DEFINING A SUCCESSFUL WIRELESS SOLUTION

Wireless data communications is set to move from a niche to mainstream business tool rapidly over the next few years. Although the growth rates differ, every published market study points to increasing business use of wireless technologies. Announcements of wireless initiatives by organizations ranging from giant global corporations to corner coffee shops confirm the breadth of wireless adoption.

New implementations reach far beyond paging and wireless e-mail. A particularly intriguing study released in October, 2003, by respected IT research firm Gartner predicts that half of all enterprises with more than 1,000 employees will use at least five wireless networking technologies by 2007. Businesses that may be hard pressed to name five different types of wireless technology today likely will be using some of them within a few years.

Rapid advancements in communications, software and mobile computing technology can make planning a wireless implementation seem like trying to piece together a jigsaw puzzle whose picture is constantly changing. For example, cell phone companies and other network operations are now offering third-generation (3G) wireless services, just as 2.5G networks and supporting mobile computing equipment are becoming mature and affordable enough to attract new business users. The business case for wireless LANs became very strong and thousands of businesses implemented the technology after the 802.11b standard was established, but now new, higher-speed standards are requiring businesses to rethink their infrastructure strategies. Radio frequency identification (RFID), Bluetooth and wireless LAN-based telephony (VoIP) also are displacing other technologies that have delivered proven efficiency benefits.

Planned improvements to business processes must go on. Companies can’t wait for mobile and wireless computing innovation to stop. Luckily, organizations don’t need a crystal ball to plan successful wireless applications or to see what technologies will be required in three years. What they do need is a process to manage the introduction of new technology into their enterprise.

This white paper offers guidance for planning wireless implementations and investing in technology that will provide a solid, sustainable return on investment, regardless of what new innovations may evolve over the life of the system. It’s goal is to provide a framework for how to define business requirements and plan an application, differentiate between current and emerging wireless data services, and learn from examples of how businesses are profiting from converged wireless applications. The paper also includes an overview of current wireless, mobile computing and data capture technology capabilities, as well as tips on how to make selections today that will both protect current investments and provide the flexibility to take advantage of future advancements.

Defining the Application

Businesses won’t implement new wireless technologies simply because analysts and researchers predict they will. Wireless implementations should only be initiated to help solve a business

problem or create a new opportunity. Many projects don't deliver the benefits that they could because they are driven by enthusiasm to "go mobile" without enough consideration for how the project will impact the business. It is not enough to use mobile and wireless technologies to do things differently; they must be used selectively where they can make things better.

Planning a successful wireless application first requires answering a number of questions:

• How often does information need to be updated?
• Can current applications be modified or must new software be developed?
• What data transmission standards and methods should be used?
• Are multiple forms of wireless communication required?
• Should data be processed on the mobile computer or at the host level?
• Should mobile workers use a thin client or thick client?
• How will applications be updated?
• What happens if wireless coverage becomes unavailable?
• Should transaction information be stored in memory or communicated in real time?
• How should enterprise and mobile databases be synchronized?
• Should the operating system of the mobile device match what's used in the desktop environment?

These are just a few of the dozens of questions that must be considered, however there are four questions that should be answered first:

• What part of our business do we need to improve?
• What procedures delay our mobile workers?
• What procedures consistently cause inaccuracies?
• How could mobile workers take advantage of improved access to enterprise information?

Answering these four questions can be difficult, but will make all other project decisions easier by providing a framework for planning. They help define the business need wireless capabilities can satisfy and provide a way to measure results. These four questions will lead to others specific to your business that will provide even greater clarity about your application needs and goals. These requirements then should be recorded in a formal project document that can form the basis of a request for proposal (RFP). Clearly documenting project goals and requirements will build understanding among all departments, partners and vendors involved in the project, help keep expectations consistent, and make it much easier to decide which hardware, software and communications features are necessary.

Fully reviewing business processes currently used in the field typically uncovers opportunities that would help workers complete their jobs more quickly, thoroughly and accurately. For example, Schwan's Home Service, which delivers more than 300 frozen food items directly to millions of homes across the continental United States, expects to increase sales to existing customers by millions of dollars by replacing paper route books with handheld computers loaded with integrated order history, CRM and other information. The improved information access is creating significant up-selling opportunities, while the ease and convenience of automated order

entry into a handheld computer, plus fast, accurate receipt generation through a Bluetooth wireless connection to a mobile printer, allows representatives to visit more customers per day.

Ace Beverage, a beer distributor in California, faced a different problem – delays and inefficiency in its order fulfillment process. Ace analyzed its operations and found that bottlenecks developed because its pre-sales staff submitted most orders right around the 6 p.m. deadline for next-day delivery. To meet its delivery commitments, Ace frequently had to pay distribution center workers overtime to get orders picked and trucks loaded in time to leave on schedule the next morning.

Ace's response was to automate the front end of the distribution process by implementing a wireless order entry system. Pre-sales representatives now communicate the next day's orders throughout the day, using a wide-area wireless data network. The load planning and order picking workload is more balanced, minimizing the end-of-day rush. Ace estimates the system saves between 15 and 20 overtime hours per week, and prevented $50,000 in additional capital equipment costs by improving utilization of warehouse space and assets. The automated order entry system also saves each pre-sales representative an estimated 60 to 90 minutes per day, making more time available for sales calls.

Organizations completing a review of business processes typically find similar ways to can take advantage of time savings and increased accuracy to improve a variety of business processes, such as eliminating delays in information availability, optimizing dispatch and work order management, and completing customer transactions in one stop. In addition, organizations may maintain accurate order and inventory records and ensure responsiveness and consistency of service. According to a study by AMR Research, businesses that automate their services operations are 25 percent more profitable than average companies in the same industry. The study also found manufacturers fail to capture 50 to 70 percent of available service revenue because of poor record keeping and management.

Mobile computers and real-time communication capabilities can eliminate these problems and ensure accurate, efficient field operations. But not if the technology is used to automate bad processes. Here again, the business process analysis will pinpoint unexpected areas for improvement. For example, application software should deliver process improvements by providing users with the information they need to make good decisions and by ensuring the accuracy of information collected in the field. Yet this straightforward goal can be tricky to implement.

Software Considerations

The biggest software question is whether to use packaged applications or to create a customized application, which can be developed in-house or by a systems integrator. Packaged applications can be implemented more quickly, but probably won't map exactly to your needs and preferences. These tradeoffs may be offset if the package is flexible enough to allow some modifications. Customized applications can meet requirements and preferences precisely, but require more development time. Selecting customized software does not ensure that it will be flexible. The development environment, application structure and developer's skill (and the

contract terms if an outside developer is used) all help determine how easily the application can be modified and scaled.

Many software development decisions hinge on whether the mobile user needs to process transactions or simply collect data. For example, a data collection-oriented field service application could prompt a user to record customers visited and service performed, which would save support time and labor by eliminating the need for paperwork processing and manual data entry into customer record and billing systems. A transactional field service application could process the collected data to generate an invoice on site. To ensure accuracy, the transactional application could use a real-time connection to a host system or a database on the mobile computer, to access a customer's service agreement and current pricing tables. If wireless communications are used, the worker could send a job completion notification to headquarters, giving supervisors a real-time view of activity in the field and allowing dispatch orders to be changed and updated throughout the day to make the most efficient use of personnel.

The transactional application is more sophisticated, but it also provides more benefits. In the scenario above, the company could have begun with a data collection application, later added offline database look-up capabilities and later still integrated real-time connectivity for processing and dispatch. The effort and expense required to add these additional features depends on the operating system and programming environment used to develop the original application. Future needs and potential system enhancements should be carefully considered during initial planning to provide a smooth migration path.

Microsoft Pocket PC, including Windows CE .NET, has evolved to become the dominant operating system used for mobile enterprise applications. It gives users access to an unparalleled developer community, a familiar programming environment for supporting and developing their own applications, a migration path to deploy mobile versions of enterprise systems, and the ability to remotely access Web services, whose role and importance in enterprise IT architectures is predicted to grow significantly. Other operating systems may lack the drivers necessary for bar code readers, mobile printers and other peripherals commonly used with mobile computers.

Software development also is shaped by which enterprise systems a mobile application must interface with. Once again, working in a widely supported development environment (e.g. COM, J2EE, HTML, etc.) makes it easier to exchange data with a variety of host systems, reducing programming and support needs and providing total cost of ownership advantages over proprietary programs. Organizations with packaged enterprise resource planning (ERP) systems in place are not compelled to use the limited mobile modules of their enterprise system. Users can tailor mobile applications to meet their precise business requirements and use middleware or interface development to handle necessary interaction with the ERP system.

The final major factor that drives mobile software development decisions is the selected method and degree of required connectivity between the mobile and enterprise systems. For example, a wireless LAN provides constant connection between a mobile device and the host system. The mobile device therefore can serve as an easy-to-maintain thin client that primarily exchanges messages and provides a convenient user interface. Lookups and transaction processing can occur at the host level and be relayed back to the mobile device, with sub-second response time.

“Always on” wide-area connectivity is only starting to emerge, as cellular technology matures. Wide-area wireless applications must allow for instances where the user will be out of coverage. Software must allow work to continue when a user is offline and must provide a failsafe way to guarantee queued messages will be delivered and data will be synchronized once the connection is reestablished. These considerations will be explained further in the following section.

Communications Considerations

Systems usually are described as being either "batch," with no wireless connection; "casually connected" or "occasionally connected," where real-time connectivity to host systems is available for only part of the day, as is common with wide-area wireless data networks; or “constantly connected,” where a user always has a connection to a host system, such as on a wireless LAN.

The operations review and business planning evaluation should provide a pretty clear idea of the required level of connectivity. For field service, delivery, route sales and other remote mobile operations, connectivity needs depend on the how often work requirements change and how much the organization can benefit from real-time inventory, job status and order information. For example, if service requests, new work orders or additional pickups and deliveries are received throughout the day, real-time wireless connections to a mobile workforce can provide a rapid and strong return on investment. Real-time communications provide an instant view of locations and job status activity that allow dispatchers or supervisors, often with the help of workforce management software, to dynamically reroute workers and dispatch new work orders. This application minimizes wasteful and redundant travel between jobs and balances workloads to keep workers productive.

For example, AAA Cooper Transportation is an LTL carrier headquartered in Alabama that primarily serves the southeastern U.S. The 50 drivers at its Dallas terminal make between 400 and 500 deliveries a day on their routes, and then begin the day’s pickups, which typically number between 700 and 800. New customer pickup requests are received throughout the day. Previously, they were relayed to drivers by voice radio, which was inefficient and time consuming. Because drivers spend a lot of time outside of their trucks making pickups and deliveries, many radio calls went unanswered, requiring multiple attempts to reach the driver.

AAA Cooper’s field computer systems manager describes the inefficiencies: "A lot of the time if a dispatcher can’t get through to a driver, and a pickup has to be made at five o’clock and it’s four-thirty, the only option is to run another driver over there. So you run a driver out of his route to go make the pickup, and you spend gas, time and money, when the first driver may have been only a block away."

Wireless data transmissions are received regardless of whether or not the driver is in the truck, so AAA Cooper conducted a mobile computing and WWAN communication trial. Daily delivery and pickup manifests were loaded onto mobile computers kept in the truck. Drivers used the computers to record their arrival and activity performed at each customer site by entering a few keys. When each pickup or delivery was completed, the transaction record was sent to the terminal over a WWAN connection. The information provided a real-time view of driver activity and produced information that allowed AAA Cooper to answer customer inquiries quickly.

When wide-area wireless data communications were used to support mobile operations, the company increased productivity by approximately one hour per driver per day. By transmitting pickup and delivery information throughout the day, AAA Cooper's planning systems could calculate the most efficient way to dispatch additional pickup requests and manage drivers in the field.

Real-time communication between field and central operations can also be very beneficial even if routes are relatively stable and daily assignments don't undergo frequent changes. Thies Distributing, a Florida beer distributor, cut its order processing time by 30 percent after using wireless handheld computers to transmit orders to the distribution center as they are received, rather than in batch at the end of the day. Ace Beverage experienced similar benefits, in addition to streamlining operations for its pre-sales personnel.

Wireless Wide Area Networks

Wide-area communications were once considered the domain of public safety organizations and giant, international express parcel operators, but the successful systems at AAA Cooper, Thies and other small and mid-size enterprises illustrate how wireless data networks have matured to become practical, with the ability to provide strong return on investment for many types of businesses.

Wireless data networks and supporting computer products continue to evolve and mature, bringing their benefits within reach of more organizations than ever before. While third-generation (3G) high-speed data networks are rolling out amid much hype and speculation about the possibilities for mobile commerce, interactive gaming, video calling on cell phones and other consumer-oriented services, businesses do not need to wait for these capabilities to gain benefits from implementing a wireless data application. The 2.5G networks that cover most of the U.S. today continue to expand and offer a combination of bandwidth, reliability and affordability that is compelling for most enterprise applications.

Today's 2.5G networks offer two-way communication, support data and voice communication, and feature "always on" connectivity that eliminates the need to dial in to establish a connection. This productivity enhancer allows a dispatcher to push information to the field without waiting for a mobile worker to initiate the call.

For the first time, WWAN offerings can affordably meet the business requirements of small and mid-size businesses. Rates are based on the amount of data transmitted and are typically 10 times lower than the initial 2G network plans. Speeds (up to 115Kbps) and coverage also have improved to the point where the technology is a viable business tool for many organizations.

All 3G networks are based one of two technologies, CDMA/1XRTT or GPRS/GSM. This is a major difference from first- and second-generation systems, which typically were a hodgepodge of incompatible technologies that prohibited roaming, including CDPD, DataTac, IDEN and Mobitex. The more focused, current technology landscape has helped spur a more competitive market that has given users more device and software options to support wide area communications.

CDMA/1XRTT offers speed of 144 Kbps (although actual throughput is typically between 50 and 60 Kbps) and is capable of supporting data and voice communications, so mobile computers and cell phones can be used as multi-purpose devices. Data transmission is generally possible wherever cell phone coverage is available, a vast improvement over earlier wireless data offerings. Leading CDMA providers include Qualcomm, Sprint PCS and Verizon.

GPRS is offered in the U.S. through AT&T Wireless, Cingular, T-Mobile and others, and is an evolved form of GSM technology that dominates the wireless landscape everywhere outside the U.S. GPRS offers 115 Kbps connectivity (typical throughput is 20 to 50 Kbps).

CDMA and GPRS technologies are not interoperable, so roaming between the two different types of networks is not possible. Roaming among networks that use the same technology also may not be possible, because each wireless carrier has its own unique “flavor” of the protocol. Therefore to ensure reliable operation it is imperative to use mobile devices that have been certified by the carrier for use on its network. That’s why it is particularly important to work with a partner experienced in wide area wireless implementations. An experienced partner can simplify the process of determining the best network for your business needs, testing and selecting equipment, and developing application guidelines for the most efficient communications.

Hot Spots

Wide-area wireless service operators are expanding and supplementing their networks with public access wireless LANs, which are often called "hot spots." Hot spots provide Internet access through a mobile LAN connection. In areas where wide-area network coverage is unavailable, workers use their mobile computers to access the wireless LAN and use the Internet connection to communicate with the host system.

Hot spots were first available in airports and a few business hotels, but the number and types of locations is expanding quickly to include coffee shops, fast-food restaurants, campuses and public places. There were approximately 31,000 hot spots in operation in 2003, but there will be 135,000 by 2007 according to research by London-based Datamonitor PLC. As the volume and variety of hot spot locations grow, so does their value to business.

To take full advantage of wireless developments, users need flexible mobile computers capable of handling multiple radio technologies. An 802.11b-standard (Wi-Fi™) radio is required to access most hot spots, while wide area data transmission requires a separate radio matched to the wireless network. Some rugged enterprise mobile computers available today can provide simultaneous support for up to three radio types (wireless LAN, WWAN and Bluetooth short-range radio). When supported with the right software, these mobile computers can continually probe the airwaves to see what coverage is available and automatically configure themselves to communicate, using the lowest-cost network. Multiple radio support enhances connectivity and makes the most efficient use of wireless communication.

Communications support is one of the most important considerations when selecting a mobile computer and can be the leading factor in determining the hardware life cycle. Multiple-radio support, standards-based communications and upgradeable radio modules are features that

provide flexibility and a migration path to maximize the return on the mobile computing investment.

Computer Considerations

Dozens of mobile computers with hundreds of configurations are available for wireless business applications. The selection is not daunting, however, to an organization with a good understanding of its business requirements and goals. The hundreds of available options can quickly be winnowed to a manageable range worthy of further evaluation and testing if the mobile device selection is deferred until many of the business planning questions are resolved.

For example, determining the level of required connectivity will define the wireless support required in the computer; data input preferences determine if bar code scanners, RFID readers, imagers and other data capture capabilities are needed; the enterprise IT infrastructure and software development environments will point to the most advantageous mobile operating system; observing mobile workers on the job will provide guidance for optimal screen size and keypad configuration, plus ergonomic preferences and durability requirements.

The factors to consider when selecting a mobile computer are described in detail in Intermec's white paper Eight Steps to Going Mobile.

When matching business requirements to mobile hardware, it is important to consider how applications could change in the future. Many companies plan phased implementations in which a basic application is rolled out, then enhanced after the implementation has been completed across the organization and workers have become comfortable with the new mobile devices or when more budget becomes available.

A phased implementation in field service could begin by implementing wireless dispatch and paperless work order management, which will provide the largest immediate productivity benefits. Once technicians are comfortable with the new work order management procedures, mobile printers could be added to the application to generate invoices and service documentation. Later still, the company could add GPS receivers to its vehicles to facilitate a host of fleet management applications. By keeping future applications in mind and specifying a Bluetooth interface on computers for the initial wireless dispatch operation, the organization could add mobile printing, GPS and other applications requiring more peripherals without having to replace its mobile computers.

Wireless technology, data capture techniques and business needs are continually evolving. It therefore is essential that the mobile computers selected to support wireless applications have the flexibility to change and grow as new capabilities become available.

Conclusion

Successful wireless implementations are not defined by how they communicate data, but how they provide information. If businesses processes are flawed, mobile and wireless computing systems will merely speed the flow of bad data. When mobile worker needs are carefully aligned with business goals and back-end operations, wireless systems can provide a rapid return on

investment by giving users access to the information they need to complete transactions, support better decision making, and streamline back-end operations.