OrbitGPS White Paper

GPS Options & Project Planning
for Enterprise Mobile Computing

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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 worldwide.

The integration of OrbitGPS GPS solutions with 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 mobile computers. The result is increasing productivity, lowering operational costs and improving safety – with all these benefits leveraging the enterprise's investment in mobile computers.

There are a number of GPS options available when planning your mobile GPS solution. The breadth of selections allows you to choose the GPS solution best suited to your needs in the field. In this white paper, we'll go through the options and examine the strengths and weaknesses of each. Any of these options can bring great benefits, but matching the right solution with your specific needs will allow you to gain the most in terms of operational improvement and control in the field.

This white paper explores the technology, the benefits involved in "location-enabling" mobile computers with GPS, and choosing the right GPS configuration to optimize your mobile GPS solution.

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.
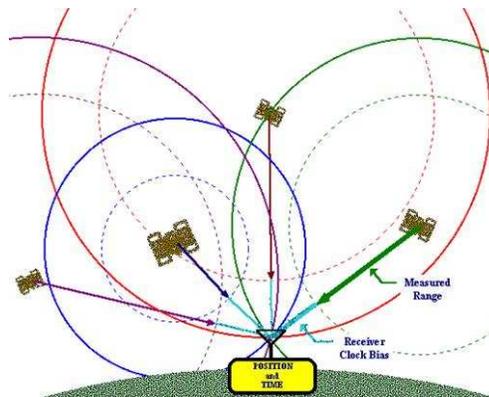
Source: P.H. Dana

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 though 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 method of assisted GPS that is often found in mobile computers 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.

Steps to Deploying a mobile GPS Solution

GPS represents a technology that offers serious benefits to enterprises using mobile computers. But, as in any technology deployment, real benefits only come from solutions that are well thought out in advance. While there are many well-known uses for GPS, such as real-time tracking and turn-by-turn navigation, the power of GPS solutions for enterprises often comes out of less obvious applications of the technology. And it often turns out that more than one GPS application can benefit an enterprise.

Here are some steps to think about when planning a GPS solution:

1) Identify the business processes you are trying to improve, or problems you are trying to solve. Don't necessarily think of it in terms of "I need tracking" or "I need navigation," rather look at the process improvements you'd like to gain from deploying a GPS solution. Here are a few sample questions to consider:

   ■ Do you want to gain greater visibility into activities?

   ■ Is it more important to track vehicles or workers?

   ■ How will the location data be used in the field and in the back office?

   ■ Do I need the location data in real time, or can I batch it to save costs?

   ■ With what other applications will you be integrating your GPS solution?

   ■ Are you interested in helping drivers find service call locations?

   ■ Do you need to know vehicle locations for dispatch purposes?

   ■ Are you trying to get a better handle on stop performance and analytics?

   ■ Do you need to validate that transactions or inspections are being conducted in the appropriate places?

   ■ Are you looking to curb unnecessary mileage and vehicle use?

   ■ Do you need to confirm the actual locations of assets or customer?

   ■ Are you trying to improve fleet safety performance?

   ■ Do you need to fit your solution into an existing mobile computer infrastructure or is this a new deployment.

2) Understand the Return on Investment (ROI). GPS can provide a measurable ROI as part of an overall mobile solution. Once you've determined how you intend to use GPS in the field, you can create an ROI case study that will allow you to determine the bottom line impact of your system. Your operational cost savings can be based on a number of results that a GPS solution can provide including, but not limited to:

   ■ Identifying unproductive time that can result in a decrease in overtime hours.

- Identifying and eliminating unnecessary mileage resulting in fuel costs and/or cost-per-mile savings.

- Adding more stops or activities per day per driver/worker allowing more work to be completed with fewer personnel.

- Improving safety in the field leading to lower long-term insurance costs.

- Better understand field operations, route dynamics, customer characteristics and worker behavior for more effective strategic planning.

- Specific issues or opportunities that are unique to your business.

3) Identify the appropriate GPS hardware and software solutions for your needs. Based on the answers to the questions above, you should have an understanding of how you intend to use GPS in the field. From this, you can determine which hardware configuration and application choices make the most sense for you. Below, we'll review the various GPS hardware configurations.

4) Plan and execute a proof of concept or pilot to prove your business case. You can do this on a small scale to gather first-hand experience on the technology and to test your assumptions on ROI. To save time and money, you can conduct your pilot without a full integration of all software elements. While this will not give field workers the same experience as the final integrated solution, it can provide valuable insights into how GPS can benefit your business. The key in an un-integrated pilot is to understand that the field processes will be less elegant than in the final deployment and not let that get in the way of understanding the information collected.

5) Based on your pilot experience, Integrate your GPS solution within the framework of your work processes including any software integration with mobile and backend systems.

6) Deploy your GPS solution into the field.

Mobile GPS Hardware Options

Now that we've reviewed the basic categories of GPS applications, we will look at the GPS hardware options for use with mobile computers. There are several options, and as we will see, hardware types should be evaluated based on the type of application for which it will be used.

Internal GPS Receivers
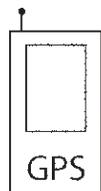
One of the most significant new options available for mobile computers is an internal GPS receiver. Internal GPS provides a seamless integration of GPS within the mobile computer and does not require any additional peripheral devices to use GPS. This type of GPS receiver can provide Autonomous GPS, Assisted GPS or a combination of the two.

The internal GPS receiver draws its power from the mobile computer and makes GPS data available to applications running on the mobile computer though a local com port. GPS data can be accessed with simple com port settings either directly or

through the GPS port sharing capability of Windows Mobile. No special device driver is needed.

Advantages

- Integrated within the mobile computer

- Requires no external devices to use GPS

- No additional, peripherals cabling or power supplies needed beyond the handheld computer

- No "installation" required for GPS hardware

- No outside drivers required

Disadvantages

- Draws power from the mobile computer, potentially decreasing battery life

- Tracks the mobile computer, not the vehicle, which can be a disadvantage in fleet applications

- Tracking applications can be more easily defeated by user (for example, putting the handheld in a toolbox when making an unauthorized side trip, or turning off the mobile computer)

Best Applications

- Applications where GPS is needed both inside and out of the vehicle

- Field data collection and asset management (such as utility inventory, inspections, geocoding customers, etc…)

- Vehicle navigation

- Applications where no vehicle is used

Summary

Best for GPS applications where the user is involved in the GPS activity. Less effective for passive GPS applications like tracking where the worker may have an interest in defeating the system.

"Snap-on" GPS Receivers

This type of GPS received is designed to attach directly to a mobile computer to provide an integrated platform for mobile and location-enabled applications. Overall, the characteristics are similar to Internal GPS as the GPS receiver draws its power from the mobile computer and passes GPS data to the mobile computer through a physical connection between the devices. Communication between the snap-on GPS receiver and the mobile computer is easy to set up, requiring com port settings only. No special device driver is needed.

Advantages

- Tightly integrated with the mobile computer

- Requires no cabled or separately powered devices to use GPS

- Uses same charger as mobile computer

- Simple "snap on" installation

- No outside drivers required

Disadvantages

- Draws power from the mobile computer, potentially decreasing battery life

- Adds size and weight to the mobile computer

- Tracks the mobile computer, not the vehicle, which can be a disadvantage in fleet applications

- Tracking applications can be more easily defeated by user (for example, putting the handheld in a toolbox when making an unauthorized side trip or turning off the mobile computer)

Best Applications

- Applications where GPS is needed both inside and out of the vehicle

- Field data collection and asset management (such as utility inventory, inspections, geocoding customers, etc…)

- Vehicle navigation

- Applications where no vehicle is used

Summary

Like internal GPS, the snap-on is best for GPS applications where the user is involved in the GPS activity. It is also less effective for passive GPS applications like tracking where the worker may have an interest in defeating the system. Although internal GPS solutions

provide a fully integrated solution, as standards evolve in the next 12 to 18 months a Snap-on solution can provide all the benefits of the integrated one but with a more flexible migration path to an integrated solution. A snap-on can also be a cost effective way to pilot and prove your application before a mass deployment.

Serial GPS Receivers
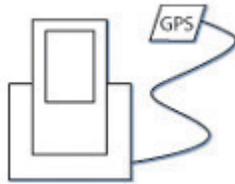
"Serial" GPS receivers are designed to plug into the vehicle docking cradle for a handheld computer and draw power off the vehicle electrical system. These receivers feature a waterproof external antenna that is placed on the roof of the vehicle and cabled directly to the cradle. In the standard configuration of the serial GPS, location data is available to the handheld when docked in the cradle. Data Logging Serial GPS receivers are also available. Serial GPS can provide a very reliable and cost effective GPS solution when used with a vehicle docking cradle.

Advantages

- Low cost when used with vehicle dock

- Highly reliable solution

- External rooftop antenna ensures better "view of the sky" for optimal GPS performance

- Tracks the vehicle rather than the mobile computer

- Data logging version stores data for unbroken history of all location activity

Disadvantages

- No GPS available to mobile computer when it is out of the vehicle cradle

- Requires added cost of vehicle cradle

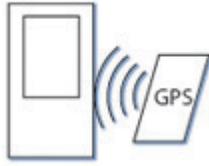- Requires separate power supply

Best Applications

- Fleet applications where GPS needs are focused on the vehicle

- Vehicle tracking (serial dataloggers are especially useful for vehicle history tracking or "breadcrumbing" applications)

- Vehicle navigation

Summary

Serial GPS receivers are the most reliable and cost effective choices for fleet applications when a vehicle cradle is in use. Serial dataloggers provide the added ability to store and forward GPS travel history, providing full visibility into fleet activities in the field.

Bluetooth GPS Receivers

Bluetooth GPS recievers are designed to capture GPS data and transmit it to a mobile computer wirelessly using Bluetooth technology. Bluetooth GPS receivers have their own internal battery and can be used in the field outside a vehicle, or they can be hard-wired in a vehicle for transportation-related applications. Like the serial GPS, the standard Bluetooth GPS receiver simply broadcasts data and if the mobile computer does not have a Bluetooth connection, no GPS information is available. Also like the serial GPS, Bluetooth GPS receivers are available with data logging features that allow GPS data to be stored for later access.

Advantages

- Can be installed in a vehicle with an external antenna for fleet applications where a vehicle cradle is not available

- Internal battery allows Bluetooth GPS receiver to be carried by "foot-mobile" workers for capabilities similar to internal and snap-on GPS

- Optional external rooftop antenna ensures better "view of the sky" for optimal GPS performance

- Depending on how it's deployed, it can track the vehicle or the mobile computer

- Data logging version stores data for unbroken history of all location activity

Disadvantages

- No GPS available to mobile computer when the Bluetooth connection is not present

- Requires management of Bluetooth connectivity within the mobile application between the mobile computer, GPS and other Bluetooth devices used in the solution

- When used by "foot-mobile" workers two device must be managed and accounted for (handheld and the GPS receiver)

- Requires separate power supply or charger

Best Applications

- Fleet applications where GPS needs are focused on the vehicle

- Field data collection applications where internal or snap-on GPS options are not practical (for example, where another external snap on device is also needed as part of the solution)

- Vehicle tracking (Bluetooth dataloggers can be especially useful for breadcrumbing applications)

- Vehicle navigation

Summary

Bluetooth GPS receivers take advantage of personal wireless technology to provide location capabilities. When installed in a vehicle, they provide an effective GPS solution that does not require a vehicle cradle. Bluetooth dataloggers provide the added ability to store and forward GPS travel history, providing full visibility into fleet activities in the field.

Conclusion

The combination of GPS and mobile computing has created a technology that can reach into and improve every aspect of enterprise field operations. From improving performance in the field to gaining better understanding and control over activities, GPS promises to change the way enterprises manage their operations in the field.

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 OrbitGPS

OrbitGPS is the leader in GPS technology solutions for enterprise mobile computing.

We provide you with the peripheral GPS solutions you need for your enterprise mobile GPS solutions and back you up with the support you need to make the solution a success.

OrbitGPS offers a wide range of GPS receiver options for the most popular rugged mobile computers and the proven expertise to help you effectively integrate GPS technology with your mobile solutions.

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