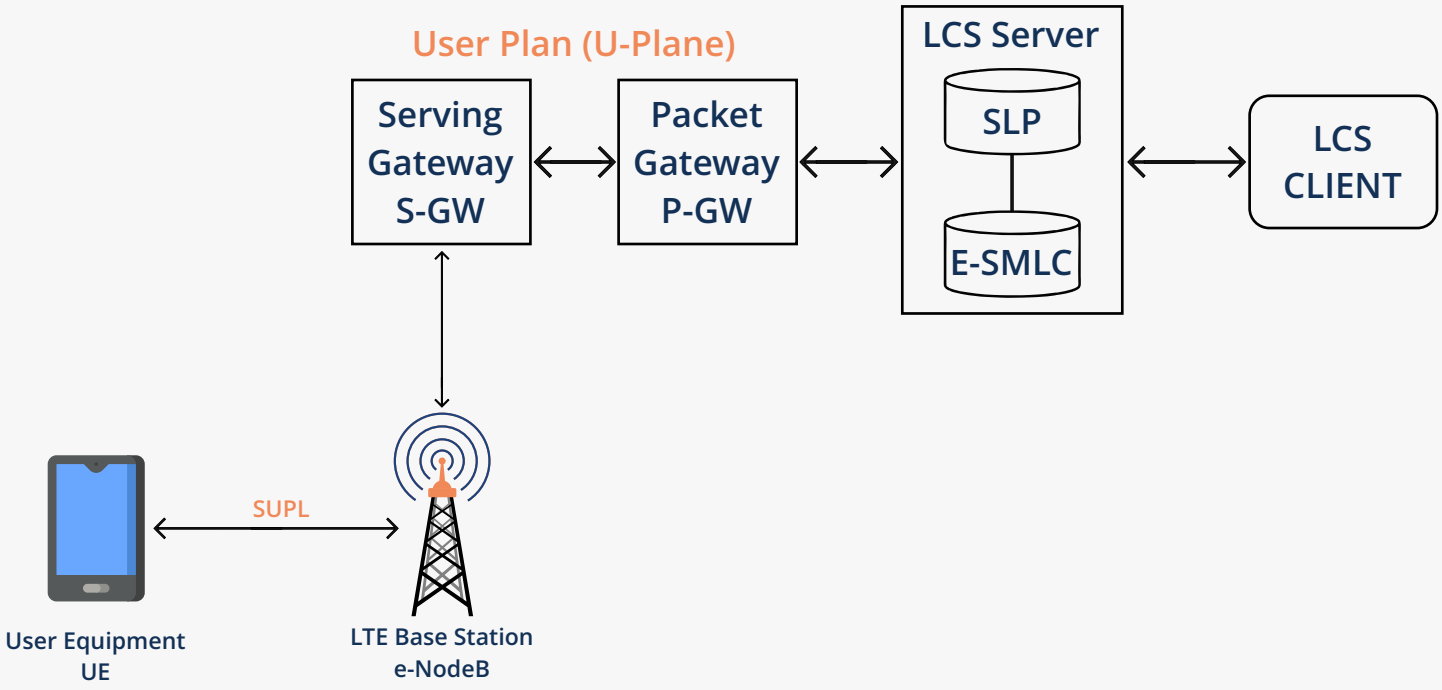


USER PLANE

Positioning Methods

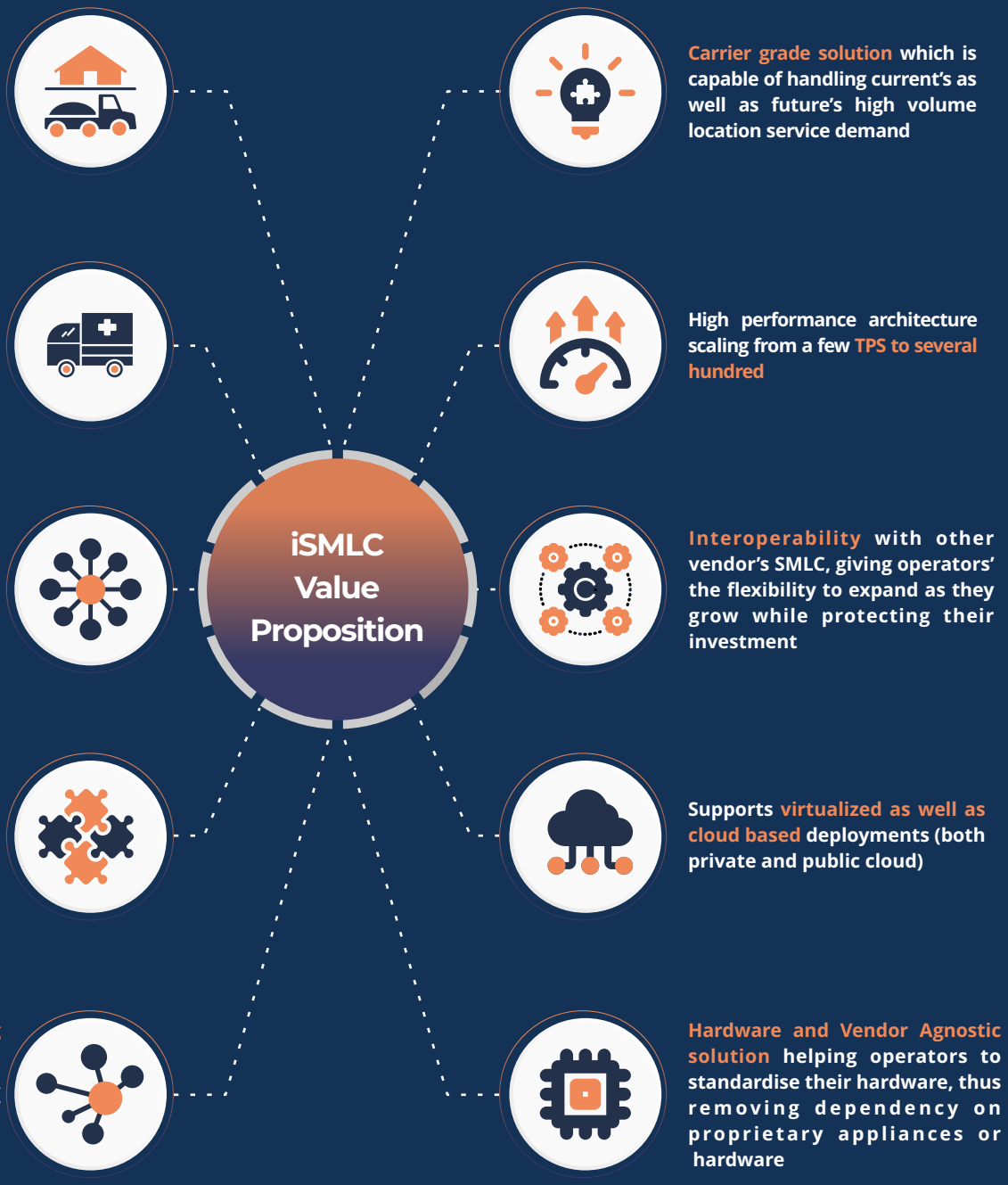
PertSol iSMLC also supports user plane positioning method which uses data link to tranmit positioning information and is enabled by the SUPL protocol. Secure User Plane Location (SUPL) – SUPL is an encrypted IP technology which transfers location data into IP datagrams using end-user application. It is bearer agnostic and can be applied to multiple wireless standards including LTE.

iSMLC supports the latest OMA standard for user plane location i.e. SUPL2.0. It provides the most accurate and cost effective deployment of location based services. It does not involve SS7 or SIGTRAN integration, instead defines protocols to transmit the messages defined as per the existing wireless standards for various mobile networks, like 2G, 3G, LTE as well as 5G, over data link.



iSMLC

Value Proposition



Delivers **highest degree of accuracy** for identifying location across all environments ranging from densely populated urban areas to uninhabited rural areas

Support for Emergency Services **(E 112, NS 911)**

Easy to deploy with flexibility of accommodating broad range of technologies and network

iSMLC supports integration with network elements (like **BSC/RNC/MME**) of all the major NEPs like Nokia, Ericsson, Alcatel, Huawei, ZTE and others

Support of **different positioning** techniques based on Cell Id, TA (Timing Advance), NMR (Network Measurements), RTT (Round Trip Time), E-OTD, OTDOA & others

Carrier grade solution which is capable of handling current's as well as future's high volume location service demand

High performance architecture scaling from a few **TPS to several hundred**

Interoperability with other vendor's SMLC, giving operators' the flexibility to expand as they grow while protecting their investment

Supports **virtualized as well as cloud based** deployments (both private and public cloud)

Hardware and Vendor Agnostic solution helping operators to standardise their hardware, thus removing dependency on proprietary appliances or hardware

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Reach us at

INDIA

Corporate Office:
720 Midas Sahar Plaza, J.B. Nagar,
Andheri East, Mumbai 400059,
Maharashtra, India

+91 224 023 5503

Sales Office:
Unit No: 05-012, 5th Floor, Tower-B,
Emaar Digital Greens, Sector-61,
Gurugram-122011, Haryana, India

+91 124 427 3777

USA

Sales Office:
6379 Clark Ave.
Suite 260 Dublin CA 94568,
USA

contact@pertsol.com

www.pertsol.com