

LBS(Location Based Service)

마켓 현황과 Solution



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SK C&C

KMIS 춘계학술대회 2004년 6월 18일

Agenda

- LBS Overview

- LBS Market

- SK LBS

- SK MPC

- SK PDE

- SK LBS Platform

- LBS Services

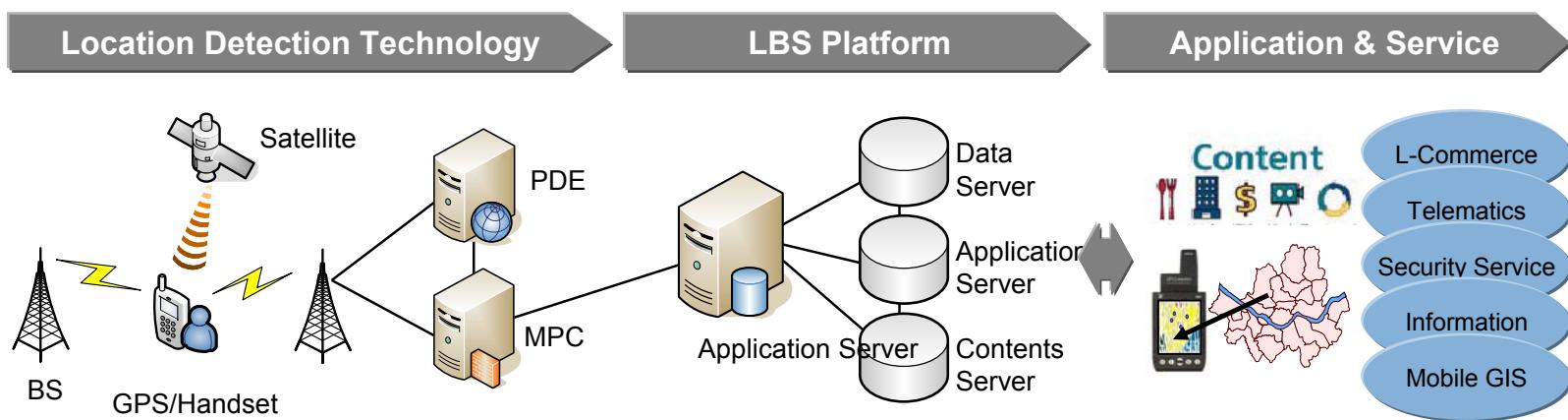
What's LBS?

Definition

- Location Based Service system, one of mobile service solutions, can provide various value-added-services based on determined location. It is the killer application of new 3rd Generation services with multimedia and mobile commerce.

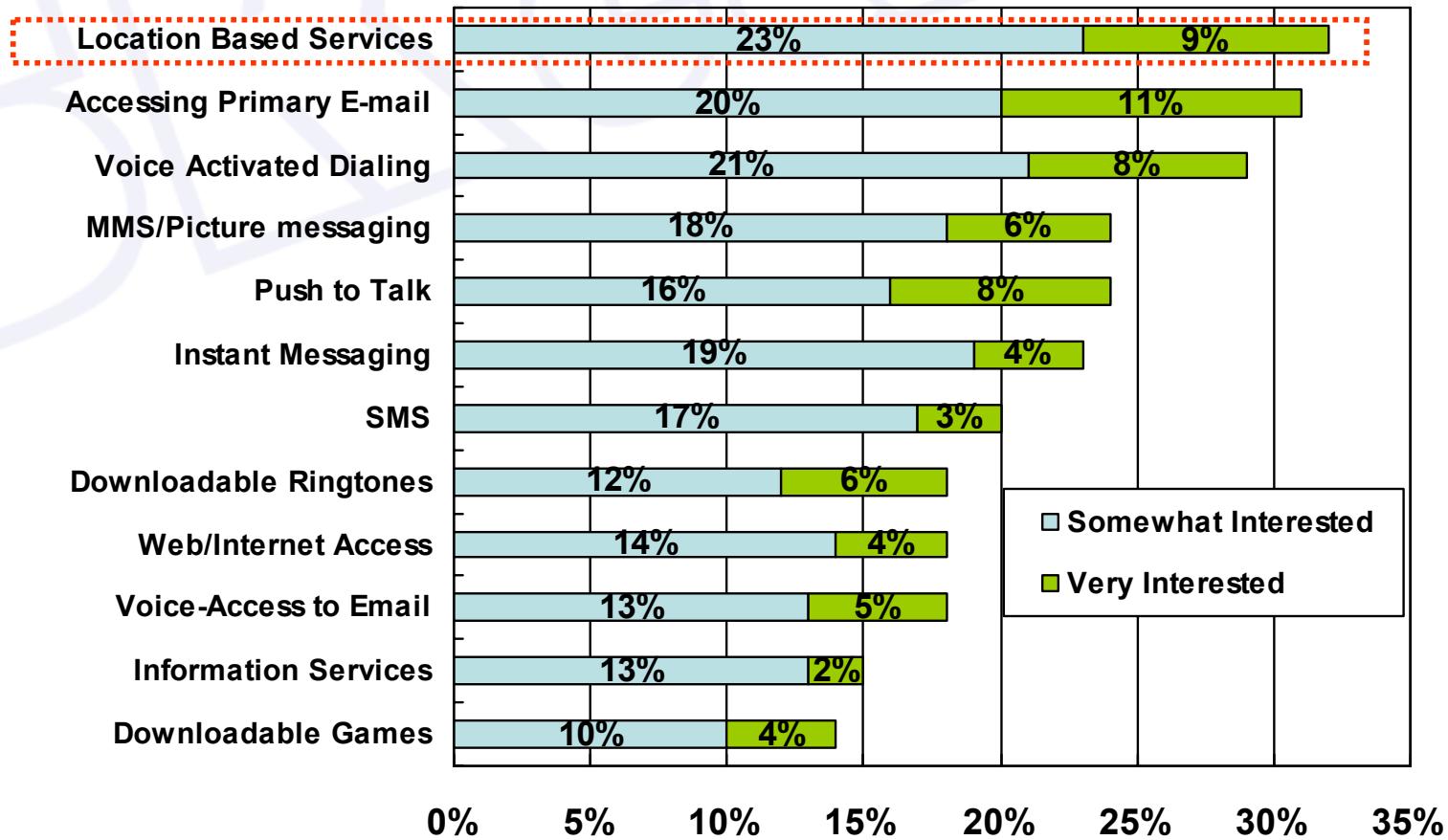
Service Categories

- Enhanced 911(E911) service
- Location Based Billing service
- Fleet Asset Management (FAM) service
- Location Based Information service (LBIS)



Market Overview

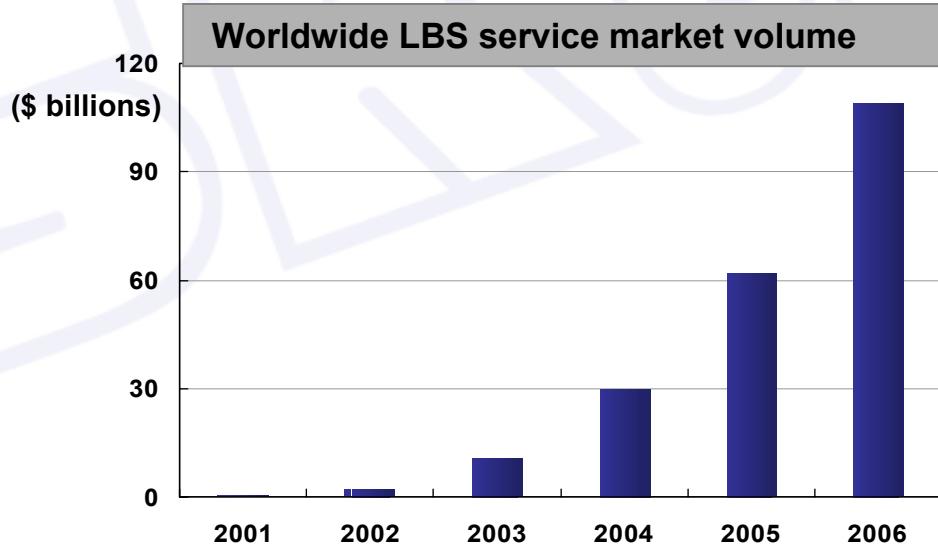
□ Interest-levels in Mobile Service/Feature



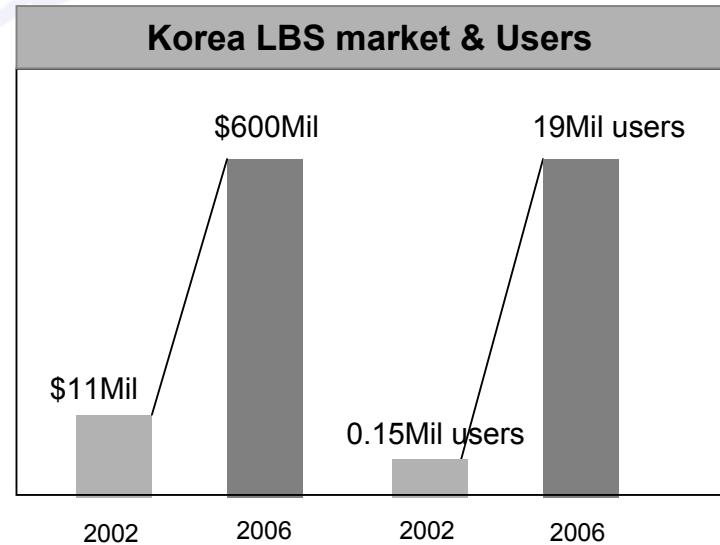
<Source: the Yankee Group's Mobile User Survey, 2003>

Market Overview

□ LBS Service Market Volume



<Source: OVUM report, 2002>

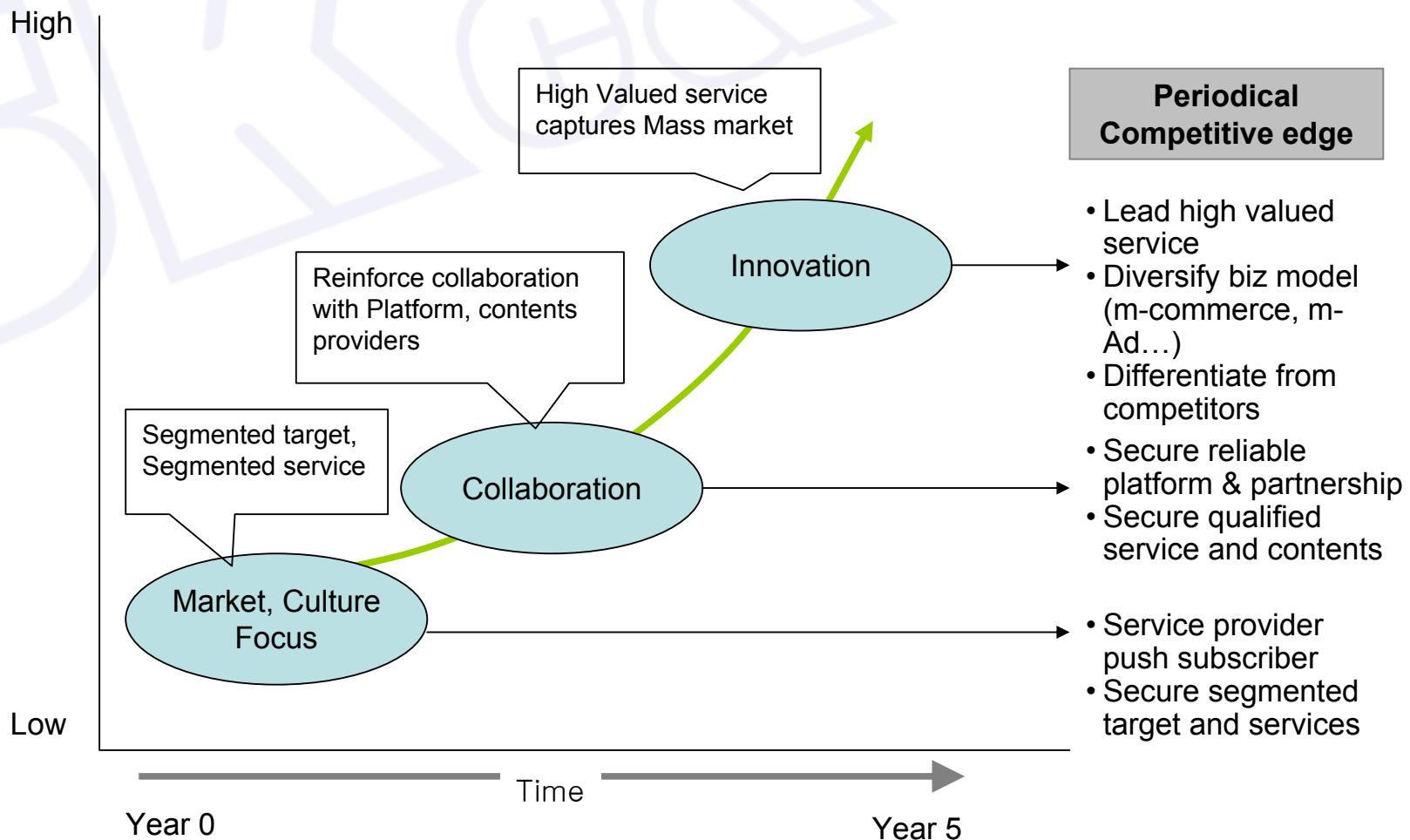


<Source: Softbank Research, 2002>

- Improve ARPU across some portion of the existing customer base,
- Attract new subscribers, as well as bringing existing customers “over to the data side”,
- Penetrate new markets (e.g. verticals, geographies, other market demographics)

Market Overview

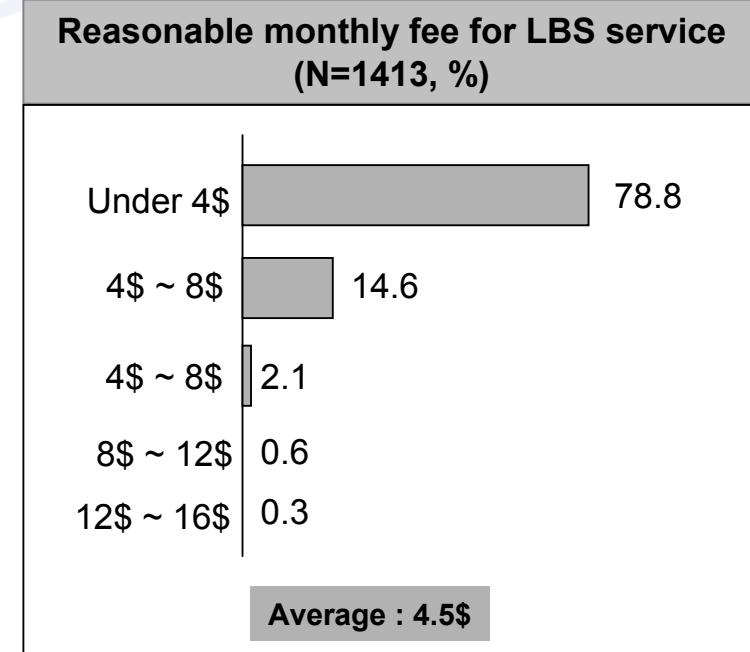
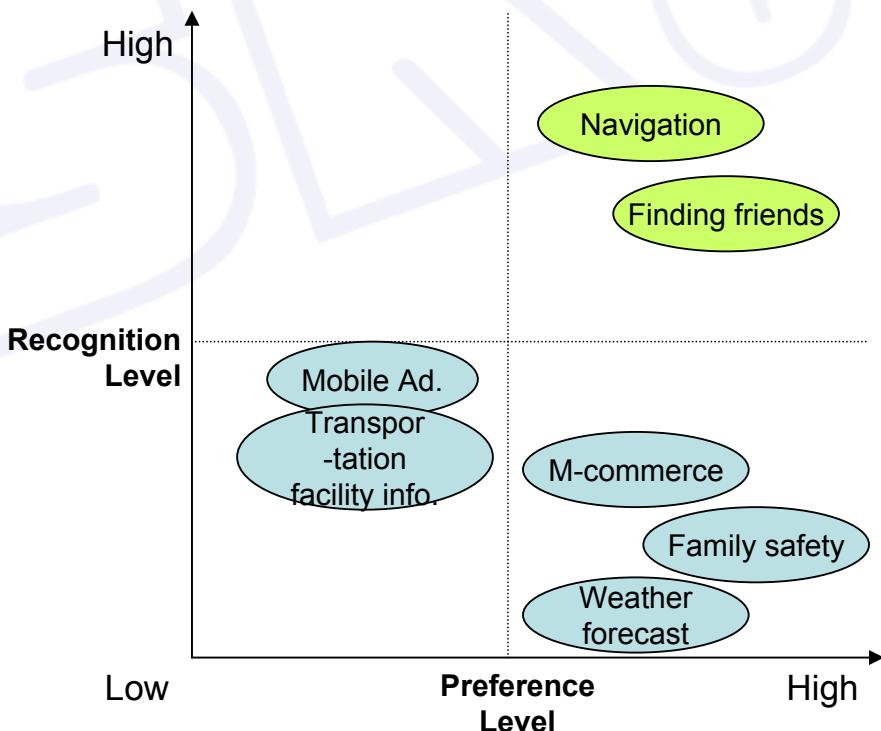
□ LBS Service Trend



<Source: Softbank Research, 2002>

Market Overview

□ Profitability of LBS services (Korea market)



<Source: Softbank Research, 2002>

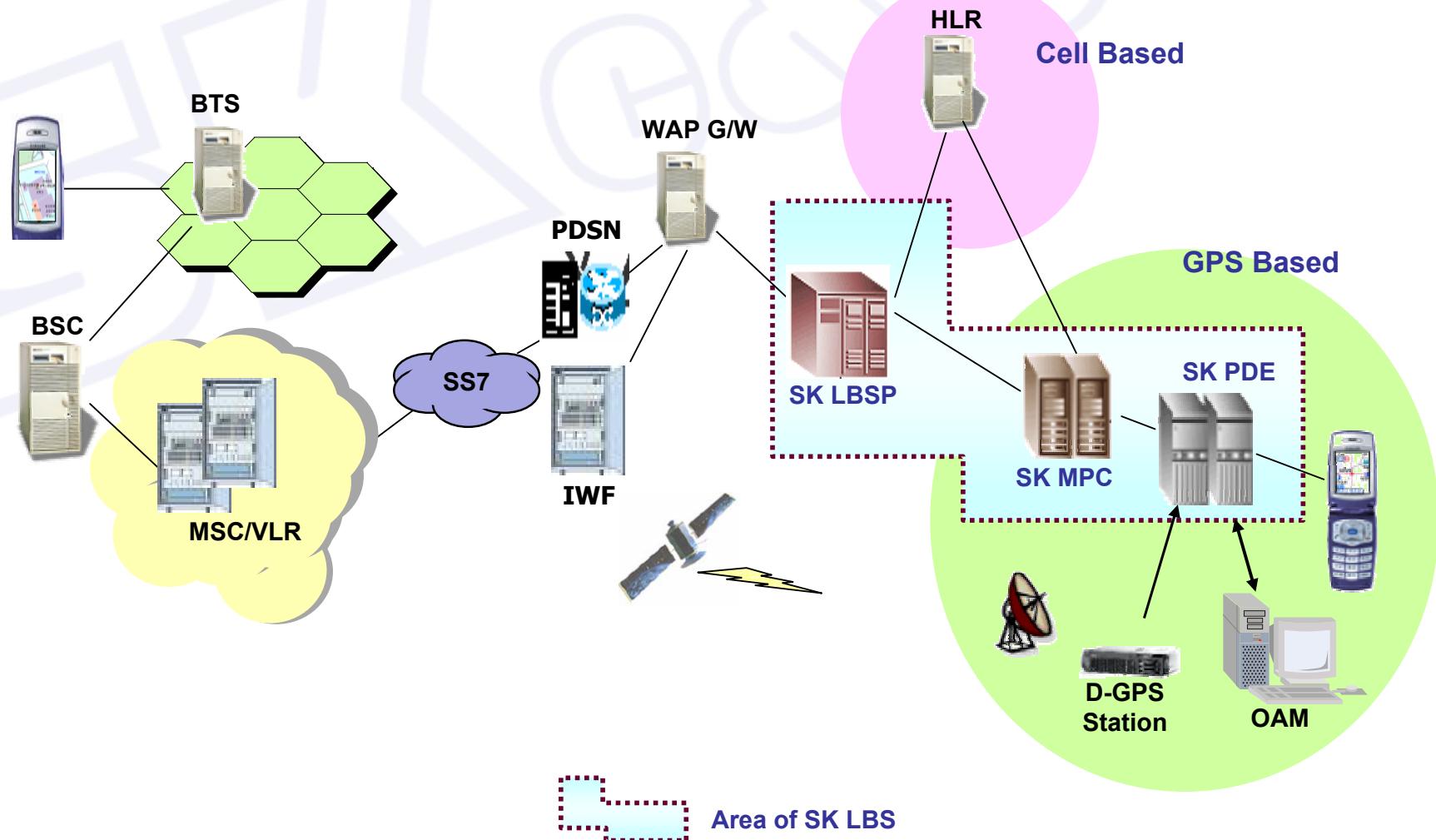
* Yearly revenue of Finding Friends(SKT case, 2002) : 500,000 use x 0.04\$/use x 365 = \$7.4Mil

* Expected LBS service revenue in 2006: 19million users x \$4.5/month x 12 = \$1,026Mil

Why SK for LBS?



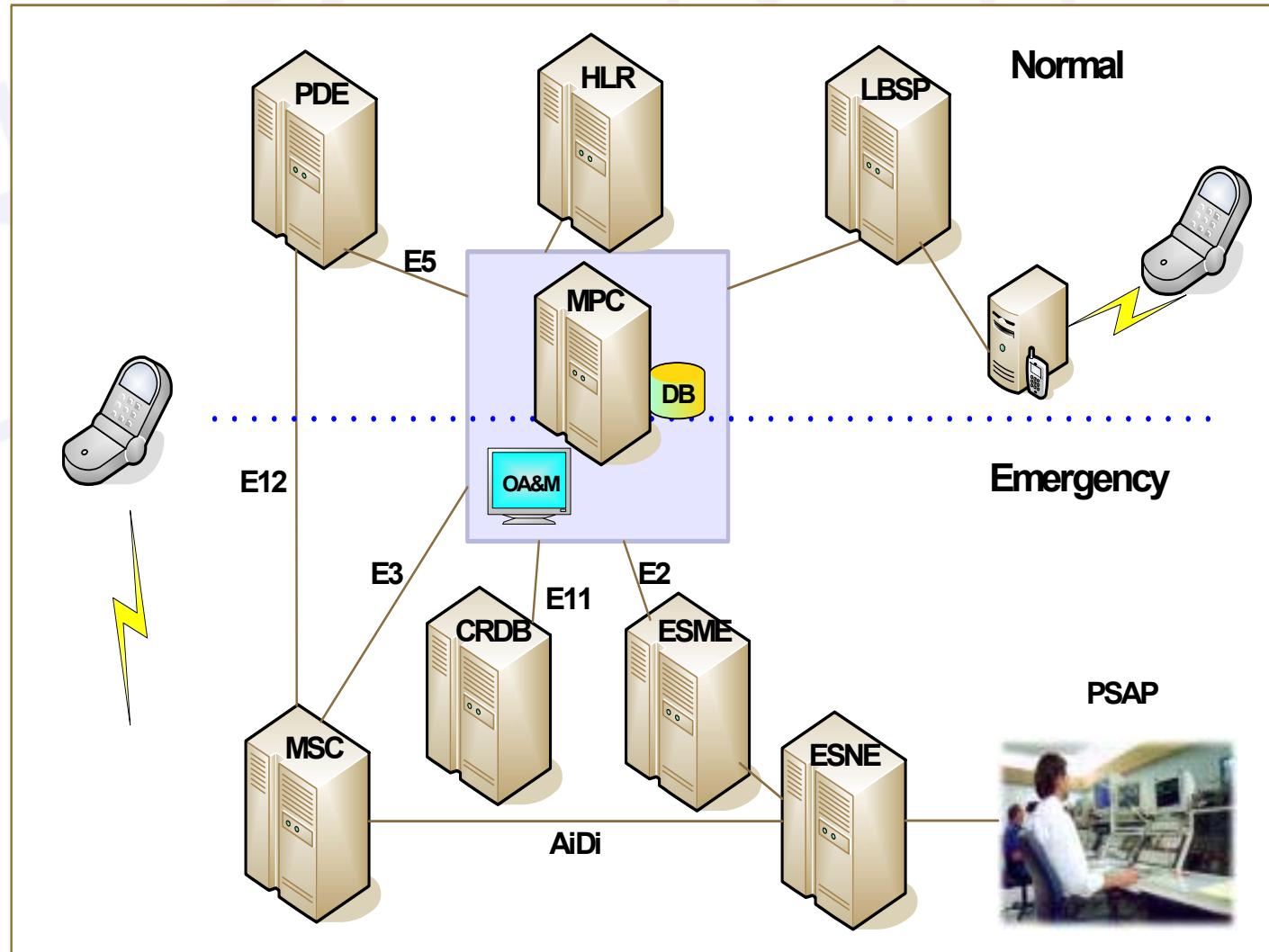
Where is SK LBS



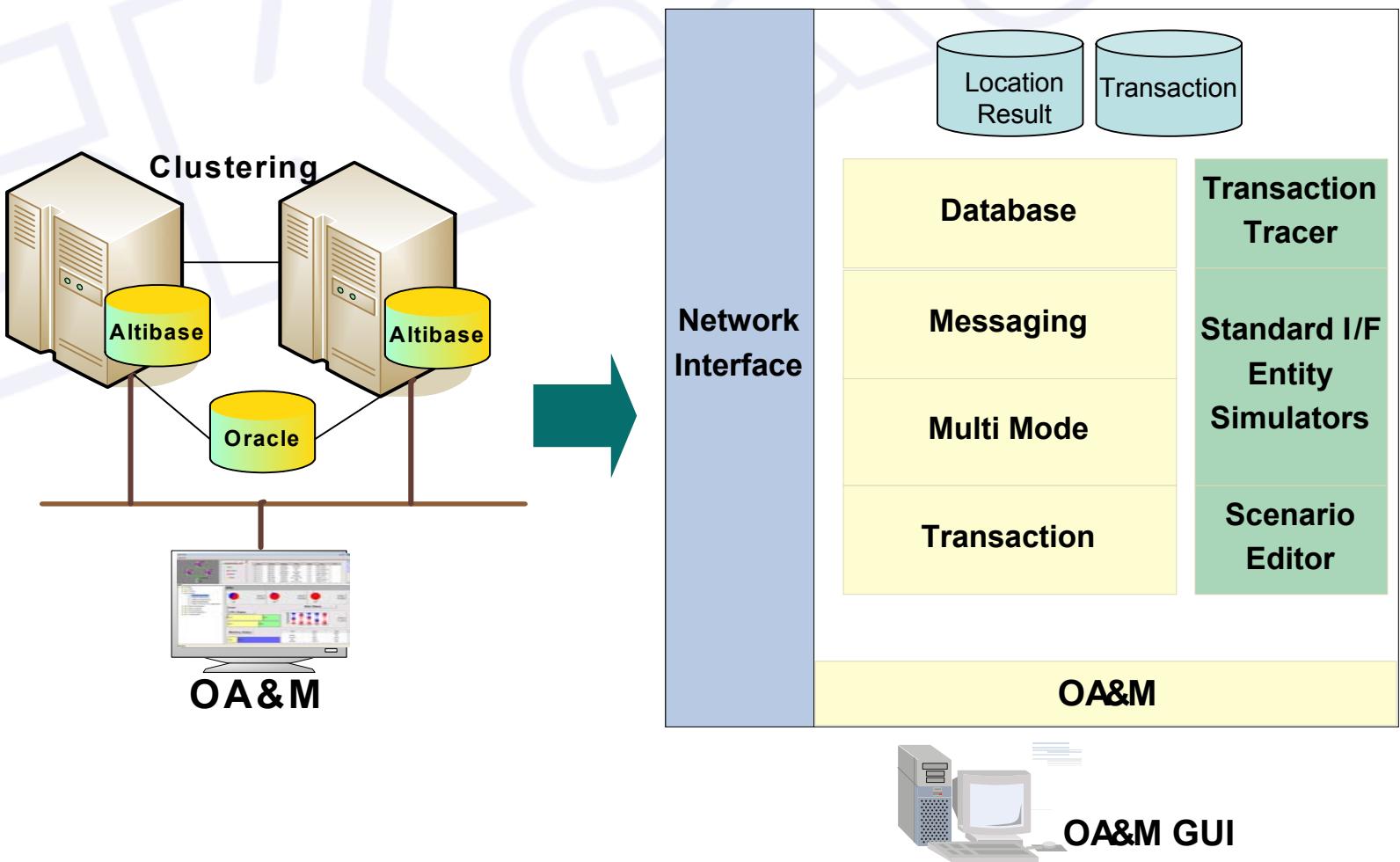
What is MPC ?

- **SKeMPC is a central entity of LBS location detecting procedure and it begins and ends location request. SKeMPC's roles are authentication of LCS client, acquisition of radio environment information and forwarding location results.**
- **SKeMPC is also a central entity of emergency system and it acquires location result, so that emergency user's call setup is established to PSAP with location information.**
- **SKeMPC is composed of essential functions to start normal and emergency location request. These functions are:**
 - Transaction management
 - Messaging management (ANSI-41)
 - Database management (Oracle, Altibase)
 - Operation management
 - Interworking with external systems using SS7 protocol and TCP/IP
 - Hand Off Management (Home, Serving, Anchor)
 - Emergency Data Management

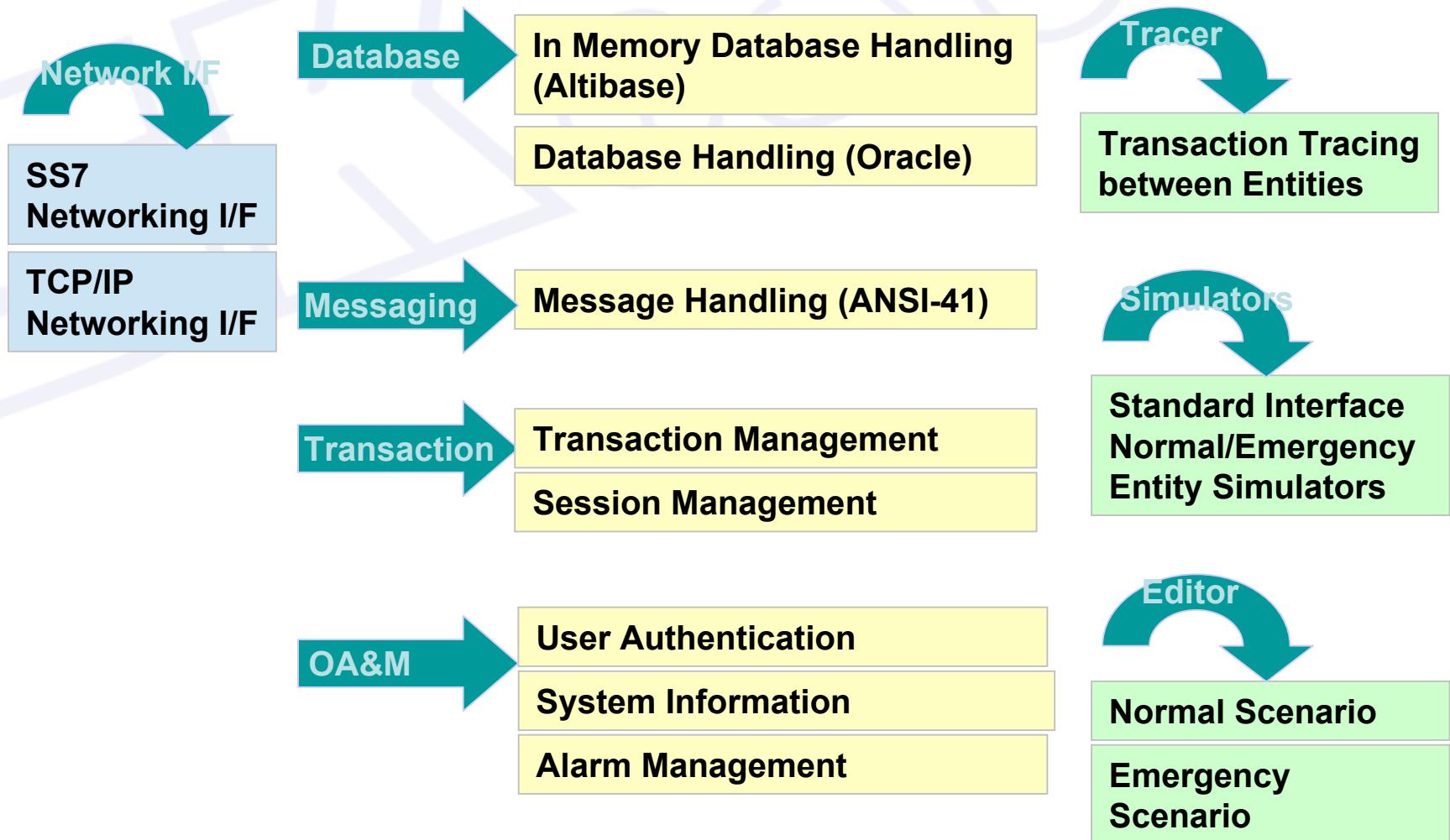
Where is MPC?



MPC Configuration



MPC Functions



MPC OA&M GUI

□ MPC's Operation Administration & Maintenance GUI

The screenshot displays the MPC OA&M GUI interface. On the left, a tree view shows the navigation menu under the SKOMC root. A blue callout points to the 'System and Network Status' panel, which shows a network diagram with nodes LBSAP1, LBSAP2, WEB, and WITS PORTAL connected by green lines. Another blue callout points to the 'Alarm Messages' panel, which lists several entries with columns for Date, Grade, System, Item, Code, Desc, and Ack. A third blue callout points to the 'CPU' monitoring panel, which includes three pie charts showing CPU usage (37%, 10%, 3%) and three bar charts showing disk status for /, /stand, /oracle, /lbs, and /install. A fourth blue callout points to the 'Memory Status' panel, which shows a bar chart with two segments: 19% yellow and 81% blue.

System and Network Status

WEB

LBSAP1 LBSAP2

WITS PORTAL

Disable Alarm

Date Grade System Item Code Desc Ack

2004-03-2... MAJOR LBSAP2 looping2 2110 PROCESS ...

2004-03-2... MAJOR LBSWEB tnslsnr 2110 PROCESS ...

2004-03-2... MINOR LBSAP1 /lbs 1131 DISK MINOR ...

WEB looping2 2110 PROCESS ...

WEB MEM 1121 MEM MINOR ...

AP1 looping2 2110 PROCESS ...

AP2 203.236.36... 2121 AGENT CO... ...

AP2 MEM 1121 MEM MINOR ...

WEB 203.236.36... 2121 AGENT CO... ...

If you select the menu, the detail items will be display this panel

Alarm Messages

SKOMC

- SKOMC
 - Utility
 - Process
 - System
 - System Monitoring
 - Network Monitoring
 - Database Monitoring
 - Service Monitoring
 - Service Resource Configuration
 - Service Subscriber
 - Service History
 - Alarm Statistics
 - User Management
 - Configuration

CPU

cpu

IDLE USED

cpu

IDLE USED

cpu

IDLE USED

lbserv1

Disk Status

CPU Status

67% 33%

60% 40%

Memory Status

19% 81%

free used

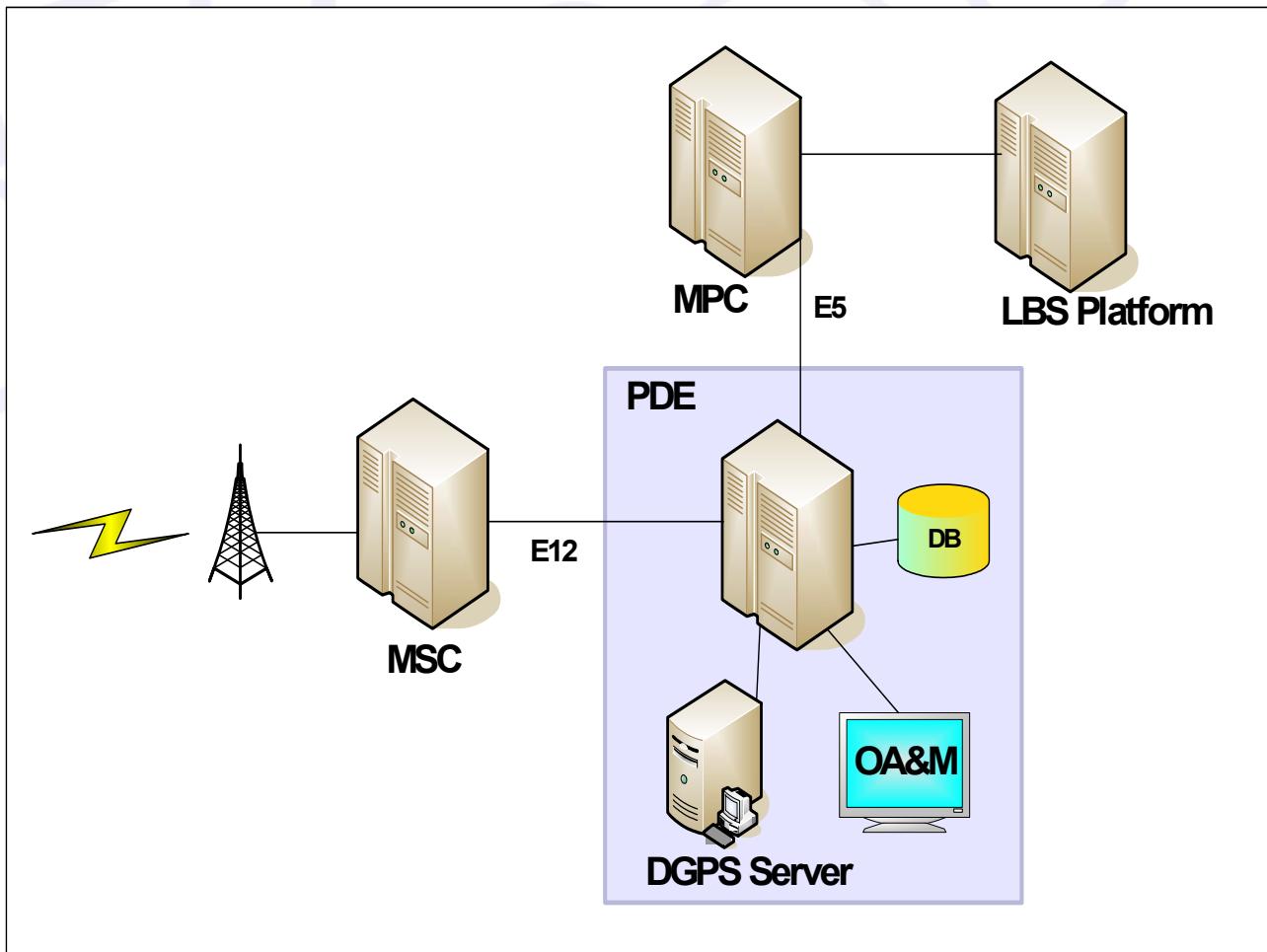
disk	used	free
/	5317	6682
/stand	251	40
/oracle	3429	2570
/lbs	1852	6147
/install	14538	1461

발생 알람

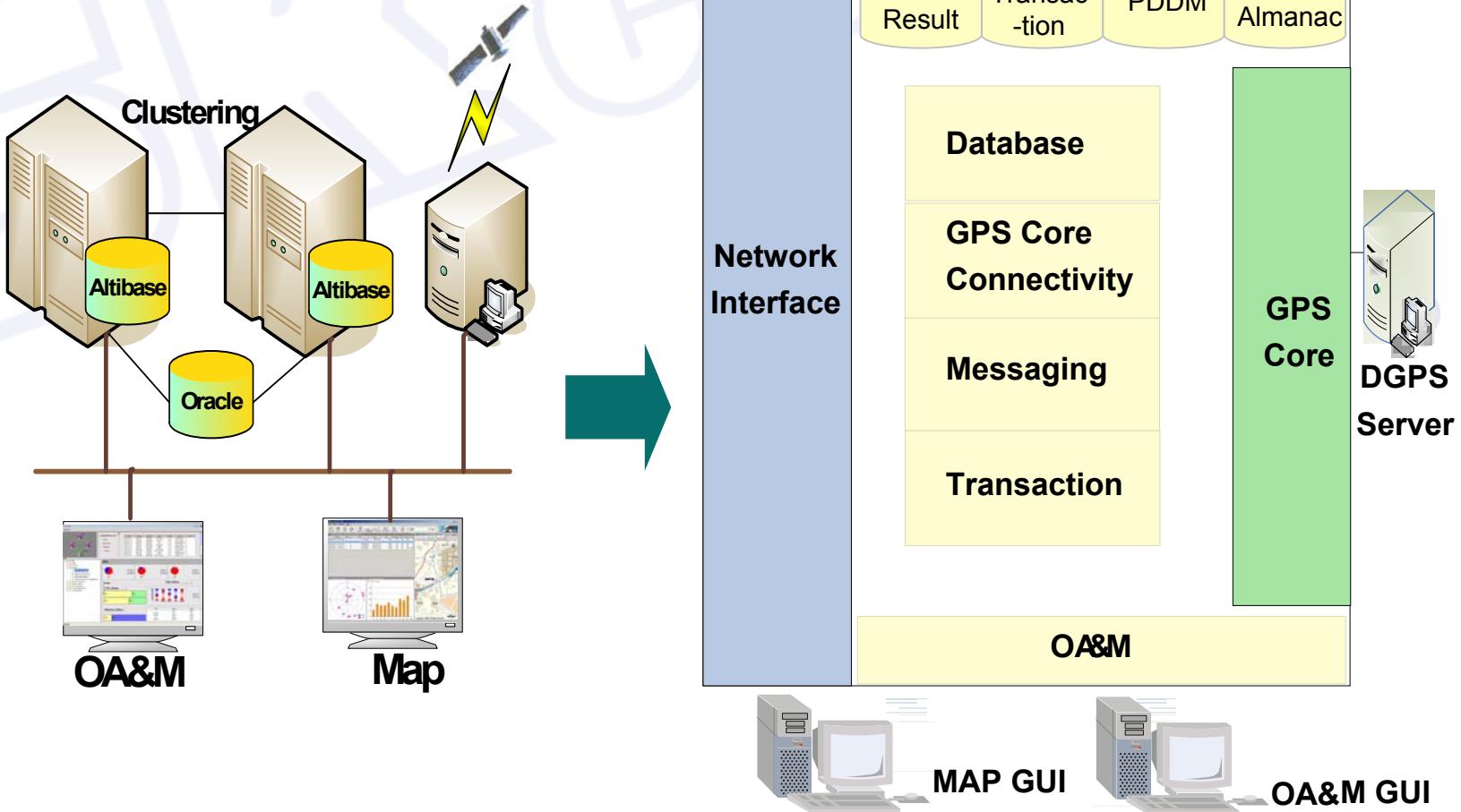
What is PDE ?

- SKPDE has Location Detection Technology (LDT) inside to search for the user's location by detecting the signal, direction, or time from the terminal with GPS receiver.
- SKPDE has GPS module, it provides Aiding Data to target MS and MS sends Pseudorange Data to PDE, so that SKPDE calculates MS's location (Latitude/Longitude/Altitude)
- SKPDE is composed of essential server functions to detect user's location and GUI tool for monitoring location results. These functions are:
 - GPS module interface management
 - Transaction management
 - Session Management
 - Messaging management (ANSI41, IS801)
 - Database management (Oracle, Altibase)
 - Operation management
 - Interworking with external systems using SS7 protocol and TCP/IP
 - GUI Map functions

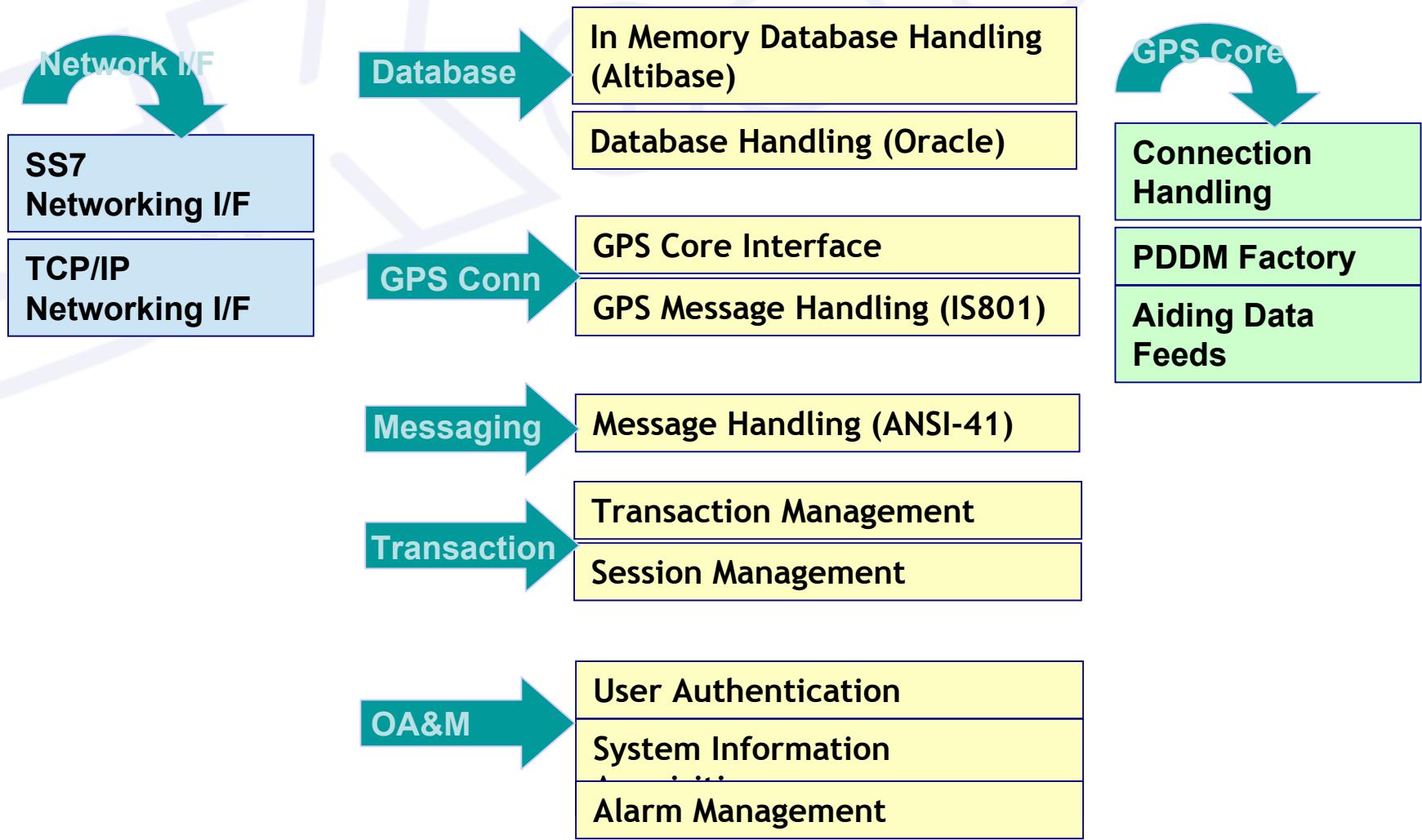
Where is PDE?



PDE Configuration



PDE Functions



PDE MAP GUI I

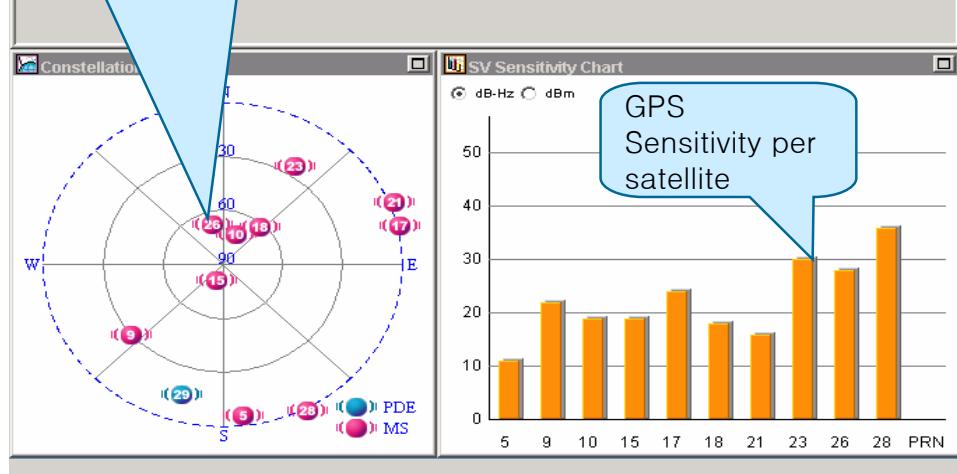
GPS Satellite Constellation & GPS Sensitivity with Map

Location Result

Latitude, Longitude,
Altitude, Uncertainty

InTime	Seq ...	LAT	LON	ALT	U_ANG	U_A	U_P	U_V
2002-06-17 17:01:29 2...	1	37.55724	126.97541	1615	22	24	48	2
2002-06-17 17:02:01 7...	2	37.557545	126.975906	1573	22	32	48	128
2002-06-17 17:02:51 0...	3	37.555923	126.975723	1662	22	24	48	0
2002-06-17 17:03:35 7...	4	37.556416	126.976372	1528	67	32	32	2
2002-06-17 17:04:24 2...	5	37.557861	126.974319	1628	28	24	48	8192

Satellite Number, Azimuth and Elevation Angle caught by MS or PDE. Red means it all caught by MS and PDE.



PDE MAP GUI II

□ Analyzed IS801 GPS Message (PDDM) and Each Parameters Information

Trial Lists (01192006414) (TNo. 3)											
SNO	Start Time	TTF(s)	SV(p...)	SV(...)	LATI	LONGI	ALTI	U_ANG	U_A	U_P	U_V
1	2002-11-19 10:55:26	13.15	7	2	37.384583	126.959038	36	0.0	2048.0	2048.0	0.75
2	2002-11-19 10:55:26	13.15	6	6	37.39109	126.960495	43	5.625	32.0	16.0	0.75
3	2002-11-19 10:55:26	13.15	6	6	37.391106	126.960518	42	11.25	24.0	16.0	0.75
4	2002-11-19 10:55:26	13.15	6	6	37.39106	126.960571	52	16.875	32.0	24.0	0.75
5	2002-11-19 10:55:26	13.15	6	6	37.391071	126.960396	38	11.25	24.0	24.0	0.75
6	2002-11-19 10:55:26	13.15	7	7	37.390972	126.960556	65	22.5	32.0	16.0	0.75
7	2002-11-19 10:55:26	13.15	7	7	37.39093	126.960579	67	33.75	24.0	16.0	0.75
8	2002-11-19 10:58:04	13.15	7	7	37.391315	126.96064	58	22.5	32.0	16.0	0.75
9	2002-11-19 10:58:30	13.15	5	5	37.391106	126.960503	41	5.625	32.0	24.0	0.75
10	2002-11-19 10:58:54	15.20	7	7	37.391155	126.96051	56	5.625	32.0	16.0	0.75
11	2002-11-19 10:59:19	13.17	7	6	37.390934	126.960381	41	5.625	32.0	24.0	0.75
12	2002-11-19 10:59:44	12.15	7	6	37.390972	126.96048	69	5.625	32.0	16.0	0.75
13	2002-11-19 11:00:06	15.19	7	7	37.390812	126.960617	44	11.25	32.0	16.0	0.75
14	2002-11-19 11:00:32	14.19	7	6	37.391037	126.960609	56	5.625	32.0	24.0	0.75
15	2002-11-19 11:00:56	13.19	7	6	37.390926	126.96051	50	5.625	32.0	16.0	0.75
16	2002-11-19 11:01:21	13.17	7	6	37.390839	126.960625	41	0.0	32.0	16.0	0.75
17	2002-11-19 11:01:45	16.21	8	8	37.39095	126.960526	57	78.75	16.0	24.0	0.75

Location Result
Latitude, Longitude,
Altitude, Uncertainty

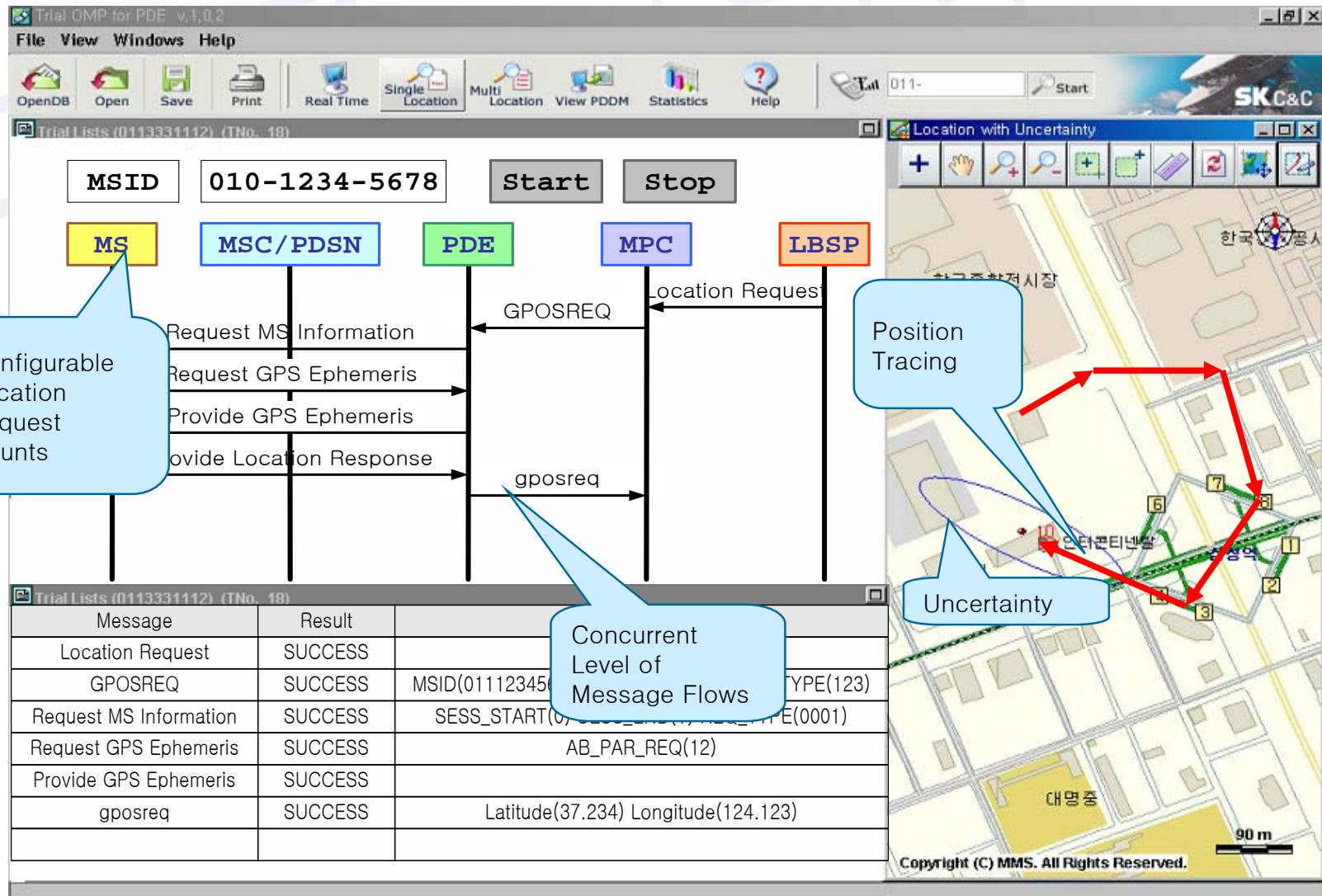
IS801 Message Flow							
Time	S	E	T	O	Dir	PDDM Type	Length
[2002/11/19 10:55:26 508429]	1	0	2	1	UP	Request GPS Sensibility Assistance	6
[2002/11/19 10:55:26 508429]	1	0	2	1	UP	Request GPS Location Assistance sp	1
[2002/11/19 10:55:26 508429]	1	0	2	1	UP	Request GPS Ephemeris	1
[2002/11/19 10:55:26 508429]	1	0	2	1	UP	Provide Pilot Phase Measurement	16
[2002/11/19 10:55:26 566950]	0	0	2	1	DN	Provide GPS Sensibility Assistance	166
[2002/11/19 10:55:26 566950]	0	0	2	1	DN	Provide GPS Location Assistance sp	14
[2002/11/19 10:55:26 566950]	0	0	2	1	DN	Provide GPS Ephemeris	381
[2002/11/19 10:55:39 620664]	0	0	2	1	UP	Request Location Response	1
[2002/11/19 10:55:39 620664]	0	0	2	1	UP	Provide Pseudorange Measurement	20
[2002/11/19 10:55:39 634786]	0	1	2	1	DN	Provide Location Response	13

IS-801
Flows

Field Name	Value
NUM_SV_P	6
PART_NUM	0
TOTAL_PARTS	0
AB_PAR_INCL	0
SV_PRN_NUM	4
IODE	3
C_RS	6
DELTA_N	1
MO	70101
C_UC	64741
ECCENTRICITY	3639
C_US	4970
A_SQRT	2701 378
TOE	1125
C_IC	654
OMEGA_0	161 89959
C_IS	15
ANGLE_INCLINAT	63 525140
C_RC	6017
OMEGA	443089164
OMEGADOT	16754102
IDOT	14751
TOC	11250
AF2	0
AF1	19
AF0	87210
SV_PRN_NUM	5
IODE	110
C_RS	3500
DELTA_N	13623
MO	1474900303
C_UC	3011
ECCENTRICITY	55908798
C_US	4836
A_SQRT	2701988034
TOE	11249
C_IC	65507

IS-801
Parameter
Data

GUI Simulator with PDE



PDE's OA&M GUI

□ PDE's Operation Administration & Maintenance GUI

The screenshot displays the PDE's Operation Administration & Maintenance (OA&M) graphical user interface (GUI). The main window is titled "SKOMC".

System and Network Status: A diagram shows three server nodes: LBSWEB, LBSAP1, and LBSAP2, connected to a central "PORTAL".

Menus: On the left, a tree view of the menu structure includes Utility, Process, System (with sub-options like System Monitoring, Network Monitoring, Database Monitoring, Service Monitoring, Service Resource Configuration, Service Subscriber, Service History, Alarm Statistics, User Management, and Configuration), and Configuration.

Alarm Messages: A speech bubble points to a table listing alarm details. The table has columns: Date, Grade, System, Item, Code, Desc, and Ack. Data rows include:

Date	Grade	System	Item	Code	Desc	Ack
2004-03-2...	MAJOR	LBSAP2	looping2	2110	PROCESS ...	<input type="checkbox"/>
2004-03-2...	MAJOR	LBSWEB	tnslsnr	2110	PROCESS ...	<input type="checkbox"/>
2004-03-2...	MINOR	LBSAP1	/lbs	1131	DISK MINOR	<input type="checkbox"/>
		LBSWEB	looping2	2110	PROCESS ...	<input type="checkbox"/>
		LBSWEB	MEM	1121	MEM MINOR	<input type="checkbox"/>
		LBSAP1	looping2	2110	PROCESS ...	<input type="checkbox"/>
		LBSAP2	203.236.36...	2121	AGENT CO...	<input type="checkbox"/>
		LBSAP2	MEM	1121	MEM MINOR	<input type="checkbox"/>
		LBSWEB	203.236.36...	2121	AGENT CO...	<input type="checkbox"/>

CPU: Three pie charts show CPU usage for "cpu" across three categories: IDLE (red) and USED (blue). Values are approximately 37% (63%), 10% (90%), and 3% (97%).

Disk Status: A bar chart displays disk usage percentages for various paths: / (56%, 44%), /stand (14%, 86%), /oracle (43%, 57%), /lbs (77%, 23%), and /install (91%, 91%). A legend indicates "free" (blue) and "used" (red).

Memory Status: A horizontal bar chart shows memory usage for two components: 19% free and 81% used.

Table: A summary table provides disk usage statistics:

disk	used	free
/	5317	6682
/stand	251	40
/oracle	3429	2570
/lbs	1852	6147
/install	14538	1461

Bottom Left: A small text message "알람 발생" (Alarm Occurred) is visible.

PDE's OA&M GUI

- PDE's Operation Administration & Maintenance GUI

The screenshot displays the PDE's Operation Administration & Maintenance (OA&M) graphical user interface (GUI). The main window is titled "SKOMC".

System Overview: On the left, a network diagram shows nodes: LBSWEB, LBSAP1, LBSAP2, and WITS PORTAL connected in a topology.

Alarms: A central panel lists alarms with columns for Date, Grade, System, Item, Code, Desc, and Ack. The list includes entries from March 2004, such as "MAJOR" events on LBSAP1 and LBSWEB related to "looping2" and memory issues.

Navigation Tree: On the left, a tree view shows the hierarchy: SKOMC > Utility > Process > System > System Monitoring (selected), which includes Network Monitoring, Database Monitoring, Service Monitoring, and Service Resource Configuration.

Resource Monitoring: The main area contains several monitoring sections:

- CPU:** Three pie charts show CPU usage: one for the entire system (63% USED, 37% IDLE), one for lbserv1 (90% USED, 10% IDLE), and one for lbserv2 (97% USED, 3% IDLE).
- lbserv1:** Includes a "CPU Status" section with two horizontal bar charts showing CPU usage percentages (67% and 60%) and a "Disk Status" section with a stacked bar chart showing disk usage across /, /stand, /oracle, /lbs, and /install partitions.
- Memory Status:** Shows memory usage as a horizontal bar chart divided into yellow (19%) and blue (81%) segments.

Data Tables: Two tables provide numerical data for disk usage:

disk	used	free
/	5317	6682
/stand	251	40
/oracle	3429	2570
/lbs	1852	6147
/install	14538	1461

disk	used	free
/	5317	6682
/stand	251	40
/oracle	3429	2570
/lbs	1852	6147
/install	14538	1461

Alerts: A small message at the bottom left indicates "알람 발생" (Alert Occurred).

What is LBS Platform ?

- SK LBSP provides mobile communication subscribers with a variety of location based services. It also ensures that the subscribers are provided with a speedy, accurate and stable location based services.
- SK LBSP effectively satisfies the demands for variety of location based services. It provides basic functions such as speedy application integration, receiving rich location data and privacy protection. Connecting with external systems including map contents is the key to provide and integrate a variety of mobility information. The platform can be easily expanded to accommodate increasing LBS subscribers without interrupting existing services. Other location based services can be seamlessly integrated with the SK LBSP.

SK LBSP consists of Basic, Interface and Service components.

These are used to provide Location Based Services such as Finding Friends, Map Service and Fleet Management. The salient features of SK LBSP are:

- | | | |
|--------------------------------|---------------------------------|----------------------------------|
| ✓ Position Management | ✓ SMS Management | ✓ Fault Management |
| ✓ User Management | ✓ Billing Management | ✓ OA& M |
| ✓ DB Management | ✓ Cache Management | ✓ Management through SNMP |
| ✓ Log Management | ✓ Transaction Management | |
| ✓ Statistics Management | ✓ Load Management | |

Why LBS Platform?

- Provides mobile subscribers with an easy, simple and cost effective way to locate and communicate with friends.
- Service is easy to understand and use due to optimized application design and automatic positioning.
- Give groups of subscribers a simple and effective way to communicate collectively
- Protects the end-user's identity and location all the time.

- SK LBSP meets an earnest demand for services from mobile subscribers and is designed to speed up the development of other services. Each function of SK LBSP is modularized to cater to the continuously evolving networks, devices, maps and applications.
- SK LBSP provides an open architecture that enables network operators to provide subscribers with variety of location based services. It provides subscriber's location information such as latitude and longitude.

Customer Friendly

Open Architecture

Privacy Policy

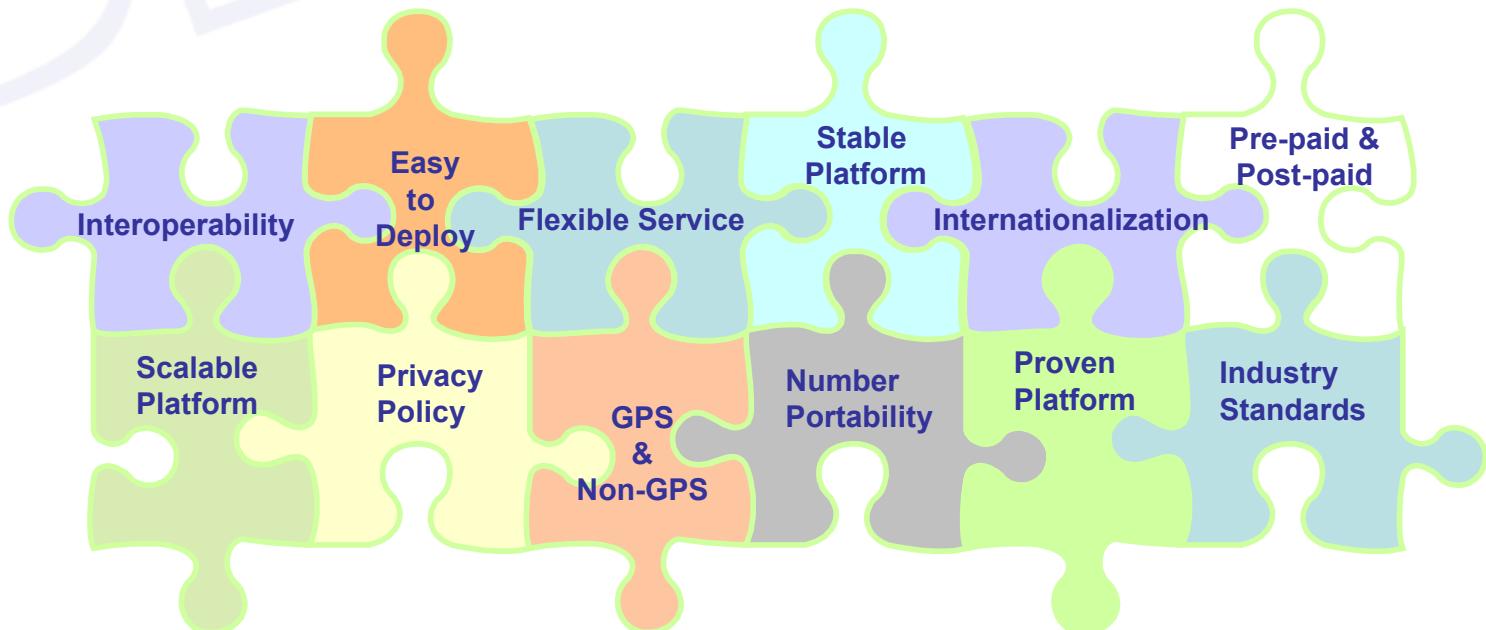
- Supports privacy policy mechanism that ensure the subscribers privacy.

Easy Integration

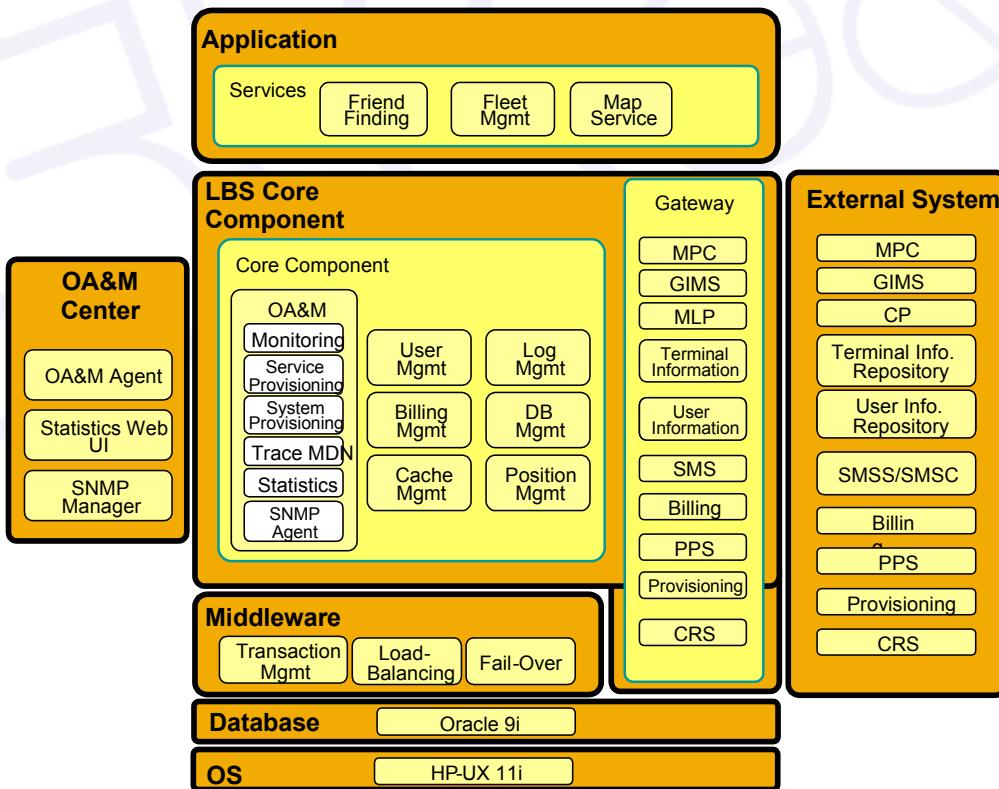
- it is equipped with an XML based open API to enable easy integration with external content providers (CP). Service providers can easily provide various Location Based Services to the subscribers. Eventually, it will contribute to sales growth through increased ARPU (Average Revenue Per User), Churn prevention and attraction of new subscribers.

Features and Benefits

- SK LBSP is a robust, standards-based, scalable service delivery platform that enables network operators to deploy the latest Location Based Services quickly, easily and cost-effectively.
- SK LBSP is a reliable platform that handles the transaction, load, and failover in efficient manner to ensure non-stop availability of services. SK LBSP is a tested and proven system; SKT, a leading mobile service provider in Korea, has successfully deployed the SK LBSP and it is functioning extremely well.



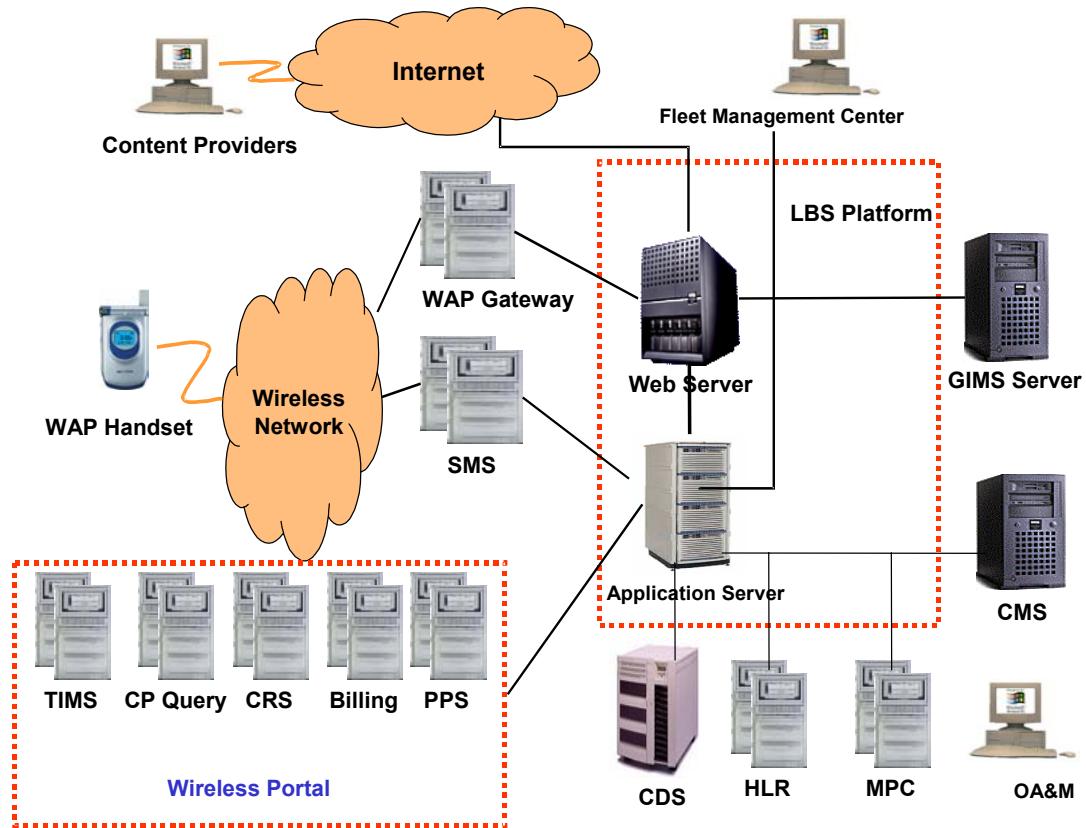
S/W Architecture



- ✓ **SK LBSP offers three basic services (Finding friend, Fleet Management and MAP service)**
- ✓ **Core components provide the basic functionality such as position information, billing log generation and subscriber, service, platform monitoring and CP management**
- ✓ **Gateway interface is used to communicate with the external system**
- ✓ **Middleware provides the Transaction management, Load balancing and fail-over features**
- ✓ **OA&M center is used to monitor the status of SK LBSP**

H/W Architecture

- ✓ Web server is connected to WAP and VM handsets through wireless network. Web server is connected to CPs through Internet. The web server is connected to GIMS system for implementing map service
- ✓ Application server is a key component of the SK LBSP to transmit/receive position data. It interacts with external system and database server for handing service request
- ✓ Gateway components are used for communicating with external systems.



Function of LBS Platform (1/3)

Basic Features

■ Position Management

Provides location information in a format requested by the subscriber.

■ User Management

Enables managing subscribers, content providers, service and privacy information.

■ DB Management

Enables connection with the database and related functions.

■ Log Management

Enables generation and storage of logs.

■ Statistics Management

Generates and stores statistical reports related to components and services of the SK LBSP.

■ SMS Management

Sends short messages to various entities depending on the service.

■ Billing Management

Generates service usage data from the service log.

■ Cache Management

Enables improved performance and reliability.

■ Transaction Management

Enables data consistency and close connectivity between data sources.

■ Load Management

Manages the load on the system automatically.

■ Fault Management

Enables preventive actions before any problem can occur.

Function of LBS Platform (2/3)

External interface

Gateway	External System
Terminal Information	Terminal Information Repository
User Information	User Information Repository
Billing	Billing Server
PPS	SCP(PPS)
Provisioning	Provisioning Server
CRS	Contents Registration Server
MPC	MPC Server
SMS	SMSS/SMSC
GIMS	Map Server based on GML
MLP	CP

- External interface is used to interact with external systems
- SK LBSP components are independent from external system
- Supports standard interfaces such as SMPP, MLP and HTTP
- Provides interface for billing and provisioning system
- Provides interfaces to positioning system such as MPC and HLR

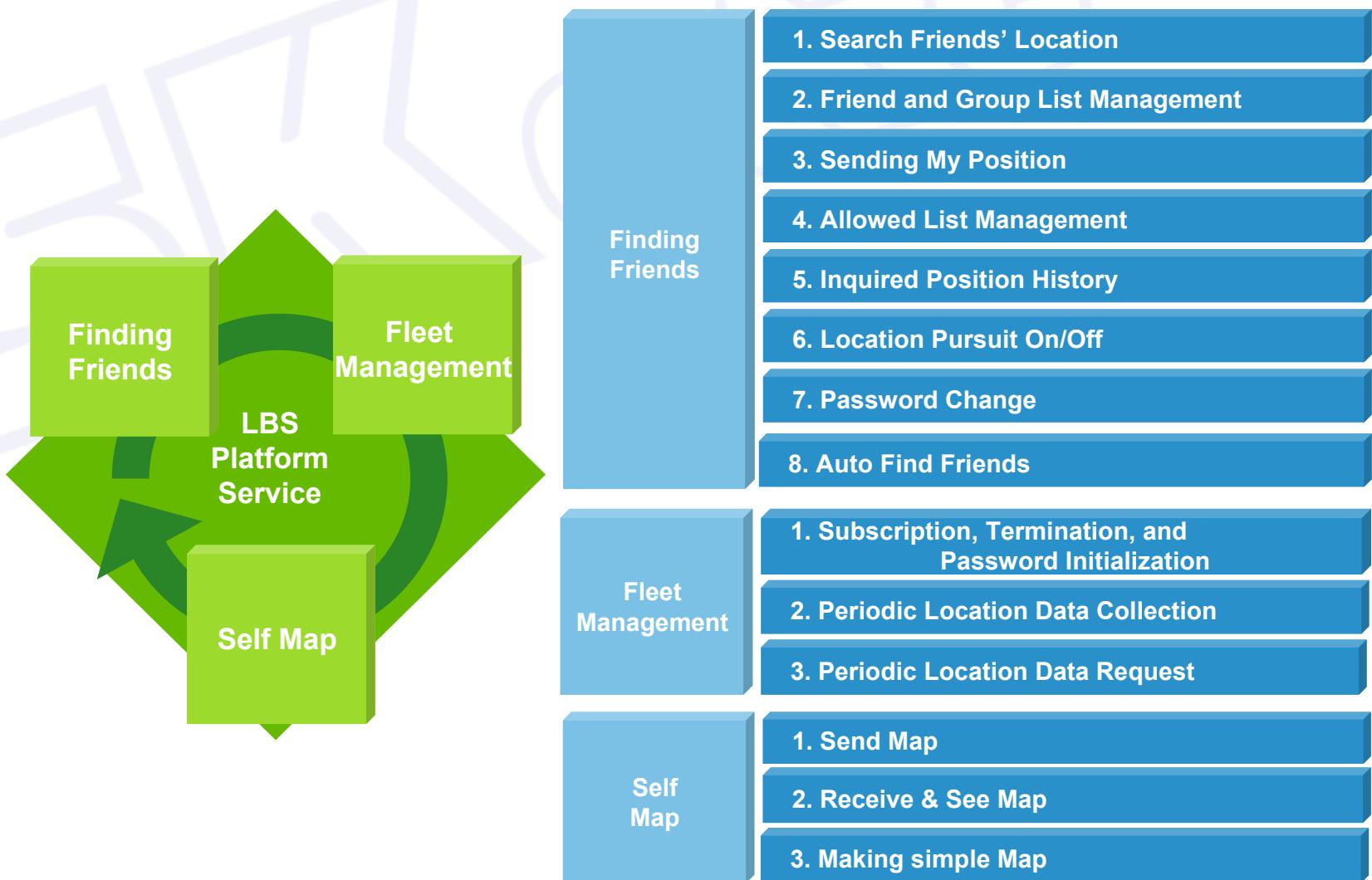
Function of LBS Platform (3/3)

OA&M

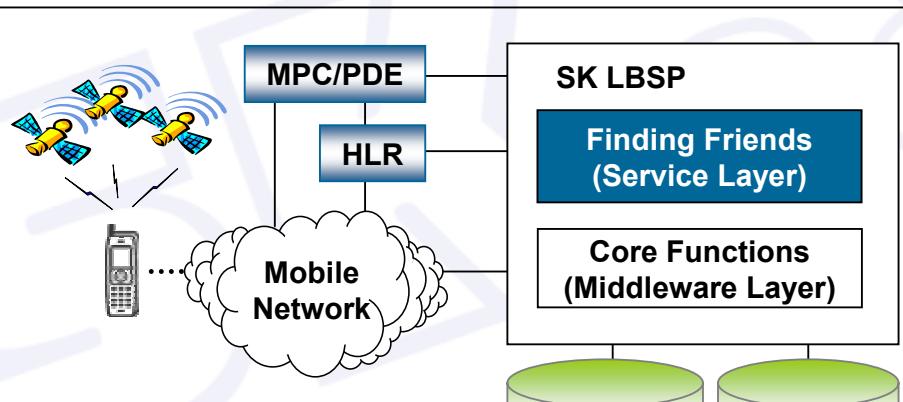
SK LBSP components are monitored by OA&M and SNMP agent module. SNMP agent uses the standard SNMP protocol to monitor the components of SK LBSP. OA&M uses TCP/IP for monitoring the components of SK LBSP. Various statistics and reports are also provided through a user-friendly graphical user interface.

- SK LBSP can be monitored using standard SNMP and proprietary (SKT specific) protocol
- Easy to integrate with standard NMS
- System resources such as CPU, DISK and memory are monitored
- LBS DB Table space sizes are monitored
- Statistic reports can be generated
- Service success ratio details are provided
- Supports transaction tracing mechanism

Services (1/4)



Services – Finding Friends (2/4)



Friend's Location and Map



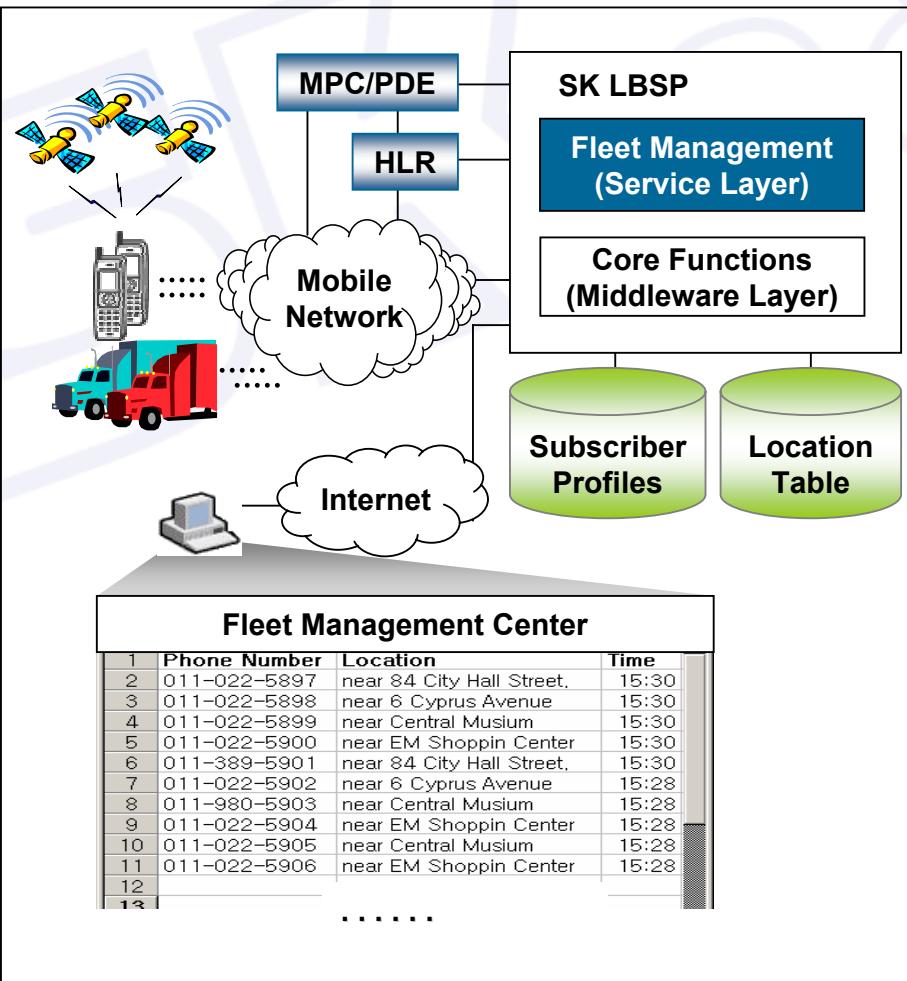
Feature and Benefit

- Easy and attractive way to communicate with friends
- Optimized and friendly user interface
- Sophisticated support to protect subscriber's privacy
- Easy to be integrated with presence/messaging service
- Reduce churn by binding users together tightly

Service Functions

- Searching Friend's Location
- Friend/Group List Management
- Allow List Management
- Location Hiding On/Off
- Inquired Location History
- Sending My Location
- Auto Finding Friends
- Subscription/Termination/Changing Password

Services – Fleet Management (3/4)



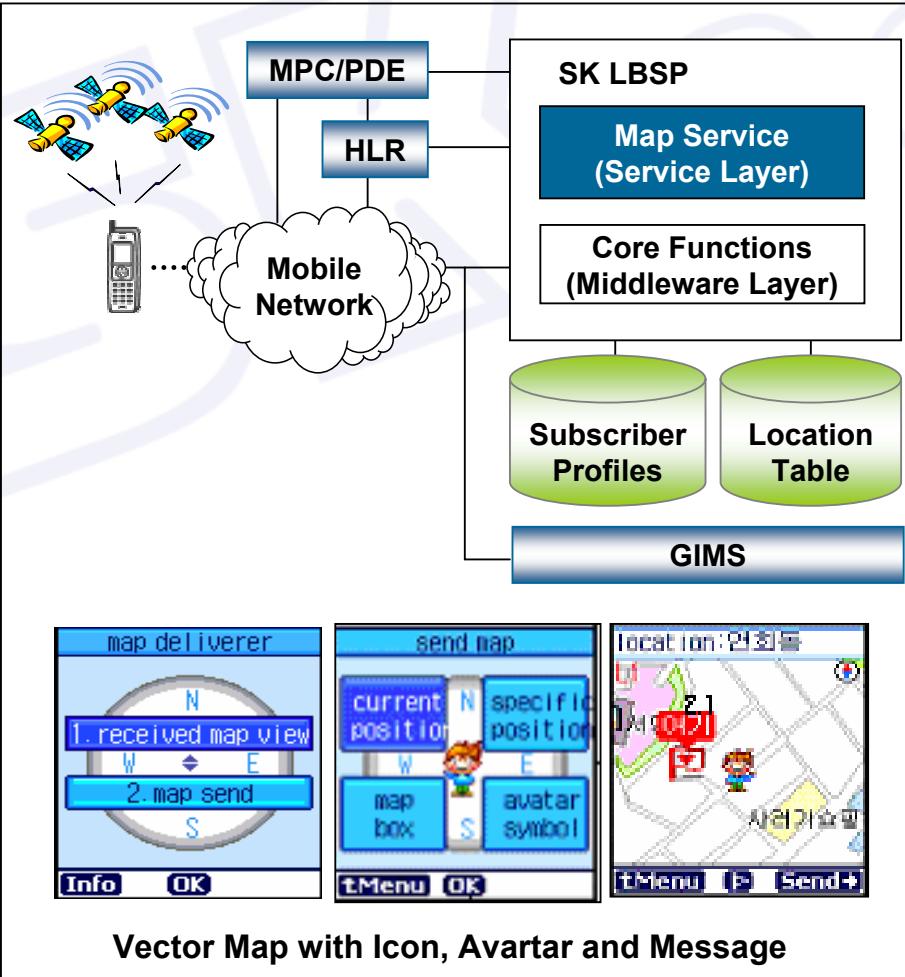
Feature and Benefit

- Location service for enterprise users
- Effective way to track and control large volume of a fleet

Service Functions

- Fleet Management Center
Subscription/Termination/Changing Password
- Center Profile Management
- Fleet Management Member Subscription/Termination
- Refreshing Members' Location Periodically

Services – Self Map (4/4)



Feature and Benefit

- State-of-the-art vector map service
- Easy and attractive way to share location related information
- Support subscriber's self-presentation with icon, avarta and message
- NATE GIMS supports different types of GIS servers, and shows map

Service Functions

- Create Map(Location search by address/name/GPS current location)
- Zoom In/Zoom Out/Navigate
- Insert/Edit Icon, Avatar and Text Message
- Send/Receive Map
- Save/Edit/Delete Map