Digitalearth

The GeoMode Solution: Product Description

GeoMode™ is an innovative development from location technologies developer Digital Earth Systems Limited. The GeoMode™ system is a software based cellular location system for determining the location of any wireless cellular device. Additionally, this technology fully meets public safety mandates for enhanced emergency services. An important feature of this technology is that it accurately determines location by analyzing the cellular signal strength data already available in the network, without requiring any network overlay or special handsets. The system runs on standard hardware and can be deployed in the carrier's network or independently of the network.

The most cost effective solution for location positioning is one that can use the existing radio signal level measurement from a mobile device to a series of base stations. The advantage of this approach is that, because you analyse the existing cellular signal levels, you require no new infrastructure.

GeoMode is an economical, accurate and simple to install 100% software solution for wireless location positioning using freely available signal-level data. GeoMode™ does not require any additional network infrastructure changes or cell site add-ons and is therefore less costly and less complex to implement and manage.

The GeoMode™ software solution utilizes existing network data only and has none of the complexities of network overlays. GeoMode™ system consists of two components:

- The first is the location determining software, which may be installed either at the wireless carrier's facility or, independently of the carrier, at a GeoMode™ Location Service Data Center. This system collects wireless network data and calculates the physical location of a cell phone. The system can also control the phone to transmit that Information over the data channel when requested or automatically when triggered by a local event. This sophisticated software, using patented algorithms and 'self training' *neural* networks, receives the transmitted data and calculates the position. The software also has the ability to add differential correction based on a transmitted reference, this can be used to refine the position accuracy of the mobile. One other unique feature is the location software has the ability to discover and update itself by self-adding new installed cell sites to its database and making corrections for other environmental changes.

- The second component is the Map Information Data Center which integrates the X,Y data into a digital map and/or converts the X,Y location into a street address list. This location data, including the complete geographic display, can then be provided to any Internet Location-Based Service application or Emergency Dispatch Center. This location data can also be fed to any standard GIS (Geographical Information System) in any format. Alternatively, the data can be transmitted to and used by any dynamic LBS application.

The GeoMode™ system runs on standard hardware and can be deployed in the carrier's SMLC / GMLC or independently of the network in a data center using IP / Internet connectivity to the carrier's MSC / Gateway. The GeoMode™ location software has an API for most popular client databases and also supports location-positioning data from GPS devices. For commercial LBS and emergency applications across a complete coverage area, the ideal solution will be a hybrid of GeoMode and a GPS based solution.

GeoMode™ technology meets all accuracy requirements specified by the US Federal Communications Commission (FCC) Mandate for enhanced emergency services. This mandate requires that wireless service providers have the ability to locate 911 emergency callers to within 100 meters at least 67 percent of the time. GeoMode™ tests on a GSM network demonstrated location accuracy of within 50 meters in metropolitan areas 92% of the time.

GeoMode^{TM} And How It Works

In a GSM and similar digital systems, the signal data between every mobile device and all recognized base stations is measured at sub-second intervals to facilitate handover. GeoMode software analyses the signal level data to determine the exact location of the phone. The signal data for every phone on the network is polled by the base stations (BS) at sub-second intervals and is managed by the Base Station Controller (BSC). The signal strength received from multiple base stations is converted to a function of distance and the position is fixed by triangulation. The GeoMode Location Server receives the signal data from the SMLC or Mobile Switch Center (MSC) via the Gateway MLC in the diagram below.
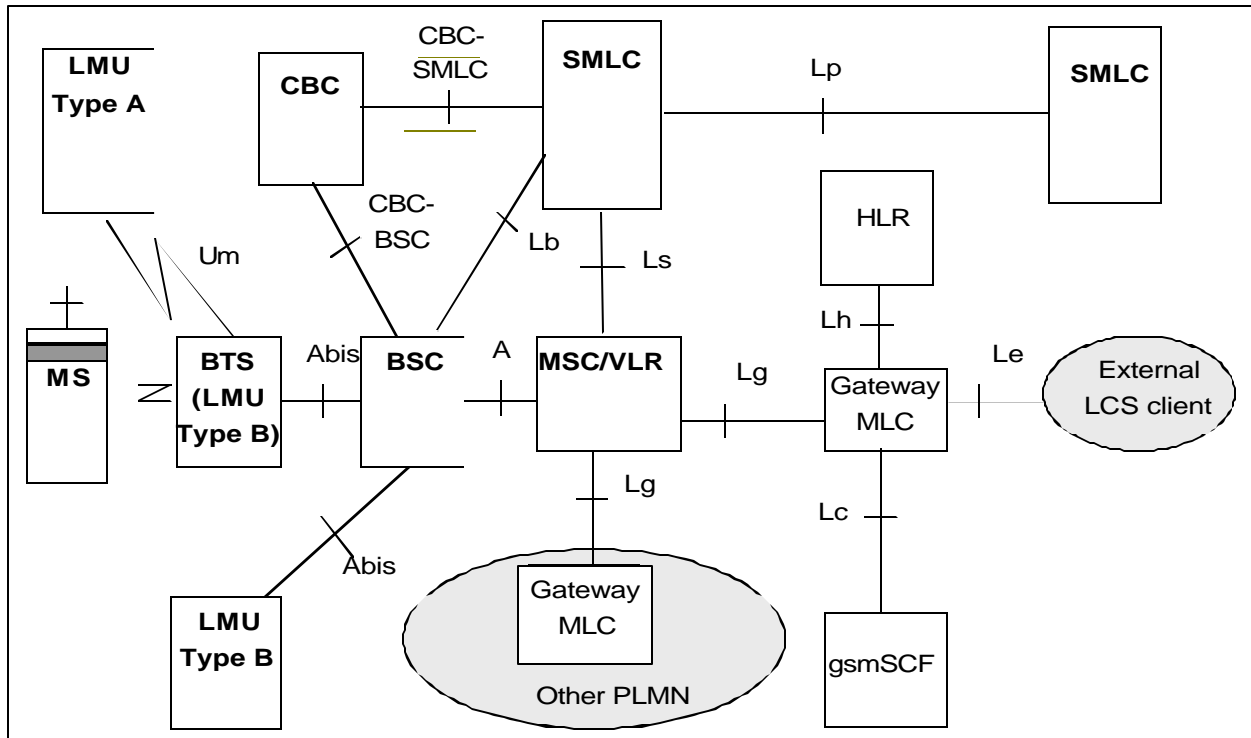
In an ideal free-space environment, signal level contours are represented as perfect circles around base stations and the location of a mobile device is the unique intersection point of three circles. In the real world however, practical propagation conditions, especially in urban areas, are far from free-space propagation, and signal level contours are not circles. GeoMode software is based on filtering algorithms and a patented network signal level modelling process, overcomes these variations, providing an accurate location of the wireless device to within 20 to 50 meters.

GeoMode Wireless Positioning For GSM and GPRS:

The GeoMode™ Wireless Location System provides the most economical and simplest positioning technology available today. The implementation of GeoMode™ does not require any additional network infrastructure changes or cell site add-ons.

GeoMode™ has been tested in a variety of metropolitan and rural settings and it exceeds all requirements of the Federal Communications 911 Mandate, Phase 2. This mandate requires that by October 1 2001, wireless service providers have the ability to locate 911 emergency callers to within 125 meters at least 67 percent of the time. GeoMode™ tests on a GSM network demonstrated location accuracy of within 50 meters in metropolitan areas 92% of the time.

- **GeoMode** software runs on a standard Intel Pentium III server - capacity / size depends on coverage area. Entry level platform: http://www.compaq.com/products/servers/platforms/

- **Simulation** testing of entry-level location platform (Compaq DL380-G2 Server Cluster); configuration was loaded to simulate 500,000 requests over a 60-minute period. This load reflects a capacity of 140 location transactions per second. By comparison, SMS/text messaging loads in Europe have reached over 300 messages per second based on around-the-clock volumes.

- **Scalability** is dependent on the application however, the location processing component requires less resource than SMS. If you use SMS as the benchmark you are on the safe side for estimation purposes. Each particular LBS application will have its own configuration requirements and performance characteristics; some services will require low resources such as "*where am I*" while other commercial services such as e-commerce searches or personal navigation applications will require moderate to increased resources. Most applications will be hosted and provided by third parties so the impact on the location process is negligible.

- **Accuracy** has been audited independently and test results recorded accuracy of 20-50 meters for 92% of the readings.

- **GPS** options are available for rural areas or areas without adequate cell coverage

GeoMode™ technology allows wireless phone users to accurately locate themselves and tap into new applications. These applications include mobile yellow pages, enhanced safety calling, roadside assistance, location sensitive billing, personal navigation and tracking services.

Benefits Of Location Positioning For Wireless Carriers:

Frost and Sullivan has called location-based services the next "the killer app" for the wireless industry. Recently announced GeoMode™ can enable wireless carriers across the globe to launch new revenue-enhancing services by offering their subscribers a host of location-based value-added applications - applications that can also help increase customer retention. These include:

Enhanced Safety Services:
 By 2004, this market could be worth nearly $3 billion for wireless carriers - and also lead to increased customer satisfaction by offering wireless subscribers enhanced safety and unprecedented peace of mind. Roadside assistance, medical alert, and child safety services are examples of top-tier personal safety services that consumers are willing to pay for. A survey by Driscoll-Wolfe shows that more than 50 percent of wireless consumers would be willing to pay as much as $5 per month for enhanced personal safety services, and the majority of auto club (AAA) members indicated a willingness to pay at least $10 to $20 extra per year for such services.

Location Sensitive Billing:
Wireless carriers can target new market segments by offering variable rate discount calling plans based upon the location of the caller. This enables wireless carriers to compete more effectively with fixed-line carriers by offering comparable rates when the caller is in a home zone or discounted location. With some 39 percent of wireless subscribers indicating they would take advantage of location sensitive billing, The Strategis Group estimates that increased revenues for U.S. wireless carriers offering location capabilities could reach roughly $2.3 billion by 2004.

Mobile Yellow Pages and Enhanced 411 Services:
The projected annual revenue for Enhanced 411 services is roughly $1.2 billion by 2004. This category includes mobile yellow pages for wireless consumers, personal direction finding and location specific information services (e.g. getting directions to the nearest ATM machine, restaurant, or hotel). According to the Driscoll-Wolfe survey, a quarter of U.S. wireless subscribers indicated they would use Enhanced 411 services, either on a per use basis as an added fee or in the form of a monthly service charge. Enhanced 411 also lays the foundation for lucrative location-sensitive advertising and e-Commerce applications.

Location Sensitive Advertising and E-commerce: Location sensitive advertising and sales could lead to an additional increase in a wireless carrier's average revenue per unit (ARPU) of $2 to $3 per month, according to Strategy Analytics. The combination of Enhanced 411, e-commerce and navigation capabilities will lead to location-aware advertising and sales that will result in significant revenues for wireless carriers. Location aware advertising and time/location sensitive coupons will not only lead to revenues for wireless carriers from local and national retailers such as Shell, EXXON, McDonalds, and Barnes & Noble, but also entice more subscribers into using more airtime, more frequently.

Traffic & Navigation Services:
According to The Strategis Group, more than a third of U.S. wireless subscribers would pay from $2 to $5 per month for traffic update and driving direction services. These services would include real-time traffic and road condition updates, route planning, and vehicle navigation services. By 2004, The Strategis Group estimates this market could be worth more than $500 million. It would also lead to business-to-business vehicle fleet management applications that would be used in conjunction with non-voice location devices. GeoMode™ provides compatibility between personal navigation and vehicle telematics systems.

The biggest benefit: The GeoMode™ architecture allows wireless carriers to gain new revenue and benefit from this future-generation technology with minimal upfront investment, because the technology is a 100% software solution to wireless positioning requiring no changes to the network infrastructure. In fact, the GeoMode™ system requires neither modification to existing equipment nor the addition of new cell sites.

Professional Services: Consulting

Digital Earth Systems provides professional services for the development of and hosting of Location-Based Services for service providers, telecoms, utility companies, governments and large multi-nationals, specifically those organizations whose data management and business process can benefit from the seamless integration of their business data and location data.

The services offering may include services from our partners, which will comply with all the latest standards and will include worldwide location data, online applications and developer tools. Digital Earth Systems will effectively become an Open Global Location-based Services (LBS) platform using platform technologies from our partners, data from our content provider partners and applications from our service provider partners. This means that our regional distributor partners can establish a service provider business model for very little investment and with all their technology and content provided by our partners and enabled by our GeoMode location positioning software.

Additionally, our consultants can add *Location-Awareness* to enterprise clients without the in-house complexities and costs associated with traditional Geographical Information Systems.

A Partnership Program has been established for service firms and government agencies that will establish the client organizations as an ASP.

For partners, we will provide any combination of technology, consulting, Internet services and a location aware platform, to support the development of e-business, m-commerce, integrated workflow and decision support systems for the enterprise.

Professional service s will include:

- Needs analysis
- Data conversion
- Strategic planning
- Internet web development
- Spatial Application Development
- LBS Application Development
- System and data base design
- Spatial data management
- Application development
- Education and Training
- The digital earth network

www.digitalearthsystems.com