BIOGRAPHICAL INFORMATION

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Specific Responsibilities
Mr. Solomine is the Director of Sales and Marketing for CompassCom's software and services offerings. Mr. Solomine has been an employee of CompassCom for four years and is involved in all phases of software system integration and design, including, but not limited to: product development, needs assessment, project management, marketing, sales, and new business development.

Past Experience
Prior to joining the CompassCom team, Mr. Solomine was a strategic consultant for the telecommunications division of a big 5-consulting firm. Here Mr. Solomine was involved in e-development and project management for solutions ranging from wireless Internet applications to mobile commerce.

Educational Information
Master of Science – Information Technology, University of Denver, Daniels College of Business

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Bachelor of Science – Integrated Science and Technology, James Madison University

Professional Memberships
APCO (Association of Public Safety Communication Officials)

Mr. Solomine has spoken at various trade shows including his presentation 'AVL for Mutual Aid During the 2002 Salt Lake Winter Games' which was presented at the 2002 NENA National Conference. Mr. Solomine was also recently profiled in Washington Technology Magazine's article 'Rugged Wireless Modems Track Public Vehicles' in November 2003.

Mobile GIS, Tracking and Wireless Solutions for Utilities

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ABSTRACT

As access to real-time and spatial data increases, the need for and benefits from Geographic Information Systems (GIS) has become more prevalent for utility organizations. This session will overview the need, uses and applications of GIS and will illustrate innovative solutions in the fields of Mobile Resource Management (MRM), in-vehicle mapping, Automatic Vehicle Location Systems/Mobile Asset Tracking, and workflow management applications. The session can serve as an introduction for beginner GIS users as well as an industry update for intermediate and advanced users. Focus will be placed on the integration of real-time data with GIS, linking appropriate files to GIS, and historical analysis of GIS data to improve response and operational effectiveness.

INTRODUCTION

There it is. Oops, I meant there it was. Mobile GIS is an oxymoron like jumbo shrimp. Geographies – unless we're talking about tectonic plates or volcanic explosions – aren't mobile they're static. Things move *on* geographies. Having an integrated means of managing the movement across geographies, in real time using your GIS software investments is the core of Mobile Resource Management.

Mobile Resource Management, or MRM, is a process that incorporates GIS, GPS and wireless communications technologies with the strategies and concepts of "command and control" born from strategic defense initiatives. Think of MRM in terms of the OSI stack – GIS is the application layer where the information is graphically presented and managed; GPS is the physical layer producing the positioning and status messages; and the array of wireless protocols provide the network and transport layers – in the MRM stack. The key component in the MRM stack is the engine that takes all the GPS data and transforms them into useful information for the GIS application software running on client terminals. It is this transformation – data link, session and presentation layers in OSI parlance – that allows GIS to move.

There are three basic data types in MRM – location, status and messages. Location tells you where things are. Nice, but a whole lot of inference on the part of the user is required to make useful decisions with this limited data set. AVL (Automatic Vehicle Location) and LBS (Location Based Services) are two popular terms used to describe this today. Nice. Interesting. But these are of limited real use for asset managers. Watching vehicles move down the pike –

even when speed and heading are inferred – provides limited decision support information. MRM adds two elements of real-time information, status and messaging, presented through existing GIS applications. Going beyond where, MRM provides the manager with real time capabilities to understand the status of the mobile asset – have the lanyards been deployed on the cherry picker, has the safety belt been closed around the technician in the cherry picker – and two-way messaging – stop the basket extension because the lanyards haven't been deployed – to allow for real time asset management.

In addition to the data types there are four main physical components of any Mobile Resource Management solution. Each will be discussed below and practical uses within industry will be highlighted.

MOBILE HARDWARE

The starting point of any MRM system is the data collection system tied to the mobile asset. Honoring the adage 'garbage in garbage out', the quality and accuracy of the data delivered is tied directly to the strength, capabilities and effectiveness of the end-point device deployed. When thinking through the myriad options available – from simplistic 'black boxes' to full-functioning laptop computers – form, function and features are the three decision variables to consider. The most common components found are ruggedized computers (either fixed or hand-held) and wireless modems. Many times these devices are integrated within one platform. Two commonly found solutions are the Panasonic Toughbook series of ruggedized computers running Windows and the Trimble Geo Series of GPS data collection devices running Windows CE. Not only are today's devices many times designed to military spec stands for shock, dust, vibration and humidity, but are actually readable in direct sunlight. These devices enable access to useful mobile applications in the most rugged terrains or operating conditions.

Beyond the computers running in the field, many organizations have now added ruggedized modems for wireless data transfer and real-time communication with other mobile users, mobile supervisors and centralized dispatch.

In my experience, most clients seek to minimize the cost of the mobile hardware. While price is certainly a critical variable, I remind you that you get what you pay for. And another reminder about the mobile hardware: if it breaks you're not going to get any data into your data management system – unmoving GIS is not a pretty picture.

WIRELESS COMMUNICATIONS

The second critical link in the MRM chain is the communications network deployed. It doesn't do you a whole lot of good to collect all these valuable decision variables and have no ability to get them to the decision maker. As discussed, many users are now beginning to link the mobile computing experience with a real-time link to centralized operations. There are many strategies employed for this purpose and a few of the commonly used transmission mediums will be discussed below.

Private Mobile Radio (PMR)

Although PMR has been used for years for voice communications, organizations are now extending its ability for wireless data transmission. In just about every flavor of UHF, VHF and 800MhZ in either conventional or trunked modes, RF has become a secure and stable medium that requires little recurring costs. Common data hardware systems that are now used include Motorola RDLAP and Dataradio networks. These networks can not only transmit data in speeds of roughly 19.2 kbps, but also can be optimized and IP-enabled with middleware applications such as Radio IP. When set up in this mode, RF provides field users with wide range coverage that enables their TCP/IP-based mobile application to function as if they were connected to a LAN, albeit at a slower speed.

Terrestrial Commercial Networks

With the replacement of the legacy CDPD networks to be completed this year, two new standards for high-speed data have emerged; GPRS and 1xRTT communications. GPRS (and its enhanced cousins EDGE and UMTS), have been adopted by carries such as AT&T Wireless, Cingular and T-Mobile, while 1xRTT (and its current flavor EvDO), have been embraced by Sprint and Verizon. Although utilizing different over-the-air protocols, both networks achieve the same goals; native TCP/IP support and 3rd Generation wireless speeds. These networks and their enhanced derivatives now offer wireless speeds twice the rate of dial-up modems and will soon surpass DSL.

Satellite

As more and more satellite networks are launched throughout the world, competition for subscribers has increased, driving recurring costs down. From geostationary to low-earth orbit satellite networks, users now have myriad of options for wireless connectivity that can provide 100% coverage areas.

802.11

Although not commonly used for wide area connectivity, 802.11 has established itself as an excellent medium for remote software and data synchronization/updates within hot spots. Hot spots are commonly installed in refueling areas, maintenance facilities, and parking locations. In addition, 802.11 also can serve as local backhaul when an in-vehicle computer is removed from the vehicle by passing data from the device to a vehicle-mounted modem.

Singularly or in combination, there is a wireless communications option available anywhere in the world to link the mobile hardware to the MRM command center. The choice of network boils down to understanding the deployment characteristics of your mobile assets and the criticality of data feeds. The combination of these two elements will dictate the best network choice selection.

GIS, CAD AND DOCUMENT DATA ELEMENTS

Data elements are simply that, elements from which useful information and conclusions can be derived. From Geographic Information Systems, Computer Aided Drawings, and Photographs to Digital Documents, all elements are important and need to be accessed in real-time and on-demand for many mission critical applications. Vetting the various data points available is a

critical component used to determine both the mobile hardware and the communications network you choose. In my experience the hardware and communications decisions made often times underestimate the fertile imaginations of data users. You have to strike a critical balance between what's nice to know and what you need to know to be effective. Through a thoughtful examination of both current and future data elements, the mobile hardware and communications network investments made are both simplified and more accurate.

SYSTEM SOFTWARE

Once the in-vehicle hardware, wireless infrastructure and data elements are in place, software applications have emerged to provide a fully integrated view – both in the field and at the command center. And, in turn, software applications have integrated with each other to complete an entire operational picture. The following example illustrates this convergence with a real-world example.

As the cost of wireless hardware and modems has decreased, markets such as Automatic Vehicle Location (AVL) and Mobile Asset Tracking have emerged. These technologies capture real-time location data from mobile assets and transmit it live via a wireless network. As a stand-alone application, this system has marginal value. However, coupled with a Computer-Aided Dispatch system, the utility of this data takes on a more important role. By comparing known service order request locations coupled with real-time location data, CAD systems can now make intelligent decisions based on spatial locations, status of mobile assets and locations of required response.

To further this convergence of applications, CAD systems will next dispatch the appropriate resource. Here the mobile hardware, applications and data elements enter the equation. By employing in-vehicle mapping on computers, field users can now use their GIS data for field routing, navigation and mapping. Further field users can communicate their status (en route, at location, performing work, etc.) in real-time back to CAD. Once the dispatch message is displayed and the location is arrived at, mobile users can then dig deeper into applications to pull useful information from the data elements. Applications now have the ability to link disparate data sets (e.g. GIS with CAD drawings or building photographs) to create one interlinked tactical picture to make more efficient decisions in the field while removing the time and inconvenience associated with paper documentation.

CONCLUSION

By taking a holistic view of the need – capturing, delivering and presenting the data to make meaningful decisions in real time – MRM allows you to make GIS move. Going beyond vehicles on a map, MRM allows you to achieve real time decisions and communicate these decisions to deployed mobile resources. With a relatively small incremental cost, you can move beyond knowing where your mobile assets reside on a map to include what they're doing, when they're doing it and controlling how and why your mobile assets perform their work.

MRM provides you the ability to orchestrate in real time the effective and efficient use of your mobile assets, saving time, saving money and in many cases saving lives. The return characteristics on the small incremental investment needed to turn vehicles on a map into a resource management tool is significant. In my experience the 15% to 20% up-front investment needed to go beyond simple asset location and tracking systems to a full-functioned MRM solution is less than a year.

MRM moves your existing GIS investments to a new level of efficiency and effectiveness providing you the power of real time command and control of your mobile resources.