



LinksPoint White Paper

GPS Applications for Motorola[®] Mobile Computers

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The purpose of this paper is to provide an overview of GPS and its applications for Motorola Mobile Computers. It highlights the most common mobility applications with GPS and provides guidance to their business benefit.

Also refer to: *GPS Options for Motorola Mobile Computers*

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GPS Options for Motorola Mobile Computers

The Global Positioning System (GPS) is a revolutionary technology that is changing the way businesses operate in the field. From its origin as a military navigation technology to its use for “black box” tracking of trucks on the road, GPS technology has proven its worth to enterprises world wide.

The integration of LinksPoint GPS solutions with Motorola mobile computers is making location information available in real time as an intrinsic part of field activities and the business decision making process. GPS location data is now accessible by users in the field and supervisors in the back office, providing greater visibility to operations and giving managers better control over operations in ways that have previously been impossible.

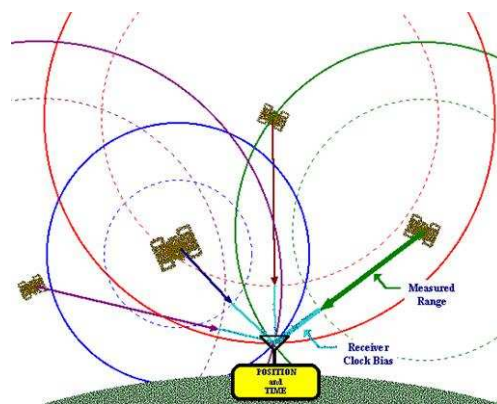
What this means for mobile enterprises is that, for the first time, GPS can be tightly integrated into current business applications that utilize Motorola mobile computers. The result allows for increasing productivity, lower operational costs and improved safety – with all these benefits leveraging the enterprises’ investment in mobile computers.

This white paper provides an overview of the types of applications and the specific benefits that GPS solutions can bring to Motorola mobile computer users. For more information on GPS receiver options and considerations for deploying a GPS solution, please see the companion white paper, *GPS Options for Motorola Mobile Computers*.

What is GPS?

The Global Positioning System, or GPS, is a satellite-based navigation system. It was developed by the United States Department of Defense (DOD) for military and government use, but the information it provides is now available free for civilian and commercial uses worldwide.

From complex military applications to handheld receivers carried by hikers, GPS offers a wide range of applications and uses. Between these two ends of the spectrum, GPS technology can provide mobile enterprises with a number of significant benefits.



Source: P.H. Dana

The first GPS satellite was launched in 1978. The full constellation of 24 satellites was in place in 1994 and the system was declared fully operational in 1995. In May 1, 2000 “Selective Availability,” a means of diminishing civilian GPS accuracy was discontinued, significantly increasing the accuracy of GPS signals to what is available today

In simple terms, GPS is a broadcasting system in which satellites transmit information toward Earth. GPS receivers take the transmitted information and use a form of triangulation to calculate the user's exact location. The basic premise of the technology is that the GPS receiver compares signal transmission time with the signal reception time, and then uses the time difference and the propagation speed to deduce the distance from each of the visible satellites. The distance calculation for each satellite creates a sphere of possible positions for the GPS receiver. The point at which the spheres representing the distances for all the GPS satellites used in the solution intersect is the user's location. The GPS receiver translates the position into latitude and longitude that can be used in software applications. Typical GPS accuracy for mobile computer-based GPS solutions is 3-5 meters. Better accuracy can be achieved through GPS correction technologies such as the Wide Area Augmentation System (WAAS), which can bring typical accuracies into the two meter range. WAAS technology is included in many GPS receivers.

Today, there are two basic types of GPS in use:

Autonomous, or Active, GPS ("GPS") where the GPS receiver has the ability to resolve the device's location without the need for assistance from a wireless network;

Network Assisted, or Aided, GPS ("aGPS") which relies on a GPS receiver associated with a Wireless Wide Area Network that is supported by network location server technology to resolve the unit's location. This type of assisted GPS is based on technology originally developed to support the United States Federal Communication Commission's Enhanced 911 ("E911") requirement for public safety location services and is generally not available outside of the United States. Another new method of assisted GPS provides performance enhancements by allowing satellite position data to flow to the GPS receiver via the internet for future use. This method of assisted GPS provides benefits such as faster times to first fix as well as the ability to get location information in places where active GPS fails, such as indoors.

GPS Receivers for Mobile Computers

From "Black Boxes" to Mobile GPS

Some of the first commercial applications of GPS were to track long-haul trucks in real-time. These generally used single-purpose "black box" systems that were installed in vehicles to collect and transmit GPS location data for monitoring and dispatching of trucks. These systems proved their worth by increasing productivity and reducing costs, but the cost and complexity limited their use to a few limited industries.

The combination of GPS receivers and mobile computers provides a powerful platform for adding location capabilities to a wide range of mobile computing applications. This technology allows traditional mobile applications to be augmented with GPS capabilities that previously were impossible for the typical mobile computer user. For example, now, a mobile computer used primarily for work order management or route accounting can also be used to provide GPS-based navigation to stops and GPS tracking for dispatch and analysis.

Please refer to the companion white paper, *GPS Options for Motorola Mobile Computers* for a review of GPS integration considerations and receiver options.

As with the evolution of any technology there are changes constantly occurring in the GPS Field. One might ask if this is the right time to deploy a GPS solution, or would it be prudent to wait? The answer to those questions is that with the proven benefits of GPS applications and the variety of GPS hardware options there is no need to wait. You can confidently deploy a very successful GPS solution today, Mobile computer based GPS solutions also protect your overall investment in mobile computing and provide a simple upgrade path to future application and mobile computer GPS capabilities such as internal GPS.

Mobile GPS Applications

The value of GPS technology can be significant 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. GPS adds a location dimension to field activities and transactions that can translate to greater control, higher productivity and lower costs.

One of the key advantages of deploying a GPS application on a mobile computer is that you are not limited to a single function. Unlike hard-wired “black box” solutions, once a mobile computer has been teamed with a GPS receiver, it can be used one, several or all of the applications described in this white paper.

An additional benefit of GPS applications using Motorola mobile computers is that the solution can evolve over time to fit the mobile computing platform. For example a solution designed to use a “snap-on” style GPS receiver can be easily migrated in the future to new mobile computers that feature internal GPS receivers.

GPS applications for mobile computing fall into a few broad categories:

Vehicle History Tracking or “Breadcrumbs”

“Breadcrumbs” solutions such as LinksPoint’s *RouteTrak* application rely on capturing and storing a detailed GPS history of vehicle travel information and uploading it for later management review. While this does not permit managers to know where their mobile workers are at any given moment, breadcrumbing can provide great value to enterprises where field activities are scheduled (such as distribution routes or service calls) and the goal is gaining visibility into, and control over mobile operations. Additionally, since the data is not transmitted in real time over a wide area wireless network, the added cost of wireless airtime is unnecessary.

Breadcrumbing solutions typically, analyze and report on activity that previously occurred in the field, providing a wealth of information that can be extracted from vehicle travel history. This information can be used to improve field performance, enhance fleet safety and give managers an unprecedented view into what actually happens in the field. Analyzing “breadcrumb trails” that accurately depict a vehicle’s path minute by minute, mile by mile and stop by stop basis can help organizations identify inefficient routing, discover patterns in how different types of customers are serviced, combat unsafe driving behavior and pinpoint unproductive driver time.

Breadcrumbing solutions like *RouteTrak* that can be integrated with core mobile applications (such as route accounting or work order management) can provide a

seamless solution to enterprises. The breadcrumbing application can be controlled by the core application, thus requiring no added procedures or extra steps for workers in the field.

Breadcrumbing can be used with Route Optimization or DOT Hours of Service logs to audit planned routes against actual activity. Breadcrumbing can help save fuel and maintenance costs, increase productivity, improve safety and provide insights into field activity that can improve overall service.

Examples of the benefits that “breadcrumbing” can provide:

- Gain visibility into field operations for greater control
- Capture a complete and detailed record of field activities.
- Identify unproductive time in the field to increase overall productivity
- Record and analyze stop characteristics for better planning and service
- Identify and reduce out-of-route mileage for fuel cost savings
- Uncover and reduce unsafe driving to reduce insurance costs
- Recognize and eliminate after-hours use of equipment and “moonlighting”
- Maximize investment in Route Optimization by auditing planned routes against “real-world” vehicle travel.
- No need for wireless airtime to transmit data
- Create a baseline for auditing DOT Hours of Service driver logs
- Integrate with other systems like maintenance or time and attendance to increase overall operational efficiency.
- Leverage investment in Motorola Mobile Computers by making them the center of the mobile GPS solution.
- **Overall benefit:** Breadcrumbing provides enterprises with the tools to cost effectively increase field performance, productivity and control. By providing a complete and detailed record of all field activity, breadcrumbing solutions, like LinksPoint’s *RouteTrak* are powerful analytical tools that can transform the way enterprises manage and optimize their performance in the field.

Real Time Tracking

Real time tracking is one of the original uses of GPS technology in the field. Also called Automatic Vehicle Location (AVL), real time tracking systems enable vehicles in the field to periodically report their location over a wide area wireless network in time intervals of anywhere from one minute to fifteen minutes or more depending on the needs and airtime budget of the user. AVL systems (including LinksPoint’s upcoming *GlobalPoint AVL* product) typically provide a map-based interface where the dispatcher can view and report on vehicle location and status. These systems also provide features like “Geofencing,” or the ability to alert the dispatcher when a vehicle enters or leaves a predetermined area.

Limited vehicle history reporting is also possible from real time vehicle locations stored in the system. AVL systems are subject to wireless airtime costs to deliver vehicle location information from the field to the back office. AVL systems can be very useful for businesses involved in pick-up and delivery or unscheduled break-fix type field service operations. Real time tracking can also provide security benefits for high-value vehicles. But real time data comes with an associated cost in wireless airtime charges. In order to receive real time location reports, you need to have wide area wireless network connectivity from a wireless service provider.

While traditional “black box” AVL solutions only allowed the vehicle to be tracked, internal and snap-on GPS receivers for Motorola Mobile Computers now allow the enterprise to track the actual worker by tracking the device both in and out of the vehicle.

Examples of the benefits that Real Time Tracking can offer include:

- Improved management of dispatch and fleet activities
- Increased daily efficiency, productivity and accountability
- Added security for vehicles
- Can replace traditional “black box” solutions with lower cost and complexity
- Leverage investment in Motorola mobile computers by making them the center of the mobile GPS solution.
- **Overall Benefit:** Motorola Mobile Computers with WWAN capabilities make real-time tracking possible and cost effective for many enterprises. AVL systems give enterprises immediate information on vehicle location for use in improving performance in time-sensitive activities.

Turn-by-Turn Navigation, or Route Guidance

One of the best-known uses of GPS technology is to provide “turn-by-turn” driving directions to the user in real-time. Automobile and consumer electronics manufacturers have embraced navigation as a “killer” consumer GPS application, but these solutions have been less attractive to enterprise users due to their reliance on expensive and complex standalone technology requiring proprietary, single-purpose hardware.

The development of GPS technology for mobile computers has put GPS navigation, such as LinksPoint’s *Field Force Navigator*, within the reach of the mobile enterprises. 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. The system then provides the driving directions, which are delivered as voice instructions through text-to-speech or recorded audio output. If the driver doesn’t follow an instruction, say by missing a turn, the navigation system will automatically recalculate the route without the need for any action by the driver. Navigation solutions usually provide “Points of Interest” or “POIs” for businesses like fuel stations, hotels, restaurants and more. Some solutions allow you to import custom POIs such as customer locations or your distribution centers.

Navigation solutions can typically be integrated with the core mobile applications so that customer addresses or other locations can be transferred directly into the navigation

application. This saves time and helps prevent errors as the driver does not need to enter the destination address manually into the system.

Examples of the benefits that GPS navigation can provide include:

- Reduce unnecessary mileage and fuel costs by providing accurate driving directions
- Improve on-time performance as drivers are less likely to get “lost” or follow inefficient routes
- More effective handling a exceptions to a route
- Increase safety with “Eyes free” interface
- Reduce vehicle engine idling time as drivers lookup customer locations on maps
- Shorten training time for new drivers
- Leverage investment in mobile computers
- **Overall benefit:** GPS navigation allows enterprises to reduce travel time between stops or activities which can enable more stops per driver per day.

Location verification for assets and transactions

The value of GPS information can 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. GPS allows these transactions and activities to be validated in both time and space. Now, it is possible to confirm that activities happened both where and when they were supposed to, with both “location” and time stamps providing a new level of confidence that work is being conducted properly in the field.

Mobile computing technology opens up the possibility to move beyond simply attaching location information to physical assets and begin associating location with specific activities and transactions. This can apply to everything from pick-up and delivery, to inspections, invoices, practically any field activity can now be validated by location.

GPS can also be used for field asset management to keep track of locations of inventory in the field (everything from power meters to street signs, generators, scrap metal bins and even exact customer locations for distribution planning). A location is associated with an asset and stored in a Geographic Information System (GIS) for reference, management and planning.

Examples of the benefits of GPS for location and transacting verification include:

- Effectively track assets and infrastructure in the field
- Record locations for specific activities (pick ups, deliveries, service calls, etc...)
- Validate locations for inspections

- **Overall Benefit:** GPS for mobile computing provides a cost effective means of associating location with activities, assets and events in the field. For the first time, you can have both a time and “location” stamp for every activity, transaction or piece of infrastructure.

Conclusion

The combination of GPS and mobile computing offers solutions that can reach into and improve every aspect of enterprise field operations. From improving worker productivity to gaining better understanding and control of mobile activities, GPS promises to change the way enterprises manage their operations in the field.

In this white paper, we have reviewed the applications available from tracking to navigation and validation, and how GPS can provide numerous benefits to mobile enterprises.

In conclusion, we hope we have provided some insights and tools for enterprise users to begin planning a successful GPS solution. GPS technology offers powerful benefits and costs savings to enterprises that can be achieved right away, and we hope this white paper will help businesses make the most of the opportunities.

About LinksPoint

LinksPoint's Location Powered Solutions™ help businesses increase field visibility, productivity and control. The company's suite of GPS hardware and software products let businesses easily add location capabilities to a wide range of mobile applications.

LinksPoint offers an array of GPS hardware choices to meet every need of the mobile enterprise, including serial GPS receivers for use with vehicle cradles, Bluetooth GPS receivers for Bluetooth-enabled mobile computers and rugged “snap-on” GPS receivers.

LinksPoint's mobile software solutions are designed for seamless integration with third-party mobile solutions to add advanced tracking and navigation functions. RouteTrak™ offers economical vehicle tracking specifically developed for transportation and distribution companies. Field Force Navigator™ is a mobile computer-based application for turn-by-turn vehicle navigation. LinksPoint also offers GPS programming tools for developers.

For more information, visit www.linkspoint.com or contact LinksPoint at sales@linkspoint.com.

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