

WHITE PAPER

**Asset Management:
Using Mobile Computing
to gain a Competitive
Advantage**

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Executive Summary: Mobile Directions in Equipment and Facility Maintenance

Industrial plants and commercial properties tend to be very large and widely distributed. Accordingly, maintenance functions have always been mobile, but until recently, access to maintenance data has been static. Service and repair of capital assets, whether equipment or facilities, used to require carrying paperwork to and from each individual site where the work is performed. Technology has rapidly evolved to a point where maintenance and inventory data can now be accessed and updated, safely and reliably, in “real time” through wireless devices. The benefits are many, and the savings are clear – response time is quicker, paperwork is minimized, the data is current and completely visible, redundancies are eliminated, and scheduling can be optimized.

Early mobile technology was fraught with problems that have, until now, hindered mobile deployment. Unreliable networks interrupted access to the server, and concerns about transaction security inhibited broad use of mobile computing. A new era of innovation in mobile technology has arrived which makes such obstacles a thing of the past. Companies can now rely on mobility as an essential part of their maintenance process. Mobile asset management provides essential productivity gains and cost savings that you can bank on.

The proliferation of remote devices includes portable barcode readers, laptops, handheld scanners, pocket PCs, RF-enabled devices, email-enabled RIM devices, “smart” Web-enabled cell phones, 2-way pagers, and wireless personal digital assistants (PDAs), which are connected into the phone networks and the Internet by wireless connections. No longer does the operator need to be directly wired to a computer terminal or server. “This can translate into faster response times for better asset utilization and will permit sharing of skilled resources for improved efficiency and consistency,” says Houghton LeRoy, ARC Advisory Group.

In some cases, innovation in technology precedes the realization of a business need, and in other cases business need drives innovation. As portable devices are released to the market, imaginative uses for them take shape. Pagers, for example, initially went on the market as a one-way “call me” device. Now meaningful business messages and alerts are being transmitted via pager, and meaningful responses are returned. In terms of mobile access in asset management, technology has solved existing business problems as well as created opportunities for new efficiencies.

Many companies are already benefiting from the use of mobile asset management, and analysts are indicating that further innovation is to be expected. This paper attempts to outline the state of mobile computing in asset management, how business and technology imperatives are being answered, and how Indus International is responding to the growing demand with advanced solutions designed for sustained competitive advantage.

Business Imperatives

The ability to communicate quickly, accurately, and completely in the field and in the storeroom is essential for both staff and outsourced service workers. As a result, asset management solution providers are increasingly integrating their applications with mobile devices that have wireless connections into phone networks and the Internet, freeing the user to access critical data while away from their workstation or in remote locations.

Indus International, the world's leading supplier of enterprise asset management software and services, has developed a mobile solution that enables reliable and



secure access to the system real-time while connected to the server, or locally on a remote device that is later synchronized with the server. Alerts and notifications can be passed between the handheld device and the server in the form of an email, page, or inbox entry. Communication service interruptions are unnoticeable to the operator, with data temporarily stored on the device for later synchronization when the connection is restored.

With decades of experience working with their global and high-profile customer base, Indus recognized that maintenance operations are subject to many obstacles that can be overcome with an effective mobile asset management strategy.

Obstacle 1: The Field Service Perspective

On any given day, millions of service technicians hit the road with paper work instructions in hand. Upon their return, their penciled notes need to be entered in the system. Frequently their work instructions are incomplete or inaccurate, and supporting documentation is missing, or unexpected parts are needed, all leading to service delays as the technician returns to the office or waits for assistance.

The Mobile Solution

Mobile computing in asset maintenance allows instant access to up-to-date service-related information. Work can be transmitted directly to a technician's wireless device. Work instructions and asset history can be viewed on site. Emergency service can be requested immediately for an unexpected outage. Because extraneous tasks and mountains of paperwork are eliminated, productive "wrench time" is significantly increased, and considerable cost savings are realized.

Mobile Maintenance Opportunities:

- Download assigned work orders to mobile device and display details, steps, parts
- Look up replacement parts availability
- Enter parts requests and requisitions
- Modify work order information as the work is completed
- Download asset details and history
- Add and edit assets and components
- Update meter and inspection reading information
- Create emergency work orders and work requests
- Enter time
- Enter failure mode information
- Perform work order closure
- Send notifications to work requesters when their work order status changes
- Generate alerts when approvals or other actions must be taken

"The focus of mobile applications will shift from the scheduling and dispatching of service orders to a wider range of applications aimed at all types of field work (e.g., service, inspections, maintenance, construction, outage restoration)."

– Rick Nicholson, META Group

Obstacle 2: The Inventory Perspective

The storeroom environment can be action-packed. Receipts, returns, and issues tracked manually are by nature prone to error, and estimates often replace actual counts during time constraints. Physical inventory audits, best performed when the storeroom is completely shut down, in reality must be performed while materials are still moving in and out of inventory.

The Mobile Solution

Mobility in the storeroom virtually eliminates errors and streamlines day-to-day operations. Warehouse personnel can conduct cycle counts without halting operations. Wireless technology can capture inventory through bar codes and transmit the data in real time to the corporate network. Critical material availability is easier to track, resulting in timelier asset management.

Mobile Inventory Management Opportunities:

- Provide inventory audit and cycle count cataloging
- Improve stock availability, issuing, receipt, return to stores
- Improve goods and service requisition processing
- Improve binning
- Provide pick ticket query and verification
- Send notifications to material requesters when their inventory is received
- Generate alerts when approvals or other actions must be taken
- Provide bin bar code label and delivery label printing for picked and direct orders

PPL Corporation warehouse operations process an average of more than 1,500 transactions per day, 24 hours a day, six days a week. Warehouses and outside yards, some of which total more than 100,000 square feet, store more than 80,000 catalog identification numbers. By implementing mobile asset management, errors were slashed, pick time was cut by one-third, on-time picks were improved from 64 percent to 98.89 percent, and overhead costs were reduced by 20 percent.

Obstacle 3: The Management Perspective

Operations' management goals center on running the operation at the highest efficiency and lowest cost possible. Incomplete data, inaccurate job assignments, inefficient scheduling, and unexpected delays all negatively impact operations in the field and at the storeroom. Managers can be suddenly blindsided by unexpected asset failures or parts shortages, or gradually affected by productivity problems and inefficient business processes. Customer service can suffer as a result of ineffective resource management. Management cannot afford to rely on untimely data.

The Mobile Solution

Mobile devices keep current operational data at the manager's fingertips. Alerts can be sent to or from any remote device when an action needs to be taken. Receiving automatic notifications of key performance indicators (KPIs) allows for prompt corrective action, recognition of opportunities for improvement, and better decision-making. Empowering remote users with the right tools and ready access to critical information allows them to perform their work more effectively. The mobile asset management solution improves the bottom line by improving asset up time and reducing maintenance costs.

Mobile Operations Management Opportunities:

- Push KPIs to management with alerts and messaging
- Automate existing processes by replacing paper-based transactions
- Enable simplified time entry for remote users for timely labor tracking
- Improve resource productivity by reducing delays in accessing information
- Increase visibility of asset availability, condition, and cost history
- Track work order backlog, status, and completion times
- Decentralize decision making to users physically at the location requiring attention
- Improve customer service responsiveness with remote status updates
- Assure employee and community safety by providing ready access to safety data

"Corporations need a long-term mobile strategy that connects mobile employees, business partners, and customers to corporate information, especially as enterprise software expands its influence over operations."

– Keith Mallinson, Yankee Group

PPL Achieves Operational Objectives with Mobile Strategy

Energy company PPL Corporation generates nearly 10,000 megawatts of capacity worldwide, with fossil fuel, nuclear, hydro, and natural gas facilities in the United States, Latin America, and Europe. As a result of changes in the utility industry, PPL was determined to increase operational efficiency and reduce overhead costs.

Driven by a strategy of consolidation, technology, and process change, PPL initiated a mobile asset management initiative. They now have more than 150 warehouse operations personnel in Pennsylvania and Montana using hand-held, wireless devices to perform all processes from receipt of material to issuance to customers, including work management tracking of specialized tools and cycle counts. Implemented on time and under budget, the initiative realized a reduction of FTE (full time equivalent) personnel and overtime hours during the first year of implementation, improved productivity and accuracy, and cut overhead costs by 20 percent.



According to John DeFluri, manager of warehouse operations, “It’s given us complete visibility as materials move through our warehouses. In today’s deregulated environment, warehouses are forced to make faster and more frequent deliveries. As a result, you need to pick faster and more efficiently than ever before.”

Technology Imperatives

In searching for a mobile technology partner, Indus identified four primary technological requirements. First is the ability to support a plethora of devices and communications standards, and adapt to newer innovations. Second is the ability to support users who require instant or continuous access to the system, those who work while disconnected from the system, and those who are subject to interruptions in service. Third is internationalization in order to support Indus' global customer base. Fourth is the need to tightly secure the data on the remote devices as well as during transmission to the server.

Extensible, Standards-Based Architecture

An adaptive technology based on open industry standards is by design able to accommodate new key capabilities as business needs are identified. Mobile solutions with extensibility built into the architecture allow future mobility initiatives to be easily deployed.

Indus' mobile computing solutions are very tightly integrated with leading J2EE application servers (e.g. WebLogic, WebSphere, etc.), using an XML/HTTP interface to exchange data with any J2EE information source. This results in an architecture that is clean, reliable, scalable with enterprise applications, and able to balance loads.

The many portable devices on the market all have different display profiles and storage capabilities and contract with a variety of wireless vendors with different communications standards. In order to support this diversity of portable devices, an architecture that adheres to a wide variety of existing and emerging network and communication protocols is necessary. These protocols currently include WAP, GSM, CDMA, TDMA, CDPD, AMPS, SMS, GPRS, TCP/IP, Mobitex and ReFlex, and emerging standards such as 2.5G and 3G. Enabling support of standards such as these make universal device support achievable.

“From an IT infrastructure perspective, we expect a mix of mobile devices (e.g., ruggedized tablets, semi-ruggedized laptops, field appliances), an increasing percentage of thin-client applications, and continued growth in the use of public wireless data networks (e.g., CDPD, PCS)” – Rick Nicholson, META Group

Adaptable Connectivity

An advanced mobile computing solution can enable access to data running in connected, disconnected, or intermittently connected modes of operation.

MOBILE COMMUNICATION MODES
<p>Connected – In this mode, mobile workers can be wired or wireless, using any mobile device that enables two-way, real-time communication with the system. Instant access to the system information is enabled.</p>
<p>Disconnected – When disconnected, mobile workers interact with a handheld device where data is stored locally, and periodically through synchronization the data is transferred from the device to the server, and updates made by other users are received from the server.</p>
<p>Intermittently Connected – When the network, Internet, or telecommunications connection goes down, data can be stored locally. Dynamic reconnect capabilities bring the device back online when the connection is restored, and stored data is then synchronized between the portable device and the server.</p>

In connected, real-time mode, emergency work orders can be entered, materials requested, engineering designs accessed and updated, inventory counts recorded, and alerts or notifications dynamically passed between the field force and the asset management system.

In disconnected mode, mobile technicians can connect long enough to download scheduled work orders and related asset information, disconnect to perform the work, enter locally into the device the failure data, labor information, notes, and closure details, and that data is later synchronized with the server once a connection is established. Repetitive functions like taking meter readings are good candidates for this disconnected, store-and-forward method.

Temporary disconnects or inconsistent connectivity outside the coverage area need not disrupt productivity. Seamless, adaptive technology with dynamic recovery can permit work to continue with the user unaware of the service interruption.

Internationalization and Localization

Increasing globalization has propelled the need for internationalization in technology. Mobile asset management solutions must be internationalized. This includes enabling double-byte character sets (used in many Asian languages such as Japanese), and supporting Unicode, the standard encoding format that allows a user to view data in his or her own language. Dates, currencies, and other number formats must be displayed using local preferences.

Security

Protecting your systems during mobile operation is mandatory. Secured mobile asset management solutions use authentication and support SSL, HTTPS, and PKI security standards for 802.11 wireless networks. Mobile security measures integrate cleanly into the enterprise application's security architecture. Transactional security is used while communicating with bi-directional authentication via digital certificates and/or passwords. Because the data transmitted to and from a mobile device is fully encrypted, or locked, during transmission, every mobile transaction is private. Data is also protected when locally stored. Security logins and profiles control access to available data and functionality. Security measures are particularly important as industries become more collaborative in nature, opening access to systems not only to employees but also to contractors, OEMs, and business partners.

Indus Delivers Mobility with Architectural Advantage

Indus International, with three successful and very distinct asset management solutions, needed to identify a single mobile architecture that was capable of supporting all three products and that answered each of their business and technology imperatives. After an extensive search, Indus selected iConverse as its mobile application platform partner. iConverse's open standards and technology for adaptive productivity best suited the needs that Indus saw in delivering an advanced mobile asset management solution with their product suite.



The award-winning iConverse Mobility Platform enables Indus to rapidly develop and deploy mobile business applications for every mode of mobile operation and for every device on the market. Its visual drag-and-drop development environment enables the IT staff to create, deploy, and maintain applications easily, quickly, and inexpensively. They can preview the way an application and content will appear and then deploy the solution with one click. The developer environment generates

both thin- and smart-client support for user-friendly, browser-based interfaces and interoperability with any Web application, and Indus can respond to the specific mobility needs of its clients quickly and efficiently.

Previous mobile technology was only as reliable as the connection being used. iConverse's patent-pending adaptive mobile productivity technology lets remote users of Indus Solutions continue to perform their job functions whether connected for real-time data exchange, disconnected for store and forward processing, or needing automatic recovery when communications service is intermittent. The adaptive, distributed applications can be accessed in any language from almost anywhere in the world, and developers can even generate applications that utilize voice-recognition.

The two-way messaging engine can instantly communicate with any data-enabled mobile device through a global carrier network, making it unnecessary to forge independent carrier relationships or standardize on one network. If a specific wireless carrier is experiencing network problems, the message will be quickly re-routed to a more available carrier network or a different gateway on the initial carrier's network. An audible or visible alarm notification tells the receiver that a message has arrived on their device.

Wireless networks are secure with this technology. The platform adheres to standards-based HTTPS/SSL PKI in conjunction with an application server and certificate

authority. Access to the server is secured to prevent access by hackers or accidental interception. Through encryption, the integrity of data is ensured and every mobile transaction is private. This technology, combined with Indus' own security features, eliminates the problems faced by mobile workers in the past.

Indus recognized the strengths and uniqueness of the iConverse solution, and their combined solution has the capacity to serve Indus' global customer base with a powerful and flexible mobile asset management solution.

The Future of Mobile Computing

Visionary features in mobile computing open the imagination to endless possible applications in mobile asset management. Voice activation functions using voice recognition capabilities could be used, for example, for initiating work requests. Global messaging using cell phones with built-in GPS receivers could be used to locate labor resources in remote areas, or to locate management of an emergency situation. Auto-ID technology using a microchip-equivalent of a bar code could be affixed to a pallet of goods, so that wireless readers in a warehouse can automatically track the merchandise as it moves from place to place. Calendars or date books in PDAs and mobile phones could be integrated with maintenance work schedules.

Cost/benefit analyses must be conducted before it can be determined which of these visionary capabilities might be a worthy investment for your operation. Undoubtedly, growth and innovation is forecasted in mobile computing applications, and that is one area where analysts who study business and technology agree.

"...companies require a combination of mobile and non-mobile WM applications to manage field activities and the work force. The differences in functionality offered by WM and mobile WM applications are blurring, but the requirement to have data and information available at the worksite is still critical." – Marc McCluskey, AMR Research, Extending Workforce Management Applications to Third-Party Workforces, January 1, 2002

*"Bridging the network gap to provide ubiquitous access for employee-facing applications like enterprise asset management, healthcare practice management and field force automation will dramatically increase the rate of productivity at which employees can perform and services can be rendered."
– Steve Drake, IDC*

*"Mobile solutions and wireless technology have come a long way in the last few years creating, many viable new options for improving information access for better decision support and increased productivity."
– Houghton LeRoy, ARC Advisory Group*

"By 2003-2004, more than 75 percent of knowledge workers are expected to be mobile (on the road, work at home, remote office, etc.) at least 25 percent of the time." – Jack Gold, META Group

Mobile Computing Shipments Forecast (Thousands of Units)

	2000	2001	2002	2003	2004	2005
United States	8,786	9,046	10,248	11,584	13,040	14,661
Worldwide	25,521	28,151	31,923	38,196	44,445	50,692

Source: Gartner Dataquest (September 2001)

Note: The mobile market consists of laptop, notebook, transportable and ultraportable units

“Longer term (2003-05), as wireless communications bandwidth and coverage continue to improve and costs continue to drop, we predict an acceleration of the trend toward Internet-based architectures and expansion of MDSs into mobile commerce (m-commerce), encompassing third-party (e.g., customer, contractor, intermediary) self-service applications, smaller and more-pervasive devices, embedded global positioning system (GPS) technology, and voice interfaces.” – Rick Nicholson, META Group

Conclusion: Mobility as a Sustained Competitive Advantage

As technology continues to provide answers to business imperatives, further growth will be seen in the use and continuing innovation and evolution of mobile computing. Dramatically improved operational efficiency, productivity rates, and responsiveness resulting from mobile asset maintenance will benefit all industries seeking a strategy of rapid cost reductions, increased competitiveness, and a greater return on their assets. The alliance between Indus and iConverse creates one such solution that has the power and flexibility to grow with the inevitable changes while continuously providing high value for operations and improving the bottom line.

Appendix A

DEFINITIONS

2.5G	Technologies called "2.5G" will deliver speeds between 56 to 144K bit/sec. Carriers say 2.5G networks, such as General Packet Radio Service, can adequately handle most 3G services. Plus, they're less expensive to implement.
3G	Generic term used for the next generation of mobile communications systems. Proponents of 3G networks promise speeds from 384K bit/sec. to 2M bit/sec. At 3G speeds, mobile phones or handheld devices could handle high-speed multimedia and become all-in-one communications, entertainment and information devices.
802.11	A family of specifications developed by the IEEE for wireless LAN technology. 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients.
AMPS	Advanced Mobile Phone Service is first generation wireless technology, with analog voice service but no data service.
CDMA	Code Division Multiple Access is a cellular technology originally known as IS-95, competing with GSM technology for dominance in the cellular world. This is the system used by Sprint and Verizon.
CDPD	Cellular Digital Packet Data is the system associated with the analog cellular system. This is widely available, and at a reasonable cost.
GPRS	General Packet Radio Service is a new non-voice service that allows information to be sent and received across a mobile telephone network. It supplements today's Circuit Switched Data and Short Message Service.
GSM	Global System for Mobile Communications is the world's most widely used mobile system, used on the 900 MHz and 1800 MHz frequencies in Europe, Asia and Australia, and the MHz 1900 frequency in America. ATT and Cingular are converting to GSM.
HTTPS	HyperText Transport Protocol over SSL is the secured version of http
J2EE	Java 2 Enterprise Edition is a collection of discrete Java API specifications such as JSP, Servlet API, JDBC, JMS, JNDI, etc.
PCS	Personal Communications Services is a new digital technology that transmits calls at a higher frequency and at lower power than conventional cellular networks. PCS phones weigh less than cellular phones, have a longer battery life and boast clearer sound.

DEFINITIONS

PKI	A Public-Key Infrastructure comprises hardware, software and services that enable the secure and private exchange of data and transactions over the Internet.
RF	Radio Frequency.
RIM	Research in Motion, the manufacturer of the Blackberry device, which is a wireless email solution.
SMS	Short Message Service is a service for sending messages of up to 160 characters to mobile phones that use GSM communication. GSM and SMS services are primarily available in Europe.
SSL	Secured Sockets Layer is a protocol that protects data sent between Web browsers and Web servers. SSL also ensures that the data originated from the correct Web site and that no one tampered with the data while it was being sent.
TCP/IP	The Transmission Control Protocol (TCP) is a method that, along with the Internet Protocol (IP), is used to send data between computers over the Internet.
TDMA	Time Division Multiple Access is digital transmission technology that allows a number of users to access a single radio-frequency (RF) channel without interference by allocating unique time slots to each user within each channel. This is a dying standard.
WAP	Wireless Application Protocol is a family of protocols allowing mobile devices to access wireless services. WAP was introduced in 1997 by Unwired Planet (now Openwave).
XML	The Extensible Markup Language (XML) is a specification that lets you tag text for a Web-based document. It gives meaning to text on a page. With context programmed in, and information in a document structured to make it "smart," web searches and data gathering are more specific.

About Indus

Indus International is the world's only company offering a full range of asset management solutions that are global across all industries and scalable to all business sizes. Indus is the market-leading supplier of EAM software and services, according to ARC Advisory Group's Enterprise Asset Management (EAM/CMMS) Software & Services Worldwide Outlook. Indus software products, professional services and Web-based hosted service offerings improve our clients' profitability by allowing them to better manage their assets – reducing costs, increasing capacity and competitiveness and ensuring regulatory compliance. Indus solutions are used by more than 460 customers in 45 countries and diverse industries – including manufacturing, utilities, telecommunications, government, education, transportation, facilities and property management, consumer packaged goods and more. For more information, visit our Website at <http://www.indus.com>.

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