

BIOGRAPHICAL INFORMATION – AUTHOR 1

Michael Forbes
Vice President, Marketing & Product Development
LinksPoint

Specific Responsibilities

Mr. Forbes is responsible for overseeing the marketing and product development activities for LinksPoint. He directs the company's marketing activities including marketing strategy, promotion, advertising and public relations. Mr. Forbes is also responsible for development of new products including market analysis and product specification and interface requirement development.

Past Experience

Prior to joining LinksPoint, Mr. Forbes was vice president of marketing for i3 Mobile, where he worked to create text-messaging based services, including the first wireless e-commerce and advertising program in North America. Prior to i3 Mobile, he spent a number of years with The Columbia House Company, where he was a key member of the team that launched the company's first e-commerce sites.

Educational Information

Mr. Forbes holds a Bachelor of Arts in Communication from DePauw University.

Professional Memberships

Past-founding director of CT chapter of Intelligent Transportation Society-US
Past representative member of the Wireless Multimedia Forum
American Mosquito Control Association
GITA – ITAG committee

BIOGRAPHICAL INFORMATION – AUTHOR 2

Strite Potter
President
LinksPoint

Specific Responsibilities

Strite Potter is a founder and the President of LinksPoint, a mobile data company focused on providing complete enterprise solutions built around geospatial information and location technologies. The Company provides unique experience in the integration of Global Positioning System (GPS), Geographic Information Systems (GIS) and mobile data. LinksPoint also designs and manufactures GPS receivers for mobile computing devices and ruggedized handheld computers. Strite directs the Company's marketing, sales, product, business development and strategic initiatives

Past Experience

Previous to founding LinksPoint, Strite worked in research successively at Rockefeller University, Columbia University and Cornell University. He is a noted writer and speaker in the emerging field of mobile information technology.

Educational Information

B.A. – Literature, University of Richmond

Professional Memberships

GITA
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**GPS APPLICATIONS IN MOTION:
MOVING BEYOND AUTOMATIC VEHICLE LOCATION
TO FULL ENTERPRISE INTEGRATION**

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ABSTRACT

With Global Positioning System (GPS) technology now available on mobile devices such as handheld computers and cellular phones, there are many new ways GPS can improve operating efficiency and give managers control over areas that have largely been out of reach. While the use of GPS for real-time tracking of vehicles for dispatch operations is well known, the integration of GPS with mobile technologies has allowed the creation of new classes of capabilities for enterprises in the field including:

- Location Verification – GPS in handheld devices allows transactions to now have “location stamps” in addition to time stamps. From verifying that activities occurred in the proper location to adding location information to service calls, to collecting exact customer locations for use in ERP – GPS can improve operations and customer service.
- Route Analysis – GPS used for vehicle history tracking allows an enterprise to monitor the travel patterns, stop durations and safety violations for their fleets in the field, without the added cost and complexity of real-time systems. If route optimization is being conducted, vehicle history tracking can be used to measure driver compliance with planned routes.
- Mobile Navigation – GPS and navigation software can be integrated with solutions for work order management or route accounting on a mobile device to provide drivers with real-time turn-by-turn driving directions. This can allow drivers to more effectively reach customer locations and improve on-time performance, with the goal of adding more calls or stops per day.

INTRODUCTION: THE “LOCATION-ENABLED ENTERPRISE”

The value of Global Positioning System (GPS) technology for the real-time tracking of vehicles has been established in a number of industries. From tracking the movements of long haul trucks on our nation’s highways, to improving the efficiency of field service dispatch operations, GPS has proven its worth to enterprise and government users. But as the technology

continues to mature, GPS offers organizations the prospect of turning themselves into “location-enabled enterprises” to take advantage of new capabilities that can further improve operations in the field.

Making the *location-enabled enterprise* possible is the integration of GPS technology into mobile and handheld computing devices. This technology shift is making location an intrinsic part of field activities and the decision making process, with GPS positioning data now available to users in the field, and supervisors in the back office. The result is greater efficiency for mobile operations coupled with significant return on investment.

The cost and complexity of mobile GPS solutions had previously limited their use to very specific engineering and asset management functions. The technology was expensive and required highly-trained technicians to be effective. These constraints also limited the mindset of company planners who could not consider the location dimension of processes in the field when deploying mobile automation solutions. Using low-cost GPS receivers with handheld computers and cellular phones allows a much larger percentage of the workforce in the field to have location capabilities. Because of this, the “where” dimension can now be considered as a key component in any mobile project.

In the *location-enabled enterprise* virtually every field worker can have location at his or her disposal to do a better job. This can mean better validation of activities in the field, more efficient use of time and even increased safety. This can be seen in the applications described below, but it doesn’t stop there. The power of location information is such that every manager should review their activities in the field and challenge their processes to uncover the specific and unique ways location can improve their operations.

In this paper we will review a few of these new uses for GPS technology and review the challenges and benefits of deploying GPS for location verification, route analysis and mobile navigation.

GPS FOR LOCATION VERIFICATION

The idea of using GPS for field asset management and engineering is well established by organizations that rely on GIS. This has usually taken the form of using high-end mobile GPS systems to take precise location measurements of inventory in the field. A location is associated with an asset or piece of infrastructure for use in GIS and CIS applications.

New GPS technologies in mobile devices offer organizations the opportunity to more deeply integrate location into their activities in the field. More workers can include a location component in their interactions with assets. Of potentially greater importance, enterprises can move beyond simply attaching location information to physical things and begin associating location with specific activities and transactions.

An example of how location can be more broadly used in an organization to manage assets involves a utility company that made GPS a part of their mobile solution to manage the

replacement of conventional meters with wireless meters for automatic meter reading (AMR). As each obsolete meter was swapped out for an AMR meter, the technician recorded a number of pieces of information about the meter and GPS allowed for the collection of latitude and longitude information for the meter. The utility then uses this location information to plan more effective routes for mobile collection vehicles that drive by meter locations and wirelessly download usage data from the AMR meters.

This example represents the evolution of the *location-enabled enterprise* from engineering to operational usage:

- The asset being tracked was a low-value meter versus a high-value piece of infrastructure such as a utility pole or valve.
- The level of GPS precision needed for this application was well within the 3-5 meters delivered by handheld GPS devices.
- The location information was incorporated into a mobile computing application that also recorded customer and meter information.
- The entire process was conducted by a meter installer, rather than a trained GIS technician.
- The data collected had value in documenting the utility's infrastructure in its GIS, but also allowed for the more effective completion of another operational task (routing the vehicles that read the meters).

In this case, GPS resulted in numerous operational benefits with a minimum of costs. The same concept of collecting location data on assets other than major pieces of infrastructure should also be considered. This is especially significant for customer locations, where the street address may not correspond to the location required by a field worker. An example of this could be a business where the street address fronts on one street, while the service area or entrance is found on another. Or a delivery address where the loading dock does not correspond with the address for the "front door." The use of this kind of information, especially with GPS navigation technology can be highly valuable, as actual work locations can be imported as "Points of Interest" into many navigation systems.

The value of GPS begins to increase dramatically when it is integrated with business processes in the field to improve efficiency and accountability. Mobile computing has made it possible to automate the management and documentation of activities in the field. Workers routinely use mobile computing systems that manage their activities and allow them to keep records digitally, rather than on paper. GPS allows these transactions and activities to be validated in both time and space. In the "location-enabled enterprise," it is possible to confirm that activities happened both where and when they were supposed to, providing a new level of confidence that work is being conducted properly in the field.

An example of "Geostamping," or how GPS can be used to record that something happened at a given time and place, involves a cable TV services provider. As many readers know from personal experience, when the cable installer or service technician shows up for a scheduled call can often be a bone of contention. But what is less well known is that it is nearly as likely for the customer not to be on site at the time of the call as the driver. Inability to complete an installation or service call costs the cable company in terms of wasted time, fuel and decreased

productivity. To address this problem one cable company added GPS to their handheld computer-based mobile work order management system. This allowed a time and location to be attached to every call. This eliminated the “he said – she said” dilemma of technicians and customers each claiming to have been at the customer’s house at the appointed time. This innovation improved overall customer service and reduced customer complaints as the company could now prove when and where technicians were in relation to each call.

Another area where “Geostamping” can add considerable value is in conducting inspections. GPS-based validation of inspection location adds a new level of accountability for inspectors. This, in turn, promises to increase the quality of inspection data collected in the field. While less colorful than the cable example, geographic validation of inspections offers a powerful tool for increasing inspection quality and, thus, overall efficiency and safety.

GPS FOR ROUTE ANALYSIS

As noted, GPS has an established value proposition when used for the real-time tracking and dispatch of vehicles. While it may at first seem counter-intuitive, GPS tracking can potentially provide even greater value when used to review information on vehicle travel history after the fact. There is a wealth of information that can be gleaned from vehicle travel history that can be used to improve field performance, improve fleet safety and give managers an unprecedented view into what actually happens in the field.

This process, often called “breadcrumbing,” records, analyzes and recreates activity that previously occurred in the field. Monitoring “breadcrumb trails” that accurately depict where and when a vehicle went in detail can help organizations unmask inefficient routing, identify patterns in how different types of customers are serviced and help combat unsatisfactory driver behavior. In the “location-enabled enterprise,” “breadcrumbing” can help save fuel and maintenance costs, increase productivity, improve safety and provide insights into field activity that can improve overall service.

There are many examples of the advantages of using GPS “breadcrumbing.” By recording driving speed, companies can deter speeding and gain valuable documentation in case of accidents or insurance disputes. This alone is a significant benefit since, according to the Federal Highway Safety Administration, excessive speed is a major factor in 30% of fatal commercial vehicle accidents. The ability to measure stop times can serve as a “supervisor in the field,” protecting the organization against unauthorized or excessive work breaks by drivers and helping control out-of-hours use of equipment and moonlighting. GPS information can also provide documentation to show compliance with union agreements or hours-of-service rules for truck drivers.

“Breadcrumbing” goes hand in hand with route optimization and work order management, where GPS data can be used to analyze route activity and plan the most efficient routes and workforce assignments. To put it simply, Route optimization plans the most efficient routes and “breadcrumbing” shows if they were followed. The GPS system provides data such as travel times between stops, slowdown areas and wait times that route planning, fleet management,

dispatch and other software applications can use to perform at their best. By basing calculations on actual, accurate data from the field, software can optimize routes to reduce miles driven, improve utilization of fleet equipment and raise mobile worker productivity.

Examples of the benefits that “breadcrumbing” can provide the *location-enabled enterprise* include:

- A large commercial bakery that uses GPS to monitor vehicle speed to improve fleet safety and decrease insurance costs.
- A home delivery company that uses GPS-based stop information to develop customer specific stop duration expectations for their route planning system.
- A uniform delivery service that is monitoring actual vehicle travel to “audit” the routes created by their route optimization system
- A public safety agency that uses GPS to monitor that its officers are patrolling their assigned areas in an appropriate manner.
- A construction company tracking pick-up and delivery activities to reduce theft of construction materials.
- A municipality that is tracking its inspectors to discourage unauthorized stops between inspections.

GPS-BASED VEHICLE NAVIGATION

One of the best-known uses of GPS technology is to provide “turn-by-turn” driving directions to the user in real-time. Automobile manufacturers have embraced navigation as a “killer” consumer application, as evidenced by the almost ubiquitous presence of navigation systems in high-end car advertising. Most consumer users rate their GPS navigation systems as highly useful. Similar solutions have historically been less attractive to enterprise users due to these systems’ reliance on expense and complex standalone technology requiring proprietary, single-purpose hardware. The good news is that, as we’ve seen in “geostamping” and “breadcrumbing,” the development of GPS technology for mobile computers has also put GPS navigation within the reach of the “location-enabled enterprise.”

Vehicle Navigation systems use GPS to calculate the user’s current position and navigation algorithms to calculate the best route to the user’s planned destination. Navigation software on a handheld or other computer then provides the directions, which may be in the form of a digital map, turn-by-turn text directions on the computer screen, or voice instructions through text-to-speech output. “Spoken” instructions are typically the best for enterprise users as this “eyes free display” doesn’t require the driver to take his or her eyes off the road to look at the screen. Some handheld computer based navigation systems include software developer’s kits that allow them to be integrated with other mobile applications, so that, for example, a work order management system could include a “Navigate” button that allows a field worker to get help if he or she doesn’t know how to get to a destination.

Organizations can benefit from navigation systems the same way millions of lost drivers have. If mobile workers become lost or need directions to their next service or delivery location, a

GPS navigation system can provide accurate driving directions. Drivers spend less non-productive time searching for locations or stopping to ask for directions and increase customer satisfaction with better on-time performance. Besides saving time, GPS-assisted navigation also saves money by reducing fuel costs for driving while lost or taking indirect routes.

Examples of enterprises that have successfully deployed GPS Navigation are a home food delivery company that reduced “driver lost” time and added more stops per day, and a cable company that was able to increase the on-time performance of its repair crews by eliminating the need for drivers to find customer locations on maps.

CONCLUSION

Innovations in GPS technology have greatly increased the options available to the enterprise user – and the potential value to the enterprise. Real-time tracking represented the first wave in moving toward the *location-enabled enterprise*. The availability of GPS in mobile computers and other mobile devices has opened up a new range of capabilities and solutions that can make the *location-enabled enterprise* a reality today. From geographically verifying transactions and asset locations, to GPS-based analysis of field activities and navigation, the technology provides transparency into and control over mobile operations that were never before possible.