(Draft) Geoinformatics. 2002, vol. 5, nº 5, july/august 2002, p. 36-39.

Invited Contribution to GeoInformatics.

Deadline September 15, 2001.

Integration of location based services for Field support in CRM systems

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Customer relationship management solutions (CRM) are software applications that allow companies to find, grow, retain and serve customers (have a look at searchCRM.techtarget.com/ for extensive information). For companies using a CRM system, the business strategy is to enhance customer satisfaction and profitability, and therefore the main use of their information systems is oriented to this purpose.

Location is the most important information that allows selecting and filtering information considering the context of customers in the real world (where the client lives, where the nearest resources of the company are, etc.). Databases used by public administrations and enterprises have a lot of geospatial references (addresses, city distributions, cartographic coordinates, etc) that link information about customers with the real world. The exploitation of information about location of the customer and the company support services is basic in order to provide a personal service, and therefore is key information to help CRM processes satisfy customer needs.

Nowadays, the combination of mobile computers, such as laptops and PDAs, with wireless networks and location sensing systems (such as GPS) opens up new possibilities to associate location with each customer service and to track mobile resources of the company in real time. In a broad sense, services or applications that extend spatial information processing, or GIS capabilities to end users via the Internet and/or wireless communications are called Location-Based Services (LBS). The integration of LBS becomes an interesting opportunity to add value to all aspects of business beyond off-line analysis. As a result of this, CRM applications may operate over new sources of location information in order to provide better services, and it is in the area of field support where we will find the most promising applications.

CRM Systems and Field Support Applications in Internet

CRM applications can include specialized tools to support call centers (these range from the simple maintenance of outbound and inbound calls to the use of a knowledge base for troubleshooting problems), sales tracking (the tracking of the relationship with a customer over time, including functionality as the classification of customers by various metrics such as site activity or buying activity), and transactions (the scheduling and supporting of personal and resources to conduct business transactions). By connecting customers, employees, and partners to the enterprise trough a standard browser and Internet, CRM applications empower customers to help themselves online, and facilitate productivity of remote staff by having access to corporate resources no matter when or where they are doing business.

There exits several CRM systems which are sold independently, or typically as a part or as a complementary product of ERP systems: Siebel (www.siebel.com), J.D.Edwards (www.jdedwards.com), Baan (www.baan.com), SAP (www.sap.com), Clarify (www.clarify.com), Oracle (www.oracle.com), … A prototypical example of CRM is the *Vantive System*, from *PeopleSoft* (www.peoplesoft.com). *Vantive* exhibits a typical CRM functionality with a client-server solution that automates and integrates sales, marketing, call center, help desk, inventory, procurement, quality assurance, and field service. The integration of these applications optimizes customer interactions through the entire enterprise and across all customer contact channels, providing a complete view of the client that includes the insight about customers' buying patterns.

The importance of geographic context has made that traditionally CRM systems use location information within sales and marketing activities, doing analytical processes of customer information in order to locate and prioritize opportunities that may have been missed if geographic information is not considered. The use of Geographical Information System (GIS) functionality to manipulate spatial data (i.e. geocoding, visualization, spatial analysis, routing and address finding and geodemographics, as described in (Sonnen, D., ISSI and Morris, 2000), is necessary to derive this added value. However, as mentioned before, the integration of LBS opens up new opportunities within the CRM domain. Mobile professionals have access trough Internet to corporate resources, and they are also always reachable no matter where travel takes them. Moreover, it is possible to associate a location with all activities developed by mobile professionals. Location information is not reduced to where a transaction is made, now it is also possible to track mobile professionals in real time, and therefore to schedule taking account this information.

LBS in CRM Field Services

Although geoinformation may have significant value all around the CRM system components, most of the functionality related with the potential use of LBS is organized around the Field Service component (as it is called in the Vantive CRM system). This component schedules for the technicians who perform services at customer sites, managing field service orders and technician assignments (installation or maintenance teams, or third party providers). On the other hand, the Internet increases field service effectiveness providing support for contacting field service technicians through mobile communications and allows them to track and log actions with minimal data entry. Various potential kinds of LBS users can be identified as clients around the Field Service module (figure 1 shows a typical use case):

- **Service managers** who receive service orders via telephone or mail and complete the data of the service agreement and provide resources (field personal) in order to complete it. The most interesting added functionality for service managers is the visualization of the location of all resources (providers, field technicians, stores, etc.) and service order addresses. Field service allows the scheduling of service orders in accordance with different criteria such as the skills, or the workload and availability of technicians. However, a visualization of the real-time location of field technicians may improve the scheduling. Visualization functionality, and mobile personal tracking would allow service manager to visualize planned routes and assign the nearest field service personal.
- **Field service personal** who delivers services. Field technicians use standard web browsers to monitor, update and close assigned service orders using Internet. Service orders may be visualized on a digital map in order to localize client addresses and choose the best route to accomplish the workload. Field technician vehicles or mobile phones may incorporate a GPS device, providing locations in real time to the service manager. It is also possible to notify state changes and consult the *Vantive* database through Wap.
- **Service customers** who are served by field service personal and may want to be informed about the progress of their service requests by on line Internet access.

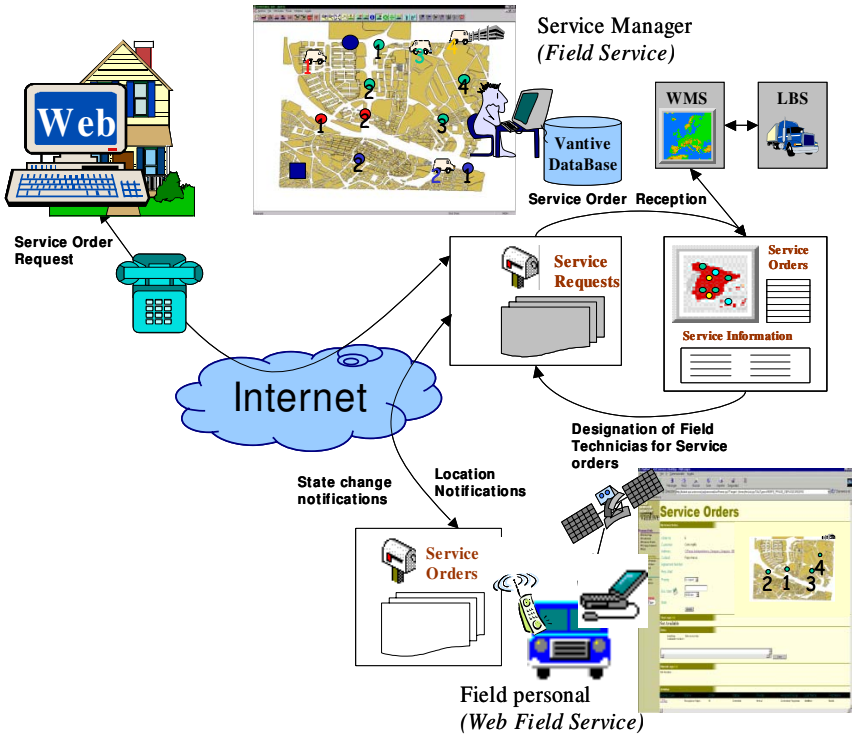

Figure 1. LBS in a CRM Field Service use case.

We have classified the integration of LBS in three levels depending on the functional power of technological components that can be used (as much is the functionality provided for LBS in the software components, as easy is the integration for the developer).

First level: Developers Need to Add Complete LBS Functionality

The incorporation of LBS functionality basically implies two aspects. On the one hand, geoprocessing components mainly used for addressing, visualization and routing, and on the other hand, enough amounts of geodata. Most of actual CRM products do not include, in general, direct support for LBS (perhaps because it is a too recent concept), and there is no specific built-in forms, APIs, objects or functions for that. However, consulting companies customizing CRM software can aggregate any new functionality, and they are already including some kind of basic LBS by its own means.

A typical way to do that is using a commercial GIS tool which access directly to the CRM database or through the application environment. The programmer must create the functionality with the tool and have a significant work to adequately access to the database, whereas this new functionality

remains quite separated from the CRM application. This is the favorite approach of GIS tool vendors such as MapInfo with its MapInsight proposal. One way to reduce this separation is using map object libraries with the inconvenience of more programming needs.

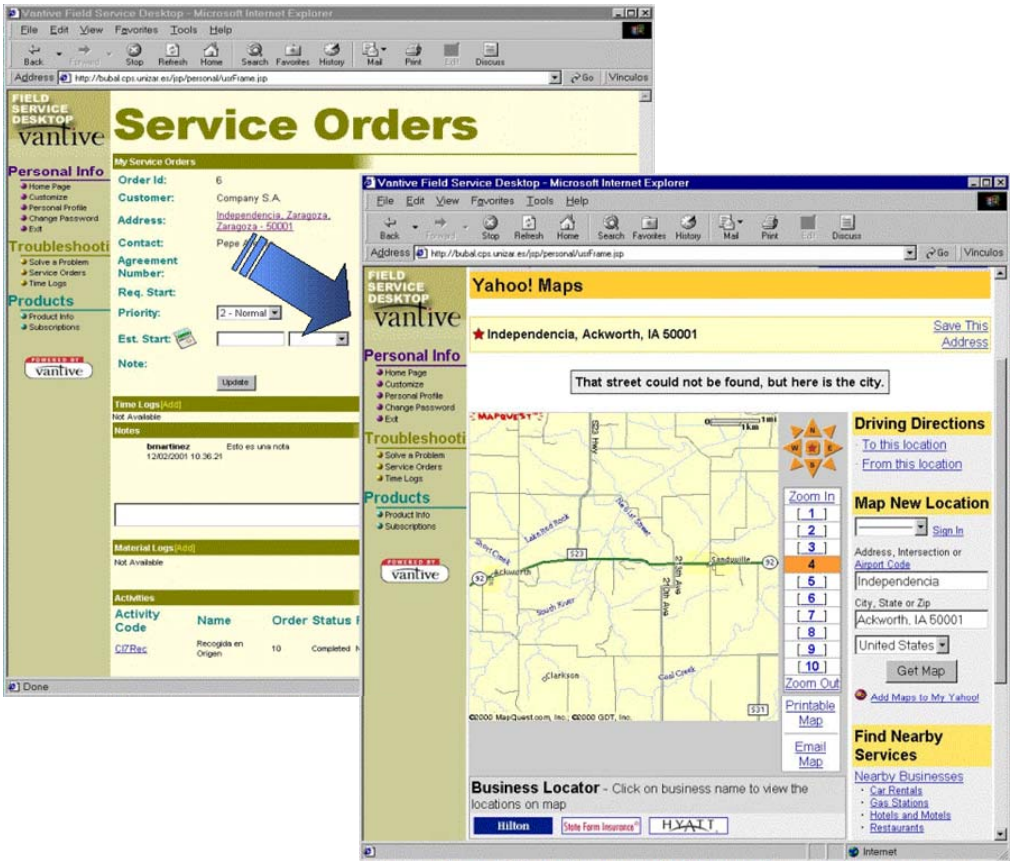

Figure 2. Demo Software of Vantive's Web Field Service using a third party Internet provider.

An additional problem is the geodata needs because it may vary a lot with the geographic area of interest and the company activity, and it may be quite expensive (at least in Europe). Internet facilitates an interesting mechanism to incorporate addressing and visualization features at significantly lower costs. Let us have a look at the example pointed out in the demo software of Vantive's Web Field Service illustrated in figure 2. The figure shows a web page accessible by field personal where service order addresses have links showing the selected location on a map. The map is easily requested to a third party Internet map provider using HTTP protocol (http://maps.yahoo.com/

was use in this case). This approach is cheap but, of course, has many limitations: provider must assume that addresses are located in United States or Canada, only an address on the map may be shown at a time, it is very difficult to add functionality or to get a higher interoperation level with the application, service specific interface is not standardized, …

Second level: Integration of Standard Internet Geoinformation Services

Despite the commented limitations, the use of Internet geoinformation-geoprocessing services is becoming the main R&D direction and it has a very promising future. Let us go first into some relevant technological aspects of this direction which have been headed by the Open GIS Consortium (OGC). The OGC has given determined steps to define vendor-neutral interoperable framework for web-based access, integration, analysis and visualization of multiple online geodata sources. The OGC defines and promotes a coherent model of heterogeneous services and clients interoperating in a distributed computer platform, and uses a standards-based interface approach. The OGC specifies web interfaces using the HTTP protocol, and an encoding specification for geodata in GML (a geographic adaptation of XML) that enables the transport and storage of geographic information. This approach not only solves interoperability problems but also allows the reuse of geodata and geoprocessing capabilities between different applications. With this technology it is possible to establish web based applications that dynamically access sharing georeferenced information and geoprocessing resources among multiple network-accessible providers.

Several specifications have already reached enough maturity and are demonstrating high levels of usefulness, whereas some others are still drafts but with high acceptation and interest. For the LBS integration in CRM, we can speak about: web map servers (generates and provides maps as rendered raster data), geocoder servers (they transform a textual term or code, such as an address, place name, o telephone number, into a location) and web features servers (provide geographic features on request). Figure 3 illustrates an example of a Vantive's Web Field Service page that uses these services to visualize a map with the addresses that must visit a field service technician. It is possible to request the Web Map Server to visualize a map with returned features in GML provided by a geocoder. Web pages of the Field Server application has been customized to retrieve from the *Vantive* database the services assigned to a technician, and request the map server a map showing all these addresses whose locations has been provided by a geocoder.

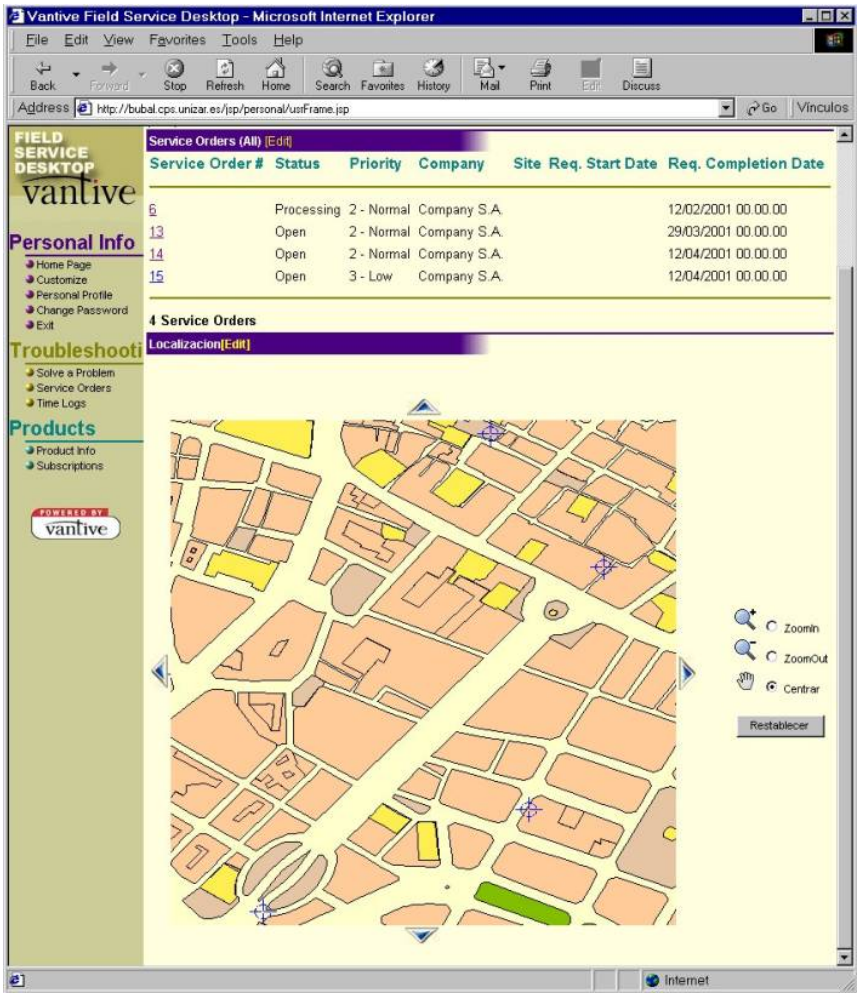

Figure 3. Service orders web page accessing to web map and geocoding services.

Third level: The future of integration of standard LBS services

The services based strategy illustrated before establish the software architecture basis for integration of LBS. However, the reader can feel certain limitations on the service functionality which seem constrained to general purpose GIS characteristics. This is true and implies that the developers are not provided with more specific service components to easy the search of location or tracking information. This problem arose in the GIS and telecommunications communities, which generated last year open

standardization initiatives such as OpenLS (www.openls.org, from the Open GIS Consortium) and LIF (www.locationforum.org, from Ericsson, Motorola and Nokia). The appearance of telecommunication companies interested in LBS is because the telecommunication operators must directly provide part of the services. On the other hand, LIF has not seem very active so far whereas OpenLS has already closed a call for participation for a testbed (OpenGIS Consortium, 2001). This document contains very interesting ideas for more specific components that give the perspective of LBS in the future and open significant opportunities to easy the task of LBS integration in general, and in CRM in particular.

In addition to the components used at the second level, several of new proposed services seem more specially useful for LBS integrating in CRM: get location service, directory services (proximity and pinpoint), tracking services (proximity and pinpoint), route services (determine route, display route vectors and display route directions). There are more services proposed but they seem more tangential to CRM, and, on the other hand, there is still work to do to clarify services chaining.

Conclusions

CRM is having an increasing penetration with the new possibilities opened to access to customers because recent developments of voice and data communication infrastructures. The integration of LBS with CRM mainly in the field support area, may have enormous value for field technicians, service managers and customers to improve their working conditions and relations. Commercial CRM systems have little direct support for LBS, which must be coupled and have limited interaction. The technological tendency goes in favor of interoperation with standard geoinformation-geoprocessing services that may be provided by third parts. GIS and telecommunication communities are glimpsing a big future for LBS and they have promoted strong standardization initiatives for specialized services, some of them will be directly provided by telecommunication operators. These services will easy and make cheaper the incorporation of LBS in CRM systems.

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