



## Game Changer - Visibility, Enablement, and Process Innovation for a Mobile Workforce

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# Mobility in Manufacturing

A key aspect of the “Perfect Plant” is having the right information in the right place at the right time. In most manufacturing environments, instrumentation and monitoring is widespread. Pages and pages of graphs and reports describe every operational characteristic and are used by operators and management to steer the plant to optimal performance. But in the modern plant, the right time to view this information is not when you are standing in front of an operator console. It is when you are in the field, in front of a failing piece of equipment or discussing a problem while on the move. More often than not, the right way to deliver information is by putting it in the hands of a mobile worker.

The right way to collect information also involves mobility. Remember that 40% to 60% of equipment in the plants and on the shop floors is not instrumented. Optimizing this critical aspect of plant performance depends on mobile field workers. Armed with the right tools, mobile workers can cost-effectively gather data from non-instrumented assets that can be readily analyzed and integrated into existing back-end decision support systems. Bidirectional flow of information to and from mobile workers is a key competitive imperative required to make fully informed decisions regarding the operation of the Perfect Plant.

## An Information-Poor Environment

Regrettably for most companies, when it comes to the mobile workforce in manufacturing, too often, vital decisions are made in the dark, in an information-poor environment and with little support or historical contextual information to make informed decisions proactively. Field workers - the people who are closest to the equipment and processes, who feel the heat, hear the noises, and see the changes that can be the first indicators of trouble - frequently do their jobs based on individual experiential knowledge acquired over many years.

This approach makes manufacturers vulnerable to high levels of variability based on individual talent, skills, and training. With the massive investments in automation over the past decades, management often lacks visibility into what these decision makers in the field do and finds it hard to provide guidance to ensure execution of best practices occurs across the field worker roles, production shifts, and assets.

The situation worsens when business conditions change and the new marching orders are not understood, communicated, adopted, or enforced in the field organization. Furthermore, much of the relevant field data and insights from the field workers is not captured in a way that provides management with the information needed to better

monitor performance, which can lead to closing performance gaps in order to achieve operational excellence.

The solution to the challenge of empowering mobile workers is no longer a mystery. The patterns of success and failure have now become clear as early adopters have shown in hundreds of site implementations and numerous enterprise deployments around the globe in environments large and small.

This white paper provides a brief summary of modern best practices for improving productivity and effectiveness of a mobile workforce and highlights how the Wonderware IntelaTrac Mobile Workforce and Decision Support System offers a framework to accelerate and mainstream process improvements that all plants must implement to be successful and sustain competitiveness.

## **Time to Rethink Mobility**

The widespread adoption of smart phones that have the ability to deliver email, calendars, contact databases and web surfing has been both a blessing and a curse with respect to adoption of mobile solutions in manufacturing. While few now doubt the value of being able to check email on the road and other forms of mobile access, the paradigm used in consumer mobility is a nonstarter for manufacturing.

Initial adoption of mobile line of business solutions in manufacturing has been driven by a business unit or organizational discipline that wanted to extend a desktop application to go paperless with mobile workers. In most cases, these deployments have been less than successful and have resulted in paving over current work processes instead of leveraging the right mobile platform to support step-change improvements in work processes. Simply moving an existing server- or desktop-based application to a mobile device generally does little to improve the effectiveness of a mobile worker. Merely going paperless provides just a fragment of the potential value of mobility.

Mobile devices are not simply the equivalent of Internet browsers; they are powerful computers in their own right with the ability to combine location information, automated data capture through RFID, remote access to data and video with repositories of historical information and step by step guidance for how to perform tasks. All of these capabilities enable mobile devices to capture key events such as early signals of impending equipment failure or suboptimal operating conditions and makes sure that appropriate follow up is performed to prevent expensive incidents further down the road.

## A New Way of Working

Exploiting the power of mobile computing requires that the work processes involved be re-imagined and redesigned. The right way to think about mobility is as an invitation to a new way of working, a search for applications that can accelerate and sustain process improvements that transform your operations, not merely moderately improve them by moving the same process from paper to mobile device.

Fortunately, the groundwork for applying mobility to a wide variety of mainstream processes has already been laid in industries as diverse as oil and gas, refining and petrochemicals, power and utilities, pulp and paper, metals and mining, food and beverage and life sciences. Best practices for applying mobility to achieve operational excellence, ensure a high-reliability organization, increase energy optimization, leverage mobile learning, and cost-effectively improve environmental, health and safety process performance are well established.

Completing the job of accelerating and sustaining these mainstream process improvements involving the mobile workforce requires a framework that can tune the processes to your particular way of working, rather than requiring expensive, customized programming and integration. As we will see, the Wonderware IntelaTrac Mobile Workforce and Decision Support System offers just such a framework.

Industry leaders have repeatedly proven how mobile technology can enable the disconnected worker, help monitor non-instrumented pieces of equipment, and assure that field operations and field personnel execute against standard operating procedures consistently and repeatedly according to defined best practices. These leaders see step change process improvements with rapid hard dollar paybacks, accountability and total visibility based on intelligent and precise stewardship and corresponding empowerment of their mobile workforce.

## The Payoff

The impact from empowering and increasing productivity of mobile workers can be truly staggering in financial terms. For example, in process manufacturing industries, more than half of the maintenance costs are incurred when equipment is operated improperly (that is, outside of normal operating envelopes), which can have significant impact on plant operating efficiencies tied to equipment availability since low mechanical availability leads to increases in unplanned downtime and slowdowns.

Essentially, operations has more impact on the cost of maintenance than the maintenance department does. Many plant audits show that about two-thirds of maintenance costs are caused by “bad actors” that have been previously identified. Providing mobile workers with

a tool that guides them with interactive best practices offers a low-risk and low-cost means to improve performance with respect to achieving higher operating efficiencies and lower maintenance costs. By providing a systematic way to capture remote data on stranded assets and enabling the mobile worker to take action in real time based on best practices while at the point of incident moves the company operations to a predictive maintenance approach based on actual condition monitoring.

This approach can free up critical resources that historically spend significant time on preventative maintenance inspections (whether the equipment needed it or not). An increase in operating efficiencies of as little as 0.5% to 2% can mean millions annually in improved margins to a large plant. The corresponding 1% to 5% decrease in total maintenance costs can yield a six or seven figure cost savings.

### **Increased Productivity**

The payoff for improving support for mobile workers comes in a variety of other ways as well. Mobility turns field staff, previously off the radar when it comes to process optimization, into a visible part of the designed processes of the enterprise, operating according to standard procedures with accountability and auditability. Management can push equipment strategies or business strategies out to this frontline workforce in near real time through procedures on demand and dynamic procedures sent to handheld computers.

By doing this, productivity can skyrocket, providing capacity for mobile staff to handle additional responsibilities for environmental, health and safety regulations. While typical workforce productivity improvements of 20% or more are common with mobile applications, documented client case studies show that Wonderware IntelTrac has delivered over 300% workforce productivity improvements over a four-year period. Such returns can be transformational.

## **Strategic Team Players**

Connecting mobile staff can become a two-way street that changes the mindset of the mobile workforce. Providing the ability for staff to recognize events, to capture insights about the behavior of specific equipment, and to suggest process improvements can be transformational. The field staff can be awakened and become part of the team, playing an active part in optimizing the workings of the plant. Management can sleep better at night knowing that full visibility into the activities of field workers is now possible.

The framework IntelTrac provides can help in creating a positive culture; one that celebrates wins and rewards cooperation and teamwork. With IntelTrac, the operators on the front lines become key players in achieving the plant's goals. Their contributions can

be recognized and they can see their efforts being recognized by management. Their ownership in the operation is increased.

Great execution is a key success factor. Effective operations management systems are ones those that can be configured by the personnel who work with the operators and understand their needs. IntelTrac fits this mold because feedback and guidance from operators can be incorporated into configurable rounds development, requiring no programming or scripting. The rounds and procedures are set up by the people who know them best, with no need for assistance from developers or system administrators. The best practices of the plant can now be communicated to all operators and their execution can be ensured. Knowledge from the most experienced workers can be captured and communicated effectively to the new and less experienced employees being assimilated into the enterprise.

Now that we've laid the foundation and provided the background for understanding the kinds of problems that the Wonderware IntelTrac Mobile Workforce and Decision Support System can help solve, let's take a deeper dive into IntelTrac functionality and business benefits.

## **Wonderware IntelTrac**

IntelTrac is a mobile workforce and decision support system designed to complete the extension of modern business process management techniques to all corners of a manufacturing enterprise. Over the past 11 years, a suite of functionality has been developed that enables mobile devices to support mobile workers and also enables the insights and knowledge of those workers to be captured. Recognizing that the foundation of best practices must always be adapted to the specific needs of a manufacturing environment, IntelTrac delivers this functionality in a highly configurable manner. Built on a foundation of Microsoft technology, Wonderware IntelTrac leads the process industry in customer satisfaction for mobile applications.

### **Functionality**

The functionality of IntelTrac falls into the following five categories:

- Location and Identification
- Rules and Procedures
- Event Recognition
- Contextual Knowledge
- Collaborative Transactions

Each of these areas provides a powerful set of capabilities for assembling specific solutions for mobile workers.

## **Location and Identification**

Location and identification functionality both automates the collection of information and provides an audit trail.

- Bar codes and RFID tags can be used to quickly establish the context for mobile workers when they approach a specific piece of equipment and can facilitate workflow.
- Scanning a bar code or sensing an RFID tag can assemble information from repositories on the device, on the tags, or from servers and enterprise applications. Such information improves audit trails and ensures that verification tasks were done while at the asset or process area.
- GPS adds to the ability to assemble relevant context and track activity to optimize routes.
- IntelTrac has also broken new ground in designing ways to use RFID technology in the manufacturing environment. The IntelTrac patented universal data tag format uses an RFID tag as a storage device for key information that is required by the mobile worker regardless of connectivity by essentially turning a read/write RFID tag into a spreadsheet with client customizable headers and fields of information.

The Wonderware advantage in applying location and identification technology comes from the company's deep understanding of the nature of manufacturing processes.

Wonderware has developed a body of best practices that help determine how to effectively apply bar codes or RFID depending on the nature of the work environment.

## **Rules and Procedures**

Wonderware IntelTrac provides step-by-step guidance to mobile workers as they address the tasks of capturing information and diagnosing problems. Each step in a procedure can be supplemented by additional information called "focused advice," which describes the best way to perform a task. The system can provide historical information on processes or assets and run calculations when appropriate, including bidirectional communication with real time systems. As the mobile worker captures information at the time of service, inspection, or observation, they are logically presented with interactive suggestions for process improvements according to approved best practices.

## **Event Recognition**

IntelTrac improves visibility through rich and configurable systems for scheduling and reporting, which enables the activity of a mobile workforce to be analyzed and optimized.

The goal is not only to make the most efficient use of mobile workers' time but also to make them intelligent participants in the larger operational and management processes in a plant.

When some important incident on a machine is noticed, it is possible for the mobile worker to take action directly through a focused advice message when appropriate. However, the systems also send information into configurable exception reports with IntelTrac or third-party decision support systems so that appropriate analysis and follow up can be conducted. By capturing information about an important event and then broadcasting that event to the various systems involved in running the plant, the mobile worker can set processes in motion that ensure that appropriate action will be taken.

### **Contextual Knowledge**

Improving performance of mobile workers is frequently simply a matter of providing a larger collection of information that can be accessed while in the field. That information can range from step-by-step instructions, notes on past equipment behavior, equipment and task documentation, video and other multimedia assets. With access to such contextual knowledge, mobile workers are able to make better decisions and learn on the job. Additional information such as schematics, detailed procedures and educational material can be delivered through attached documents or streaming video.

### **Collaborative Transactions**

Mobile devices can communicate with other systems in real time or asynchronously through means such as OPC, XML messages or web services. Such communication enables processes from other enterprise systems to be incorporated into the mobile worker's tasks. Communication, invocation of functionality, monitoring and communication of data between mobile devices and equipment can also take place through such methods. Information on the device is synchronized with server-based repositories for integration with other decision support systems.

## **Built on a Microsoft Technology Foundation**

Wonderware IntelTrac is built on top of the Microsoft mobile technology stack, which combines capabilities for advanced application development, security and mobile device support with a full set of server and desktop functionality. Developed in .NET, the IntelTrac stack supports networking of all kinds from broadband to WLAN, LAN, and various near-field technologies such as Bluetooth. Because Microsoft operating systems, standards and business process integration capabilities are widespread in the manufacturing environment, on mobile devices, and in enterprise applications and productivity tools of all kinds, integration is much easier. IntelTrac takes advantage of all



of these capabilities to achieve bidirectional integration and bidirectional communications in the service of mobile processes.

## **Implementing Mainstream Process Improvements with IntelTrac**

Wonderware Mobile Solutions leads the industry in customer satisfaction for mobile applications in the process industries. In a recent Gartner study, out of 23 companies tracked in the mobile sector, Wonderware was the only one that achieved a customer satisfaction rating of high. Such a rating is based on many factors, including the ability to submit 20 “rock-solid” reference customers. Another indicator of the vital role that Wonderware IntelTrac plays in customer operations is its 95 percent renewal rate on support/upgrade contracts, indicative of the value clients place on the ongoing functionality enhancements they receive.

Wonderware IntelTrac enables companies to put in place a variety of mainstream process improvements, including achieving and sustaining operational excellence, ensuring a high-reliability organization, enhancing asset responsiveness, leveraging mobile learning, empowering the field worker of the future, improving project/asset lifecycle management, and increasing energy optimization.

### **Achieving and Sustaining Operational Excellence**

Operational excellence depends on optimizing operating efficiency cost-effectively while ensuring that the facilities fulfill health, safety, and environment compliance requirements to be recognized as a pacesetter of corporate citizenship. It is well accepted conventional wisdom that mobile field workers on the front line play a huge role in achieving operational excellence as well as in achieving margins that lift the bottom line.

It is also generally agreed that achieving step-change improvement in field work processes requires consistent execution of best practices. The key takeaway for exploiting mobile technology is that it is best employed as a framework for execution of best practices to support work process improvements that close the performance gaps that lead to step-change gains towards the organization’s operational excellence goals.

The mobile field workers’ tacit knowledge is the only means of monitoring and proactively correcting potential problems with the typical 40% to 60% of equipment in a plant that is not instrumented (that is, not connected via analog or digitally to a monitoring or control system). These workers also often provide visual inspections and calibration of instrumented equipment. Think of it this way; field workers are amazing instruments. They have great visual optics, can detect subtle changes in sounds, sense heat and cold, retain

history of past events and actions, smell odors, correlate data to identify abnormal situations. And, of course, they are mobile.

## **Flexible Scheduling**

There is an important balance in inspecting equipment and process conditions in the field, a balance between the quality of the inspection and the frequency of the inspection based on the prior condition of the asset. IntelTrac provides a means to easily flex the schedule of inspections based on equipment status and business conditions while at the same time ensuring the proper type and degree of inspection according to predefined best practices.

Valero Energy, the largest refiner in the US, has been using IntelTrac since 2002. Its Delaware City Refinery presented charts at the NPRA's 2007 Q&A and Technology Forum showing that the same number of mobile field workers now performs many more rounds than before now that the company is utilizing IntelTrac. The number of rounds performed by the same number of workers skyrocketed from about 2500 per month in 2004 to more than 11,000 per month in 2007, more than a 300% increase. The Delaware City Refinery also documented that its round completion rate rose over this time to 99.5% while increasing the span between danger alarms by more than 200%.

How is this significant level of improvement achieved? In no small part it is that rounds can be more effective because mobile field workers have information about this precise piece of equipment at their fingertips, along with procedural guidance about what to do based on the symptom the equipment is exhibiting. Equipment malfunctions are documented consistently so that assets that are more expensive to maintain can be identified and decisions about them can be made.

Prior to the deployment of IntelTrac mobile field workers may have intuitively known about these "bad actors," but may never have settled on a best practice to address the problem or had a mechanism for tracking and presenting the trends and facts to management. Using Wonderware IntelTrac, such information can be captured quickly, easily and consistently, providing management with visibility right down to the individual asset level. Best practices are always available to mobile workers, quite literally at their fingertips.

## **Regulatory Compliance**

A discussion of operational excellence is not complete without addressing the importance of achieving cost-effective regulatory compliance. Auditability has never been more important. Depending on the industry, compliance requirements range from EPA Title V to OSHA Process Safety Management (PSM) to FDA compliance regulations. The same technology that empowers mobile field workers for operations and maintenance rounds also enables cost-effective regulatory compliance for Process Safety Management.

Scanning RFID tags provides auditability that the inspection in question relates to this precise asset. Inspection data can be quickly gathered and merged into standard reporting formats without additional effort. Using IntelTrac has helped several Valero sites have achieved 100% completion of Title V inspections.

For example, the Delaware City Refinery now has the ability to generate 38 different compliance reports via IntelTrac, 20 of which are generated automatically every day. Valero is a pacesetter in achieving OSHA's Voluntary Protection Program (VPP) status. Recent deployments into other markets suggest that IntelTrac will increasingly be used to address many other compliance issues from NOX emissions in power to CFR regulations in the pharmaceutical industry.

## **Ensuring a High-Reliability Organization**

Avoiding accidents and consistently and cost effectively running operations with minimal unplanned downtime—these are the hallmarks of high-reliability organizations (HRO). HRO includes concepts such as:

- Basic Operator Care
- Operator-Driven Reliability
- Reliability-Centered Maintenance
- Total Productive Maintenance

Using IntelTrac, companies can help identify problems and respond to them before they cause disruptions or affect performance.

Maintenance costs for assets inspected/maintained using IntelTrac typically drop by 25% to 30%, resulting in an overall reduction of 2% in the total maintenance budget. With maintenance budgets in the millions, cost savings can be very substantial indeed.

## **Prioritizing Maintenance**

Another aspect of reducing maintenance costs is making maintenance more effective by ensuring that work is properly prioritized. Many companies have found that they can reduce their backlog of time-based preventative maintenance inspections, which usually require highly skilled maintenance technicians. Instead, operators can inspect their own process equipment and identify precursors to problems using condition-based observations according to predefined procedures and best practices. This concept, called Operator-Driven Reliability (ODR), is a sweet spot for deploying IntelTrac.

For example, a mobile field worker inspects a reciprocating air compressor that is making a particular sound. Looking at IntelTrac, he/she sees that there are three sounds such a

compressor might make and IntelTrac helps correctly identify what the sound they are hearing means. Once the choice is made, IntelTrac, having captured best practices as part of the workflow, tells the mobile field worker to take a temperature reading and once the temperature is entered, those two symptoms indicate a problem with a valve that requires immediate attention.

According to procedures you define, IntelTrac will schedule the compressor to be monitored during every shift until the equipment can be repaired. If the temperature has gone up again during a later shift, IntelTrac will provide additional focused advice to the operator to take action and a new alert will be sent to the supervisory manager so that the repair of the valve can be escalated. Catching problems while they can be fixed can result in real cost savings and fewer equipment failures, as well as often eliminating the domino effect that leads to secondary equipment failures that result in unplanned downtime and slowdowns.

## **Enhancing Asset Responsiveness**

Almost every manufacturing CEO, COO, and VP of Operations shares a common dream: increased agility. When their business conditions change, they wish that they could pull a lever and immediately, every employee would have the new marching orders. Pull one lever to increase production during a boom. Pull another set of levers to optimize energy efficiency and reduce maintenance costs in a recession. More new government regulations? Pull a new lever to increase the frequency of inspections and data collection. Can it ever be that simple?

With IntelTrac, it is easy to change the priorities and schedule the tasks and workload of the field workers to ensure that the business goals of the moment are better met. You want more reliability rounds? Done. You want more environmental compliance rounds? You can have them, all within a context that ensures that the work load is balanced based on known and available resources.

Further, you can affect strategies that are initiated by external systems. For example, let's say you have strict procedures that need to be carried out when an adverse weather condition, such as a hurricane or freeze, occurs. Prior to IntelTrac, the process involved many meetings, emails, and "click-to-talk" discussions with field workers to prepare the assets.

After IntelTrac has been installed, a third-party system that monitors the longitude and latitude of the weather event can send a trigger to IntelTrac to launch the appropriate procedures to the handheld computers to be executed by the field workers on their next round. No phone calls, no meetings, less confusion and fewer mistakes. For these reasons

and more, leading companies see IntelTrac as a critical element of what industry analysts now describe as the emergence of Operational Performance Management Systems.

## Leveraging Mobile Learning

Every week, expertise walks off the job. As the baby boomers retire, years of experience goes along with them. Using IntelTrac, you capture the best practices of your most effective workers and spread that around the plant. In essence, by capturing this institutional knowledge and ensuring that best practices are followed through easy-to-use guided procedures and checklists, it's like having your best workers training your less experienced workers.

Mobile field workers can access:

- Focused advice messages about handling a problem (the short answer)
- Refer to attached documents for detailed information (the long answer)
- Watch streaming video that illustrates what to do (the visual answer)

Traditional training takes time out of the work day; mobile learning enables workers to engage with the types of training they need, when and where they need it, to assimilate new hires faster and reduce the impact of worker turnover.

## Empowering the Field Worker of the Future

From the shop floor to the top floor, automation has caused a revolution. Despite this, mobile field workers are often still running around with clipboards. By empowering these workers with tools that enable them to learn new skills, make suggestions, and directly tie their activities to their KPIs, job satisfaction and effectiveness can be increased.

Furthermore, you can raise morale by noticing and rewarding effective workers when they catch a problem early on, saving the company substantial repair costs. Such workers can be recognized and rewarded, drawing attention to the success of the program and raising morale.

Field workers of the future are not only empowered workers; they are also more aware of their impact on the economics of the operations and they are more connected. IntelTrac helps bring field workers into the automation loop by providing bidirectional flow of data between them and data historians, enterprise asset management systems, ERP systems, visualization tools and, in the near future, control systems.

IntelaTrac effectively shows how the blending of field operators and board operators will occur through improved communications, better real-time collaboration, and predefined operating strategies.

## **Improving Project/Asset Lifecycle Management**

Every manufacturing company has projects. Some call them turnarounds, others call them outages, and all have new capital expansions of new units, lines or entire plants. All of these projects share a common problem; they are high risk if the planned time to implement is exceeded. So how does mobile computing help address this risk and reduce costs by reducing project schedules?

IntelaTrac is not a project planning system. Tools from Wonderware partners Primavera and Microsoft have that well in hand. However, the IntelaTrac new Projects Module does integrate with these project planning tools. The value is in the granularity of the data that IntelaTrac can capture in providing more precise status of task and job completions to enable the planners to run planning optimization software more frequently and with greater accuracy.

Mobile workers using IntelaTrac can also utilize the tool to reduce wait time on permits and ensure best practices are followed and properly documented including the use of RFID tags to ensure proper identification, reduction in inventory losses and validation of task completion. Shaving a day or more off a project schedule is the probable result and the return from deploying the IntelaTrac Projects Module is easily cost-justified.

## **Increasing Energy Optimization**

IntelaTrac is often used to improve energy optimization. In a 2008 Plant Success paper, LyondellBasell stated they have experienced as much as \$500,000 savings on a typical plant from reducing furnace leaks since deploying IntelaTrac. Other typical uses include reducing power consumption, reducing steam leaks, and optimizing fuel gas. Honeywell has found IntelaTrac useful in providing field data to their optimization simulators while IntelaTrac can also serve as a tool to execute optimization strategies recommended by the simulator.

For example, consider a case in which a new plant manager comes in and sees that she has high steam costs. She assigns a field worker or two to locate and fix the leaks. Using IntelaTrac, this is done quickly and inspections to look for future leaks are sustained over time. The reasons for the inspections are documented. Without such knowledge capture, when the plant manager gets promoted and a new plant manager comes in, the inspections may be cancelled and the steam leaks reappear.

## Moving Forward

When you look closely, who controls the decisions around most process improvements in your facilities? In the vast majority of cases, the answer is Operations. If improving operations through your plant and field workforce is not a major part of your strategy, it should be. Efforts to improve operating efficiency and reliability will not likely have a positive sustainable impact if you do not empower your mobile workers.

The technology to cost-effectively make step-change process improvements with mobile technology exists today and it is easy to use, all based on the Microsoft Windows Mobile platform. Easily tailored to your own work processes, IntelTrac can revolutionize the way the mobile workforce operates, making their jobs easier and their work more effective and rewarding—not to mention paying for itself in a matter of less than six months. You owe it to yourself and to your operations to investigate why IntelTrac is already deployed across the enterprises of so many leading companies.

## About Microsoft in Manufacturing

Founded in 1975, Microsoft (NASDAQ "MSFT") is the worldwide leader in software, services and solutions that help people and businesses realize their full potential. Together with its partners, Microsoft delivers solutions to help the manufacturing industry improve operational efficiency and develop innovative products and services.




Contact Wonderware or your local Wonderware Distributor for more information on Wonderware IntelTrac® Mobile Workforce and Decision Support solution.

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