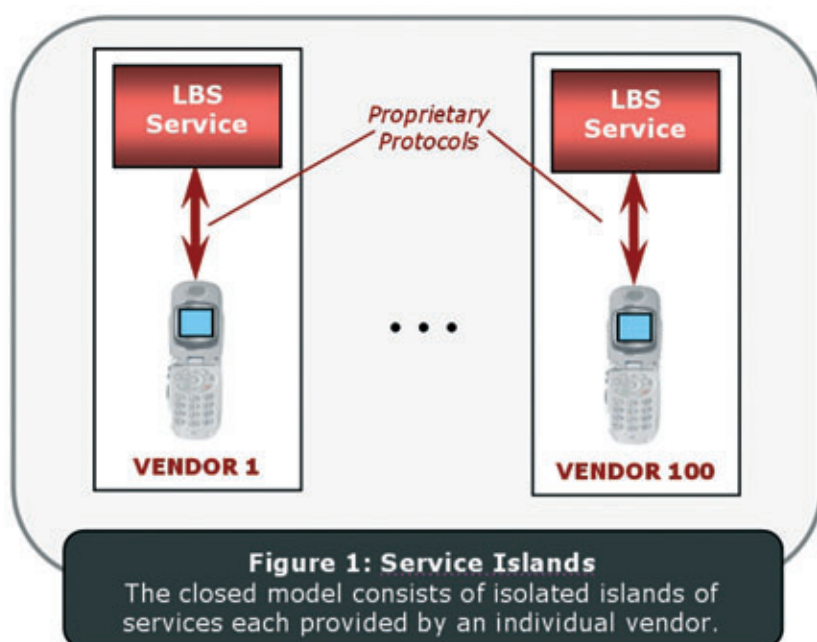


Moving Toward a Broader, More Beyond Location

With the advent of enhanced 911 services in the late 1990's, CDMA has experienced the benefits of having GPS technology integrated into the handset for precise location fixes. This resulted in the introduction of innovative new services for mobile workforce management, real-time navigation, directions and points of interest, and family tracking, among other offerings now available from the major carriers.

By Leo Modica



Shortcomings of Closed Model

The closed model refers to LBS services that rely on proprietary protocols for client/server communication. This relationship is typically established on a one-on-one basis between the client application running on the mobile device and the service running in the network. The key shortcomings of the closed model are:

- Sharing of services and technologies is not allowed, hindering interoperability across service providers and networks;
- Today's applications are run separately in a disintegrated manner. Applications such as real-time navigation and personal tracking cannot be run simultaneously because exclusive use components such as GPS cannot be shared across applications;
- Security and privacy approaches vary depending on the carrier and the vendor.

While the closed model has been the mainstay of first generation LBS services, it needs to evolve to support open standards and seamless integration of technologies.

Model for Collaboration

As depicted in Figure 1, a shared services approach allows communication between service and content providers through open standards and public interfaces provided as web services. The central component of the open model is the Location Manager that performs functions similar to those of the Mobile Positioning Center (MPC) and the Gateway Mobile Location Center (GMLC). The Location Manager serves as a common network element used by LBS service providers to provide a standard means of obtaining and protecting location data. The Location Manager acquires and stores the mobile device's location in a secure manner. Each mobile's location can then be accessed by trusted clients who have been authenticated, allowing established privacy and preference rules to govern which clients have access to that location and how it is delivered. This end user owns his personal location data and gives access to his location based on privacy and preference rules within the Location Manager.

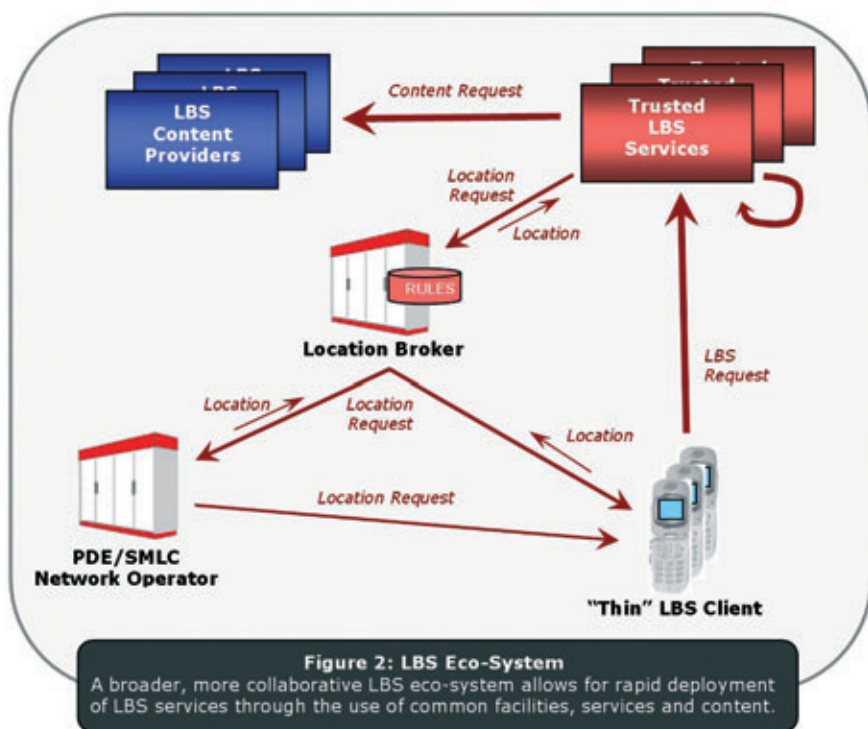
Open Ecosystem

While the applications mentioned above have achieved some success, they have not attained mass market acceptance. In order for LBS to become ubiquitous, the fundamental aspects of the LBS ecosystem must be open -- allowing multiple service providers to share users' location data, content and services. This increased level of integration of both content and services will ultimately produce a more compelling array of service offerings to the end user. Establishing an open, collaborative LBS model that safeguards location data, enables the rapid integration and introduction of LBS content and services into the marketplace. It allows interoperability between customers on disparate networks and is key for making LBS ubiquitous.

Standards

Several key aspects of the LBS eco-system must be addressed, including disparity among location determination technologies, lack of interoperability between services and networks, user authentication and privacy, and service integration frameworks. Standards such as Secure User Plane for Location (SUPL), Open Geospatial Consortium (OGC), Security Assertion Markup Language (SAML), Remote Authentication Dial In User Service (RADIUS), and the IP Multimedia Subsystem (IMS) can provide a starting point for developing a more open, collaborative model. However these standards must be 'stitched together' to address the broader needs of the LBS eco-system.

Collaborative LBS Eco-System



Network Operators

The LBS eco-system created with the open model allows service providers to quickly meet a wider range of LBS needs. For example, services can either be hosted by network operators using an IMS-based architecture or by third-party hosting centers on the Internet. Another key component of the open model is the thin mobile client application: an LBS-enabled Web browser used to access LBS network services. This browser eliminates the need for special purpose applications to run on the mobile device. In addition to providing HTML, MMS and SMS services, the LBS-enabled browser provides the following services:

- Location determination with support for one-time and periodic location acquisition, plus geo-zone processing;
- Real-time interactions with network services using AJAX-like mechanisms;
- Ability to capture and present a wide range of media, such as voice, video, images and vector graphics.

These services are enabled by JavaScript or any other suitable procedural mark-up language. They are provided by the network services and downloaded to the mobile device on demand.

Safeguarding Location

Undoubtedly, information about an end-user's location is as private and personal as his social security number and financial data, making its security and safeguarding imperative/critical. Failure to do so can have severe consequences, compromising the safety and security of the individual. Therefore, another key role of the Location Manager is to address all dimensions of security and privacy. These include:

- Firewalls to protect servers containing location data from malicious attacks;
- Digital certificates and SSL encryption methods to protect a user's identity and location whenever transmitted over the public Internet;
- Use of temporary identifiers when a user's location is shared with trusted third-party service providers to guarantee the user's true identity is never divulged;
- Strong, two-factor authentication methods utilizing tokens, one-time passwords and the Security Assertion Markup Language (SAML) are implemented to ensure that mobile device users and service providers are genuine;
- Privacy/preference rules are in place to authorize observers' access to location data and the manner in which the data is

disclosed. These rules can include who has access, when they have access, level of precision and mode of access (one time or periodic), among a host of other decision criteria that could be implemented.

The Location Manager provides a web portal that allows the end-user to manage his privacy preferences. It allows the privacy manager to grant or deny other end-users and service providers access to their location. In addition, end users can monitor who is acquiring their location and when.

Security and privacy must be a top priority as consumers and network operators alike placing an enormous amount of trust in their Location Managers and service providers. Circles of trust must be established between these entities to ensure the success of the open model in the LBS industry.

Enhanced LBS Services

Rich, integrated services are provided by service aggregators and are composed of simple services and content. Through collaborative, cross-vendor partnerships made possible by an open LBS model, service and content providers can complement each other's expertise in providing simple, aggregated services.

The implementation of an open, collaborative LBS model serves as solid foundation for the development of next generation LBS services. Our hope is that this new model will spark a proliferation of LBS services equaling the growth in Application Service Providers (ASPs) realized by the World Wide Web.

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