Chapter 3.14
Bridging the Gap:
Connecting Internet–Based Spatial Decision Support Systems to the Field–Based Personnel with Real Time Wireless Mobile GIS Applications

Ming-Hsiang Tsou
San Diego State University, USA

ABSTRACT

Internet GIS provides a collaborative communication environment for sharing data, information, and knowledge. Mobile GIS can add both geospatial information and global positional systems (GPS) coordinates from remotely located field-based personnel to spatial decision support systems (SDSS). By adopting broadband wireless telecommunication technology for connecting Internet GIS and mobile GIS devices, decision makers can gather near real-time information from field personnel and, equally quickly, distribute updated information back to the field. This chapter introduces a collaborative GIS prototype that demonstrates an interoperable framework for combining Web-based GIS technologies and wireless mobile GIS applications. The integrated framework provides real-time or near real-time GIS data update functions (such as adding new spatially located map features or GPS tracking locations) between mobile GIS devices and Internet GIS servers. Although these real-time GIS functions can be very important during time-urgent emergencies, they can be equally beneficial and highly cost effective during routine field activities.

INTRODUCTION

Internet GIS (Peng & Tsou, 2003) can facilitate the implementation of collaborative GIS in the form of a Web-based spatial decision support system (SDSS) having remote communication channels. Currently, the greatest challenge for Web-based spatial decision support systems is the creation of a real-time or near real-time GIS-based com-

munication channels between senior decision makers and multiple in-field personnel (such as first-responders). The objective of this book chapter is to introduce an integrated collaborative GIS architecture that combines Web-based GIS and wireless mobile GIS with a spatial decision support system. By adopting wireless telecommunication technology and advanced Internet GIS tools, decision makers can benefit from real-time information obtained from in-field personnel. In turn, in-field personnel benefit from more timely updated information from decision makers. The two-way communication mechanism between in-field personnel (*in situ* agents) and decision makers can facilitate a better and timelier decision-making process. Such an integrated framework combined with a client-side wireless mobile GIS application and a server-side Web-based decision support system will help optimize field-based management tasks, whether they are time urgent such as emergency dispatch, or a more mundane utility service call.

Both mobile GIS and Internet GIS technologies have been available for almost 10 years. However, very few collaborative GIS projects or spatial decision support systems have adopted both technologies for collaborative work. A principle problem has been the lack of comprehensive communication framework to combine Internet GIS and mobile GIS. Recent dramatic progress in broadband wireless technology has opened a new direction for connecting Internet GIS and mobile GIS with collaborative GIS architectures. Moreover, the GIS community is working on the establishment of interoperability standards, network-based GIS communication protocols, and XML-based geospatial data structure. These efforts from the GIS and telecommunication communities are beginning to facilitate the seamless integration of mobile GIS and Internet GIS.

Figure 1 displays an integrated spatial decision support system prototype that demonstrates an interoperable framework for combining Web-based GIS technologies and wireless mobile GIS applications. The major consideration of this prototype framework is to facilitate the interoperability between heterogeneous systems and platforms. To enhance interoperability, the integrated SDSS utilized a standardized Web-mapping interface, along with OGC Web Map Service (WMS) interfaces (provided by ESRI's ArcIMS OGC WMS connector) to provide online mapping functions and the display of remotely sensed data. By adopting XML-based metadata frameworks (ISO 19115 standard, 2003), multiple network-based geospatial information servers

Figure 1. Interoperable framework for Internet-based spatial decision support systems and wireless mobile GIS applications