

- ▶ End-to-End LBS Platform
- ▶ Highly Scalable and Reliable to Support Various Types of LBS Apps
- ▶ Unified Solution Covering Different Operators' Network Environment
- ▶ Highly Customizable Single Point Gateway for the Services Required in LBS Ecosystem
- ▶ Proprietary LBS Solutions for Wireless Operators and LBS Service Providers



Due to the increasing development of wireless networks and rapid growth mobile communication market, more and more users are willing to use their mobile phones at any location to access the internet, perform financial transactions, etc.

In this regard, new applications and services are offered to mobile users. A new set of these services are called location-based which are, according to the user's current location, capable of providing relevant services.

In recent years, due to the high demand for determining the exact location of users for such services, this area has attracted many researchers in the fields of wireless communications.

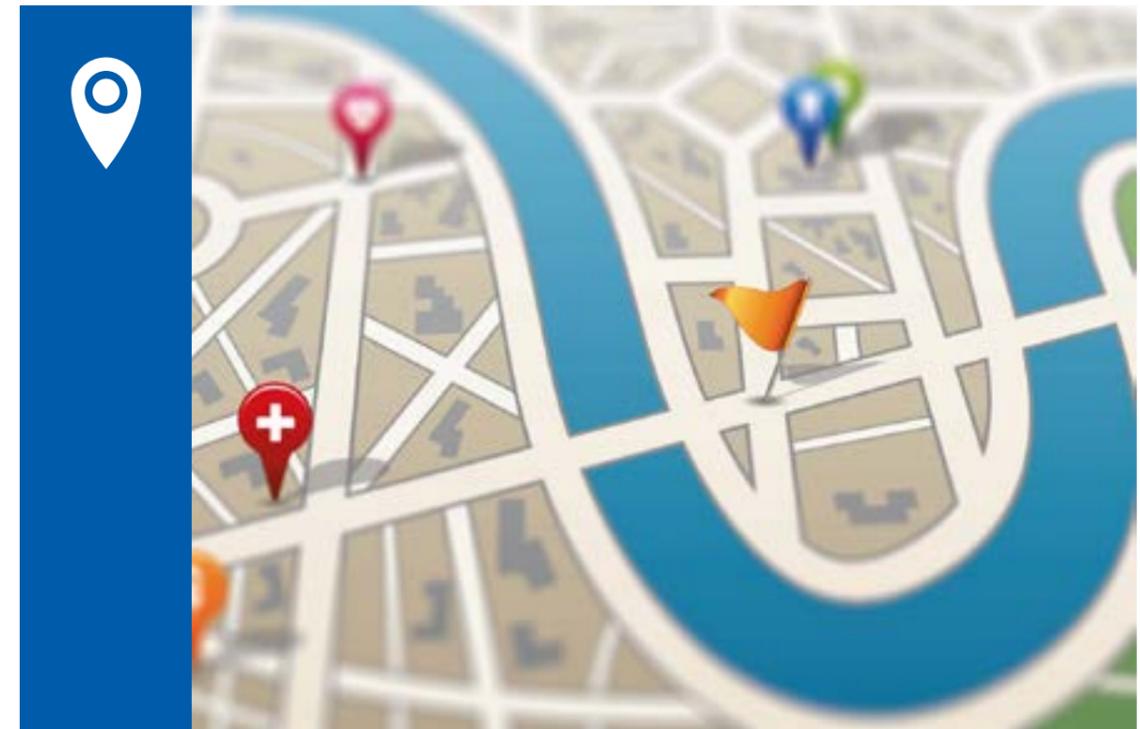
**PeykAsa LBS** (Location Based Services) platform as a location information aggregator enables mobile operators and application developers to take the advantages of the LBS market.

**PeykAsa LBS** platform consists of multiple solutions for various

applications and is compatible with different mobile network infrastructures.

**Our solutions can be categorized under the main categories listed below:**

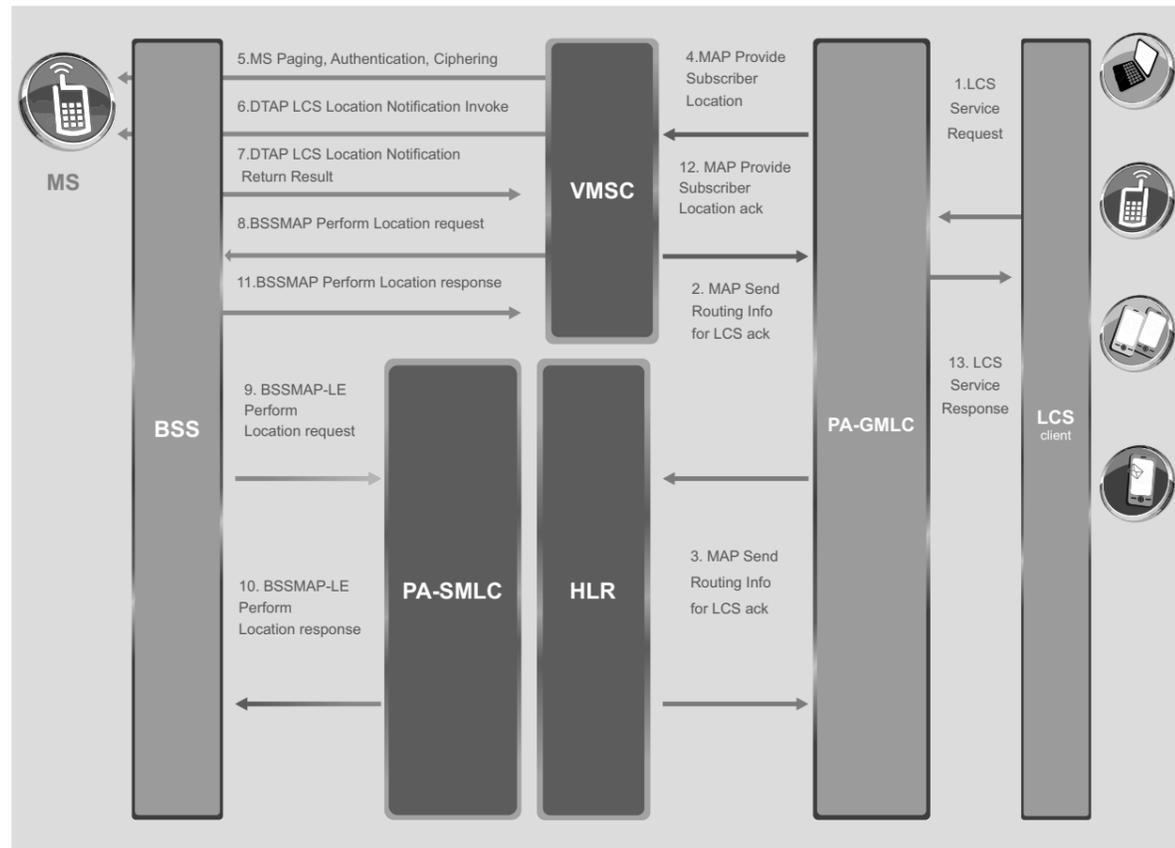
- 1- Serving Mobile Location Center (SMLC) and Gateway Mobile Location Center (GMLC) Based Solution
- 2- Probe-Based Solution
- 3- CAMEL-Based Solution



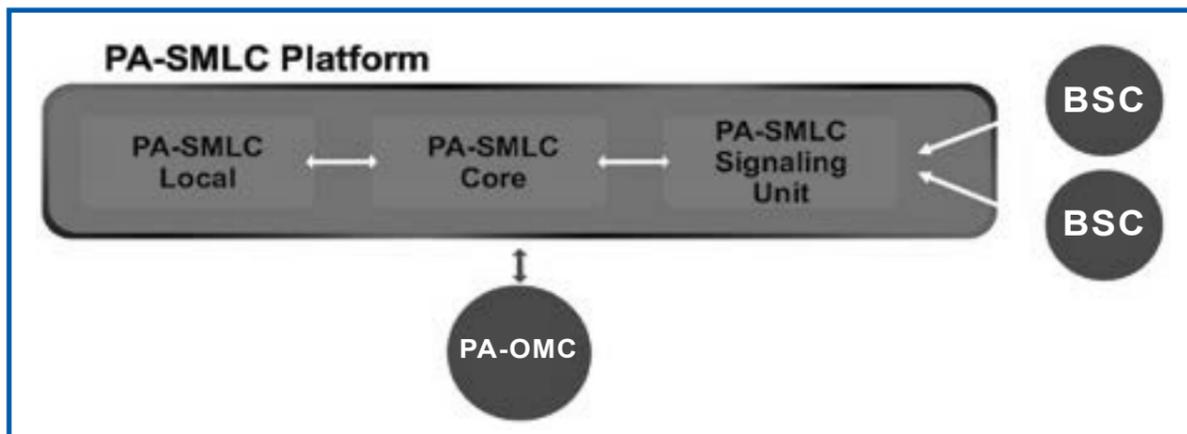
## S/GMLC-Based Solution

PeykAsa Serving Mobile Location Center (SMLC) and Gateway Mobile Location Center (GMLC) are two proprietary nodes that are used to receive the information required for determining the location of UE and to manage the authentication of the LCS client applications that want to access location data and enable operators to handle the location information of their subscribers without further investment in network equipment.

The detailed architecture and packet flow sequence of **PeykAsa LBS** platform based on S/GMLC is shown below:



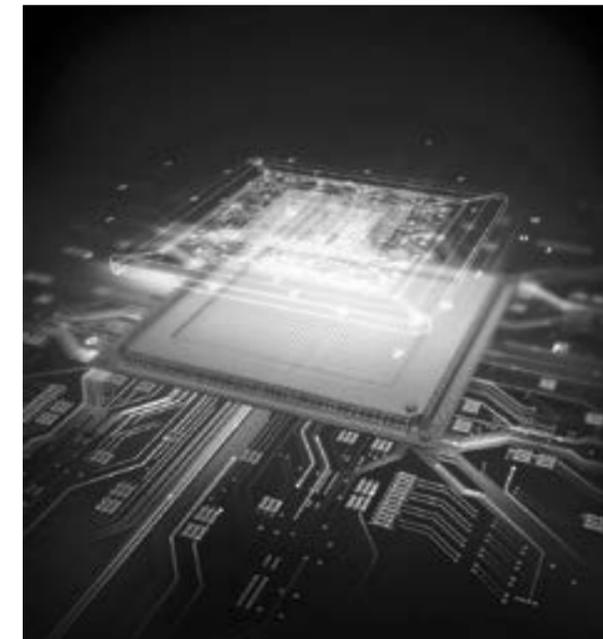
PeykAsa LBS platform consists of two nodes: PA-GMLC and PA-SMLC; each of them includes different components.



## PA-SMLC Signaling Unit Component

This component handles all of the communications of SMLC with SS7 network. It supports different protocols of the SS7 interface including LSL signaling links, HSL signaling links, and SIGTRAN protocol stack as well.

In case where LSL and HSL links are used, a special hardware should be installed on this unit which handles the TDM communications on E1 interfaces. On the application layer of the SS7 protocol stack, regardless of the lower layer (SS7 stack or SIGTRAN stack) there is the BSSMA layer that supports all of the required services for communicating with BSCs.

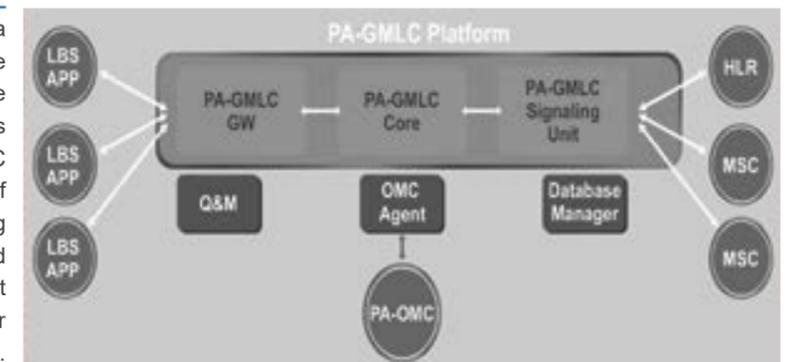


## PA-SMLC Core

This component is the central part of the SMLC node. It is responsible for conducting all of the other components of the system. This includes receiving the requests from the outside world via the signaling unit, asking the location calculation unit to calculate the location using the received data, sending the results back to the requester, supporting management scenarios via communicating with the OMC agent component and many other activities.

## PA-SMLC Local

This component takes the raw data from the SMLC core, calculates the location information and sends the result back to the SMLC core. It's the most important part of the SMLC system, that calculates the location of subscribers. In the case of switching from one location calculation method to the other, only this component should be changed and all of the other components can remain unchanged.



## PA-GMLC GW

The Gateway component is the interface unit between the SMLC and location-based applications. It has a Web Service interface (SOAP) for communicating with these applications. Managing client accounts, AAA activities (authenticating, authorizing, accounting), and applying flow control mechanisms are some of the duties of this component.

## PA-GMLC Core

This component is the central part of the GMLC system. It is responsible for conducting all of the other components of the system. This includes receiving the requests from the outside world via the gateway unit, translating the request to the standard scenarios and executing the scenarios by communicating with different PLMN nodes e.g. MSCs and HLRs and finally

sending back the location information to the requesting application.

It's also responsible for supporting management scenarios and handling the requests received from OMC agent, recording CDRs for the requests, performing recovery scenarios and many other features.

## PA-GMLC Signaling Unit

This component handles all of the GMLC communications and interfaces with the SS7 network. It supports different protocols of the SS7 interface including LSL signaling links, HSL signaling links and SIGTRAN protocol stack. In case LSL and HSL links are used, a special hardware should be installed on this unit which handles TDM

communications on the E1 interface.

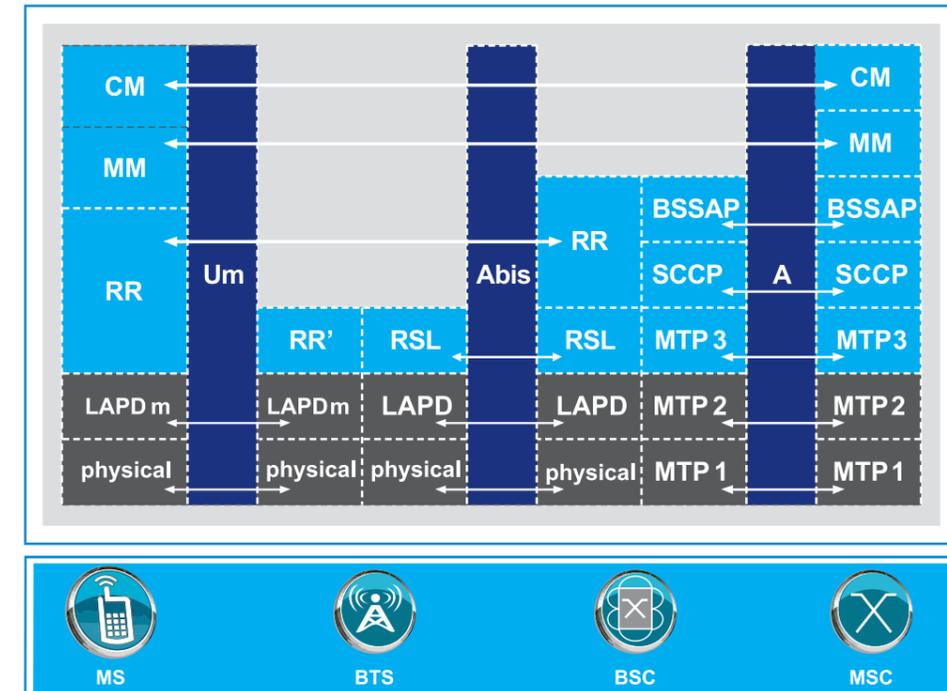
On the application layer of the SS7 protocol stack, regardless of the lower layer being traditional SS7 stack or SIGTRAN stack, there is the GSM MAP layer that supports all of the required services for communicating with MSCs and HLRs.



## Probe-Based Solution

**PeykAsa LBS** utilizes high performance probes to capture various packets in different scenarios.

Abis interface probes capture location information of the UE according to the packets that are specified in "3GPP TS 08.58: BSC-BTS Layer 3 Specification". Our system can calculate the location of the mobile station based on the "CHANNEL ACTIVATION" message which contains Timing Advance, Signal Strength and Cell ID.



In this scenario according to the information, the available identification of the user is TMSI. To satisfy different LCS client's request, which can be based on IMSI or MSISDN, **PeykAsa LBS** take advantage of a method that is mentioned in "ETSI TS platforms 129 002 V11.6.0 (2013-04)". The second probe solution is based on an

interface probes that capture the location information of the UE according to the packets specified in "ETSI TS 148 008 V11.4.0 (2013-04)".

Our system can calculate the location of the mobile station based on the "COMPLETE LAYER 3 INFORMATION" which contains Timing Advance, Signal Strength and Cell ID.

## CAMEL-Based Solution

Customized applications for mobile network enhanced logic (CAMEL) is an enhancement to eliminate the limitations of INAP (Intelligent Network Application Part). Before CAMEL, the GSM networks used INAP for injecting intelligence in GSM networks. Mobility management was major problem of INAP which was not supported by this protocol. CAMEL is a standard add mobility management of subscriber to mobile networks

that enables users to freely roam between different networks even in various countries and receive one bill from home operator. **PeykAsa LBS** platform utilizes CAMEL-Based scenarios (version 3+) and the MAP-Note-MM-Event packet described in 3gpp29.002, to add value-added services to the subscriber mobility management system as a standard for mobile intelligence across different vendor equipments for GSM network.