

t1.11

Enhancing mobile applications with location-based services

Xavier Lopez, Oracle Corporation

Introduction

Many businesses around the globe have discovered that they can improve business operations by giving their customers, partners and employees access to key information via mobile devices. But these devices shouldn't simply be viewed as an extension of the desktop. The size of the device, the input mechanisms and the types of tasks people want to complete require that companies develop a well thought out strategy for going mobile. That strategy should incorporate the roll of location-based services. Mobile devices, by their very nature, are designed to be used from a variety of locations. By taking advantage of the location technologies and services currently available, companies can greatly enhance the value of their mobile applications. Oracle offers a complete set of technology, services and partnerships to help you get the most out of your wireless location-based service applications.

Location-based services: an overview

Many people think of location information as the graphics and text that are captured on maps. But look beyond the map and you'll find geocoded information such as street addresses and zip/postal codes; positional data captured from navigation purposes such as GPS; satellite and aerial imagery; route information and directions; time-sensitive events such as accident reports, weather reports and the location of service fleets; directories such as yellow pages; and databases with demographic and psychographic data.

Organizations have demonstrated that location-based services not only deliver a strategic differentiation to their wireless and Internet services, but also provide a means to integrate customer and corporate information necessary for e-business. Carriers and portals now recognize that they will compete on the basis of how effectively they can integrate their CRM and ERP operations with those of customers and suppliers to create a positive business experience. Incorporating location into existing business operations enhances delivery of wireless services. Likewise, delivering real-time, location-enhanced information helps customers and suppliers accelerate, automate, and optimize their decision making process – an essential requirement for any location-based services system.

What do you do with a wide variety of the location-based information available? How can you improve your businesses with it? Well, location is a unifying theme in business. Spatial relationships, patterns and trends reveal invaluable business intelligence and a critical dimension of information utility and understanding to business applications. Location services bring this utility to every facet of business.

Location-based services make use of spatial information and the functions that operate on this information, thus enabling you to incorporate "location awareness" and "location sensitivity" into your front-office apps, back office apps, supply-chains, field operations, Web offerings and more. As a result, this type of information is playing an integral role in the day-to-day operations of most organizations.

Location-enabled, Wireless-ready e-business

As most wireless carriers are keenly aware, customer acquisition and retention are essential to sustainable growth. Customers of B2B or B2C wireless services have more choices than ever about when, where and

from whom to buy location-enhanced services. Keeping them satisfied and coming back is paramount – and an ongoing challenge. Location-based services offer mobile operators an excellent opportunity to deliver value-added information that is integrated with that of customers and suppliers, creating a positive business experience. The result is a suite of rich, highly integrated, and personalized location-enhanced services that can be accessed via wireless devices.

Customers want the provision of location-based service to be automatic – they want carriers and wireless portals to take care of integrating a variety of Internet and enterprise information services with a customer's preferences, enabling a user to focus on informed decision making. For example, a real-time traffic application at one end may automatically access multiple information sources at other companies' servers, across the Internet on dozens of Web sites, on other servers within the organization – and integrate the information. A customer checking on the availability of a hotel in a given city might access geocoding services that identify the location of the customer and nearest hotels, and would cull data from real-time travel services to check availability and book a room and from a driving directions service to route the customer to the hotel.

For wireless location-enhanced services to be effective, they must be integrated with front-office and back-office applications. By integrating enterprise information with customer information, carriers obtain comprehensive business intelligence, and value builds exponentially. Mobile operators become better positioned to use real customer information to determine wireless service expansion, improve service delivery, and determine load demands. On the customer end, by automating information integration and interpretation, the customer is able to deal with a much richer set of location-enhanced information for better decision-making. With the introduction of event-driven e-Business, wireless carriers and portals can send fresh information as it becomes available or as users roam into a new location, rather than waiting for customers to check in with the service. Customers, mobile operators, and partners can react immediately to the changed location of a handset user by delivering personalized services for his or her new roaming region.

Enhancing ebusiness Applications with Location

Deploying location-aware mobile applications can help your business in a number of ways. First, location-awareness can significantly improve the utility of mobile applications. Mobile devices (excluding laptops), by their very nature have to be small enough to comfortably fit in pockets and purses. The downside to the small form factor is that the display is considerably smaller and input much more difficult. By carefully choosing what content makes the most sense to display and personalizing the content whenever possible, you can improve the application considerably. Moreover, leveraging the power of location, you can provide your users with easy access to relevant and timely information. This can lead to improved productivity, greater sales, and happy customers and partners.

Location-based services can enhance a range of mobile applications across industries and job functions. Some examples of mobile location-based applications include:

- Sales force/marketing automation
- Field service
- AVL/Fleet management
- Telematics
- Consumer travel services
- Wireless call center tracking
- Location-based billing

What is Unique about Wireless Location-Based Services?

Wireless carriers recognize that a new class of mobile services can now be location-enabled as a way to enhance and differentiate offerings. In many cases, wireless portals are aggregating Internet content and

delivering it through mobile devices after it is filtered, through formats such as WML, C-HTML and VoiceXML. However, the unique state of being mobile presents special opportunities and challenges, including:

- Wireless devices will continually transmit the location of device, enabling direction finding, mapping, friend finder, and related information services.
- Location capability enables powerful and compelling services that previously did not exist for mobile users (for example, “dial 911”, “where am I?”, “how far to...?”, “how do I get to...?”, “what is the current traffic situation on route....?”).
- With “location-aware” devices it is now possible to “push” syndicated, and personalized information to wireless user (for example, local weather, local news, local traffic, advertising)
- Location capability also enables mobile operators and end users to answer the following questions:
 - What is the physical location of a current call, for billing purposes? How can I implement a locationbased tariff (for example, to discourage casual downtown during normal business hours)?
 - Where exactly are calls dropping off and what can carriers do about it?
 - What does it cost me if signal strength is poor in this area? Who lives here?
 - Self service: what is the signal strength where I live, work, travel?
- Location capability poses mobile operators with the challenge of responsibly handling customers’ personal privacy.

Key Technology Enablers for Mobile Location-Based Services

The performance and capability requirements expected for wireless location-based service can easily approach that of a top Internet portal – millions of queries on a daily basis, hundreds of concurrent transactions, and millisecond query response times. Thus, the required system must support all the unique CPU-intensive location queries, and provide scalability, storage, and interoperability.

Real-time, transaction-based location services have the kinds of feature and performance requirements listed in Table 1.

Feature Requirements	Performance Requirements
Address verification and matching	Scalable architecture
Map rendering	Gigabytes to terabytes of data
Yellow page directory query	Multiple CPU processing
Driving directions	DBMS table partitioning
Personalization by location	Distributed processing
Proximity analysis	Native spatial data management
Standards-based location service APIs	Online services interoperability
Personal/in-car navigation capability	Millisecond location query
Voice (VoiceXML) capability	Million + daily queries
XML integration with e-business apps	Millions+ user sessions per hour
Web Services Directories	Portal caching

Table 1: LBS Feature and Performance Requirements

Oracle's Location-based services infrastructure

Oracle*iAS* Wireless is a mobile middleware server that delivers any content to any device. Applications are independent of the target device, yet automatically can exploit specific features of the device and provide customized content depending on the availability of such features. Oracle*iAS* Wireless performs a variety of services as shown in Figure 1: adaptation (aggregation) of content, general processing, transparent transformation to each device, and interfaces to external location services.

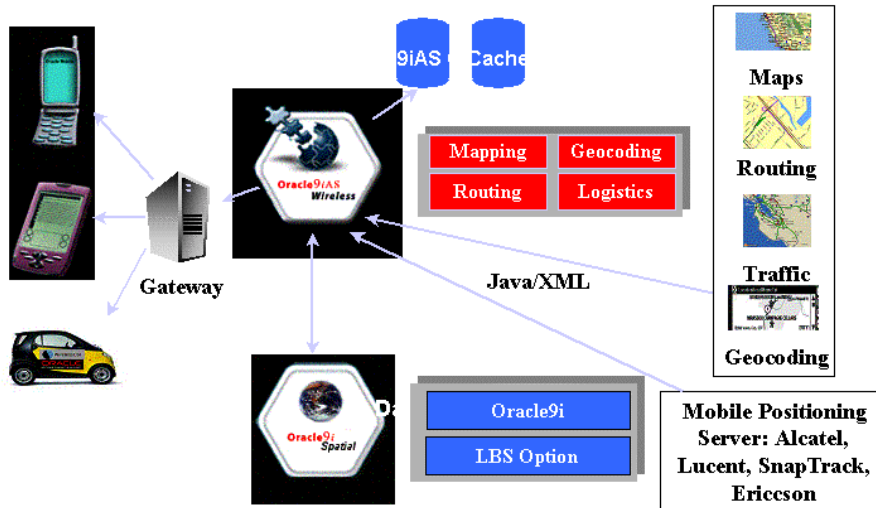


Figure 1: Oracle's Location-Based Services Solution

Any Content

Applications can use any content available on the Web, in the database, or a file system. Oracle*iAS* Wireless can either accept data in MobileXML (Oracle's device-independent XML) or use one of its many Adapters to convert content into MobileXML. Opportunities for reusing code and content are considerable, and the advantages for development time and cost are apparent.

Any Device

Oracle*iAS* Wireless Transformers then convert the MobileXML into the markup language required by each mobile device (WML, TinyHTML, c-HTML, VoiceXML etc). Obviously, devices vary in their ability to display certain content in a reasonable manner, or even to store it in memory. However, MobileXML is flexible enough to enable different input and output options depending on a specific device's capability. Oracle*iAS* Wireless exploits the maximum hardware capability of the device to present information. Most importantly, applications that work on today's devices will continue to work without limitation with tomorrow's more advanced devices and markup languages.

Anywhere

Oracle*iAS* Wireless provides a foundation for deploying location-aware mobile applications. Mobile devices naturally benefit from location awareness, especially when supported by mobile positioning technology. With Oracle*9iAS* Wireless, the method by which an application determines "location" is irrelevant. A user can choose whether to base location on automatic positioning or manual positioning. Oracle*iAS* Wireless also allows each user to define certain locations (such as home, office, and local airport), and to designate any of them as the default. It also lets users enter an arbitrary location, such as a distant city. Manual positioning can be used when the automatic positioning is not available or not relevant. It is useful for "what-if" scenarios such as performing a query for a location other than the user's current location: for example, "Which services will be available to me as soon as I reach Earl's Court in London?"

Any Location Service Provider

Location-awareness for mobile applications is incomplete without specialized services, such as geocoding, reverse geocoding, driving directions (routing), yellow pages, white pages, maps, weather forecasts, traffic reports, and demographic information. With Oracle*giAS* Wireless, an application can use data in a locally-hosted spatial database and using specialized tools (mapping, geocoders, routing) or it can access similar (mapping, geocoding and routing services) from an external provider. This gives the developer the choice of selecting those services to be hosted locally and those that are accessed remotely.

Using Oracle*gi* and Oracle Spatial, enterprises can store all their spatial and attribute data in-house and access this information using standard tools and applications. For companies that don't have the resources or data to locally host their location-based services, Oracle*giAS* Wireless can accept data from third-party providers using a suite of rich and extensible location interfaces that support a variety of geocoding, mapping, routing and yellow pages vendors. Combining these two approaches, Oracle*gi* and Oracle*giAS* Wireless provides a complete infrastructure to support both deploy both hosted and syndicated location services.

The Oracle*giAS* Wireless provides a set of APIs that enables pre-integrated web-enabled services for location related queries. This enables carriers to easily ingest different sources of location services providers worldwide using a single, consistent XML or Java interface. These interfaces allows seamless integration with existing location service vendors.

This API suite can be expanded to incorporate additional sources of online location services like real-time traffic, mobile positioning, and geodemographic services.

The Oracle location-based services differentiation

Oracle's integrated location-based Services capability is significantly differentiated from any technology on the market. See Table 2 for a list of Oracle's differentiating capabilities.

Link-Driven and Proprietary Location-Based Applications	Oracle <i>gi</i> , Oracle Spatial, and Oracle <i>giAS</i> Wireless
File based applications	Database-centered applications
Batch/off-line applications	Real-time transactions
Simple queries used by Portals	SQL queries integrated into e-business apps
Stovepipe applications	Open architecture
Link driven – no actual content	Dynamic links to content, online services
Not integrated with e-business services	Integrated with leading e-Business apps
Not enabled for wireless devices	Integrated platform for all wireless devices
Limited location services	Unlimited support for external services
B2C focus	B2C, B2B2C, & B2B focus
Limited platform availability	Multi-platform support
Limited scalability	Proven terabyte scalability
Limited support for 3 rd party tools	Supported by all leading IT tool vendors
Proprietary interfaces	SQL, XML and Java interfaces

Table 2: Benefits of Deploying *giAS* Wireless Location-Based Services

Third-Party Technology and Services

Oracle has leveraged a rich base of application, tools, and solutions partners for the delivery of location-based applications. These partner technologies have been certified to integrate into Oracle's location platform. Additional partners are being recruited on an ongoing basis and generally fall into three categories: tool vendors, content providers, and on-line service providers.

Conclusion

If your company is looking to deploy mobile applications as a way to improve business processes, increase revenue, or enhance service, delivering location-based services benefits with little added costs. Your company's location-based services strategy should require maximum flexibility and performance. With OraclegiAS Wireless you get both flexibility and performance. You can take content from any provider and make it available to any device. Built-in interfaces and partnerships with leading location-based services and technology providers enable quick access to the content for your developers. Since OraclegiAS Wireless is part of Oraclegi Application Server, you can get the highest performance possible. If you want to store and manage geographic and location-data yourself, you can leverage Oracle Spatial, an option to the industry-leading Oraclegi database.

Xavier Lopez

Oracle Corporation

World Headquarters

500 Oracle Parkway

Redwood Shores CA 94065

USA

Worldwide Inquiries:

Phone: +1.650.506.7000

Fax: +1.650.506.7200

www.oracle.com

Oracle is a registered trademark of Oracle Corporation. Various product and service names referenced herein may be trademarks of Oracle Corporation. All other product and service names mentioned may be trademarks of their respective owners.

Copyright © 2001 Oracle Corporation

All rights reserved