Many of today’s enterprise IT organizations are struggling to understand what it takes to implement a successful wireless data solution for their mobile workers. By understanding mobile challenges and partnering with a wireless expert they can be on the path to mobile success.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>STEPS TO A SUCCESSFUL SOLUTION</td>
<td>3</td>
</tr>
<tr>
<td><strong>WIRELESS DATA SOLUTION CHECKLIST</strong></td>
<td>3</td>
</tr>
<tr>
<td>ASSEMBLING THE PROJECT TEAM</td>
<td>5</td>
</tr>
<tr>
<td>DEVELOPING A PROCESS SPECIFICATION</td>
<td>9</td>
</tr>
<tr>
<td>IDENTIFY OBJECTIVES</td>
<td>9</td>
</tr>
<tr>
<td>DOCUMENT PROCESSES</td>
<td>9</td>
</tr>
<tr>
<td>DESIGNING THE SYSTEM ARCHITECTURE</td>
<td>11</td>
</tr>
<tr>
<td>ISSUE RFPs</td>
<td>11</td>
</tr>
<tr>
<td>WHAT TO LOOK FOR IN AN RFP</td>
<td>11</td>
</tr>
<tr>
<td><strong>ELEMENTS TO CONSIDER WHEN CHOOSING A MOBILE DEVICE</strong></td>
<td>13</td>
</tr>
<tr>
<td>DURABILITY</td>
<td>13</td>
</tr>
<tr>
<td>FORM FACTOR</td>
<td>14</td>
</tr>
<tr>
<td>BATTERY OPERATION</td>
<td>15</td>
</tr>
<tr>
<td>OPERATING SYSTEM</td>
<td>15</td>
</tr>
<tr>
<td>APPLICATION REQUIREMENTS</td>
<td>16</td>
</tr>
<tr>
<td>MODEM SUPPORT</td>
<td>16</td>
</tr>
<tr>
<td>PERIPHERALS</td>
<td>17</td>
</tr>
<tr>
<td>PRICE AND SUPPORT</td>
<td>17</td>
</tr>
<tr>
<td><strong>ISSUES TO CONSIDER WHEN CHOOSING A NETWORK PROVIDER</strong></td>
<td>18</td>
</tr>
<tr>
<td>WIRELESS DATA NETWORK TYPES</td>
<td>18</td>
</tr>
<tr>
<td>COVERAGE</td>
<td>19</td>
</tr>
<tr>
<td>SPEED</td>
<td>19</td>
</tr>
<tr>
<td>NETWORK CAPACITY</td>
<td>19</td>
</tr>
<tr>
<td>RELIABILITY</td>
<td>20</td>
</tr>
</tbody>
</table>
MULTIPLE NETWORK SUPPORT 32
SECURITY 33
SERVER MANAGEMENT 33
MULTIPLE APPLICATION SUPPORT 33

TESTING 34

TESTING CHECKLIST 34
DEVELOPING THE TEST PLAN 34
CREATING A TEST BED 36
EXECUTE TESTING 36

STAGING 37

PILOTING YOUR APPLICATION 38

DEVELOPING THE PILOT PLAN 38
PILOT TESTING 39

ROLLING OUT 40

GETTING STARTED 41
Introduction

Today’s workforce is increasingly mobile, yet the speed at which business operates demands that mobile workers stay in constant communication with their customers and colleagues. To provide them with instant access to enterprise, personal, and Internet information, many corporations are designing and deploying wireless data solutions. These wireless solutions allow corporations to reap a significant return on investment by:

- Increasing worker productivity
- Eliminating task duplication
- Improving customer service
- Providing point of service revenue opportunities

Implementing a wireless solution represents a significant challenge for most businesses because they have not yet acquired the knowledge and expertise necessary to understand the challenges at hand or have the technology available to overcome those challenges. Developing a wireless solution that will succeed in the field requires more than simply putting a desktop application on a mobile computer. Wireless computing is an entirely new paradigm of computing and communication.

Unlike a traditional LAN environment, a wireless solution needs to contend with the harshest of environments-- from varying coverage conditions to extreme weather conditions to narrower bandwidth to higher latencies-- making designing a good solution challenging. Wireless solutions also need to address the unique needs of mobile workers. On the road, mobile workers only want access to specific information, and they don’t want to surf for it or take a long time booting up a computer. Mobile users also want to use different devices and have information formatted appropriately for each. However, they do need data to be synchronized between devices so they don’t have to spend a lot of time managing their data.

Implementing a wireless solution can be excruciatingly painful for ill-equipped project managers. But if they design a solution wisely and partner with companies that have the required expertise, they’ll achieve successful wireless deployments and find themselves regarded as a superstar.

This paper is designed to be a guide for the IT or project manager who has been given the task of implementing a wireless solution and will want to aid the next wireless data superstar. It will walk the reader through the steps that need to be taken in designing, developing, and deploying a wireless solution and discuss many of the decision factors that should be considered at each step along the way. The
information in this paper is by no means complete or the only way of implementing a successful solution. But it is the result of Nettech’s years of experience that comes from our extensive knowledge of the wireless marketplace and wireless data communication and helping our many customers deploy mobile solutions to over 70,000 plus users.

We hope that by using this guide and partnering with industry experts you will soon be on the road to wireless data application stardom.
Steps to a Successful Solution

The following checklist represents an outline of the steps that need to be taken to ensure a successful rollout. Each step is critical to the overall success of the project and will be described in greater detail throughout this paper. So pin this page to your bulletin board and use it as a checklist throughout the project.

Wireless Data Solution Checklist

- Assemble a full project team including IT, Business Managers, Quality Assurance and most importantly, Users.
- Develop a project plan allocating time and resources for each of the items below.
- Develop a specification of the business process by conducting on-site surveys and discussions with users. Be sure to include exactly what tasks need to be accomplished, what information needs to be communicated, what information users require access to, etc.
- Define the system architecture by developing requirements for the following components based on the business process specification. Submit Requests for Proposals to appropriate vendors, review responses and choose the vendors that best meet your needs.
  - Mobile computing device/ modem
  - Network(s)
  - Application
  - Middleware/Wireless Server
- Develop migration, pilot, deployment, and solution support plans.
- Concurrently proceed with:
  - Procurement of devices and modems
  - Establishment of network connections
  - Establishment of proper test environment
  - Development of application
  - Staging of devices
  - Creation of documentation and training manuals
  - Training of support personnel
- Once developed, test the solution in the lab and, most importantly, in the field. Gather feedback from testing and make necessary changes.
- Train a small group of users and implement the pilot plan. Gather feedback and make necessary changes.
- Train all users and implement the deployment plan.
- Continue to gather feedback and improve/update the system as required.
Assembling the Project Team

Successfully deploying a mobile solution requires more than just developing an application. Successful project teams include representation from each business area involved in, or affected by, the development, deployment, and support of the solution. The following table lists the different roles that should be included on the project team and a description of the role. Please note that a team member may take on multiple roles, but it is important to have each role represented in some capacity. Many of these roles may also be outsourced to companies with the expertise required, such as systems integration companies and hardware, software, middleware or network providers that also offer professional services in these areas.

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
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<tbody>
<tr>
<td>Project Manager</td>
<td>It is imperative that there is one person that maintains overall responsibility for the wireless project. This person will oversee, manage and coordinate all aspects of the project from design through deployment. This person is charged with delivering a successfully working solution on time and on budget.</td>
</tr>
<tr>
<td>IT Manager</td>
<td>Even if the IT manager does not maintain the project management responsibility, it is still critical for the IT manager to be intimately involved in the project as the solution will ultimately need to be integrated into existing systems. In addition, supporting the system will most likely lie with the IT department.</td>
</tr>
<tr>
<td>Business Unit Manager</td>
<td>This person oversees departments receiving the solutions. The business unit manager holds responsibility for the budget and objectives for project and is critical in gaining and maintaining management buy in for the project.</td>
</tr>
<tr>
<td>Operations Management</td>
<td>This COO-type individual will contribute to the project and make decisions regarding the overall impact on company operations. Thus it is vital that operations management is on board with the project, since this person can easily waylay it if he feels it doesn’t fit with the overall company objectives and operations plan.</td>
</tr>
<tr>
<td>System Architect</td>
<td>This person, who may also hold another role on the team, is responsible for designing the overall wireless solution. This role may also be outsourced to ensure that it is someone who understands wireless communication and all the pieces of the system well enough to design an effective and efficient solution.</td>
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## Role Description

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<tr>
<th>Role</th>
<th>Description</th>
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<tr>
<td>Systems Analyst</td>
<td>This person will review the system and look for ways to improve the solution.</td>
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</table>
| **Application Developer(s)** | When it comes to application development, organizations have a few choices.  
   - They can purchase an off-the-shelf product from one of many software vendors offering these solutions.  
   - They may hire a third party to build a complete solution for them or customize a partially packaged solution.  
   - Or, they can develop the application in house. If developing the application in house, one or more application developers should be assigned to the project for its duration to be responsible for developing/programming the application and integration with backend systems. |
<p>| Quality Assurance     | Quality assurance testing is one common stumbling block to companies implementing a wireless solution. It is absolutely critical that the system be tested not only in the lab, but also in the field to ensure it is working properly before a major rollout. This involves a comprehensive QA plan that tests for the many different types of problems that may arise in a wireless solution. Having a solution that works reliably is especially important in a wireless environment because of the challenge associated with supporting remote workers. |
| Users                 | Users are a required part of the project team to provide input on their needs, describe how things are used in the field, test the system, provide feedback and help train and introduce other users to system during rollout. When designing the system, it is also important that other team members follow users’ activities for a few days to understand their business processes and what information they need to communicate and have access to. |
| Wireless Expert       | Without having someone on the team that understands the ins and outs of wireless, the project is doomed to failure. This person provides knowledge of wireless networking and communication and helps design and develops the application and wireless communication components. Since this individual does not exist in most organizations, it is possible to outsource this expertise to an organization that has a solid reputation in the wireless industry. |</p>
<table>
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<tr>
<th>Role</th>
<th>Description</th>
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<tr>
<td><strong>System Support</strong></td>
<td>It is important to have a team that is responsible for troubleshooting and correcting any problems that may arise with the system. Whether this team resides within the IT department or separately, someone must be responsible for fielding calls from users, assisting them with difficulties and escalating problems that cannot be easily resolved. It is essential that the help desk team be fully trained on the system and part of the initial design and development phases to gain a full understanding of how the system operates and provide input on features that will help them more easily diagnose problems and assist users remotely. Keep in mind that in many instances, the mobile workers may not be PC knowledgeable and, oftentimes, the systems they are using are non-standard compared to the LAN environment. A crack help desk team is required to effectively support a wireless solution.</td>
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<tr>
<td><strong>Procurement/Purchasing</strong></td>
<td>A project team member must be identified to be responsible for negotiating contracts with suppliers and purchasing system components.</td>
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<tr>
<td><strong>Training</strong></td>
<td>Effective training of users can make or break the systems success because if users don’t understand the system, they will either use it incorrectly or not at all. The person responsible for training users on the operation of the system should be involved in the project from the get go to develop a full understanding of the system.</td>
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<tr>
<td><strong>Technical Writer</strong></td>
<td>This person is responsible for creating documentation for the mobile application and supporting software systems.</td>
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<tr>
<td><strong>Legal Department</strong></td>
<td>Someone from the organizations’ legal department must be involved to review and approve contracts and legal agreements with vendors.</td>
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Not every member of the team is involved in all stages of the project. The chart following outlines when and how long each member should be involved.
## Wireless Solution Project Schedule and Role Assignments

<table>
<thead>
<tr>
<th>Project Role</th>
<th>Design (3+ mos.)</th>
<th>Development (3+ mos.)</th>
<th>QA (1+ mos.)</th>
<th>Pilot (1+ mos.)</th>
<th>Deployment (3+ mos.)</th>
<th>Ongoing Support</th>
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<tr>
<td>Project Manager</td>
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<td>IT Manager</td>
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<td>Business Unit Manager</td>
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<td>Operations Management</td>
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<td>Systems Architect</td>
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<td>Systems Analyst</td>
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<td>Application Development</td>
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<tr>
<td>Wireless Expert</td>
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<tr>
<td>Quality Assurance</td>
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<tr>
<td>Users</td>
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<tr>
<td>System Support</td>
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<tr>
<td>Help Desk</td>
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<td>Procurement</td>
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<td>Training</td>
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<td>Technical Writing</td>
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Developing a Process Specification

It is impossible to design a system that will improve productivity and enhance communication and customer service without first developing an in-depth understanding of the current business processes. Once again, this system is more than an application development project, it may, in effect, rearchitect the operational processes within the business unit. This is just another reason why it is critical to make sure members from the operational staff; business unit management and end users are all on your project team.

The first step in developing a new business process specification is first identifying operational objectives for the new system and documenting the current business practices. Some of this information may already have been collected by the team driving the project when it developed a business case to receive management buy-in. These steps are sometimes blurred. For our purposes, we are assuming that management has already committed and bought into the vision and objectives of the project, and now it is up to you to implement it.

**Identify Objectives**
Objectives for the project should be quantified, if possible, in terms of the following area(s):

1. Cost savings
2. Service enhancements
3. Revenue generation opportunities

**Document Processes**
The current business processes should be learned and examined in detail, not on paper but in real-life situations. The most effective way of doing this is by riding along with mobile workers as they go about their day-to-day business. During this documentation period, the system designers should determine:
1. What information the user needs access to during the day including the complete inbound and outbound data flow.

2. How the user currently gains access to information

3. Who they need to communicate with and how often

4. What tasks are duplicated or done manually by inhouse administrative workers on the behalf of mobile workers

5. What is the environment in which mobile workers operate (indoor/outdoor, rural/urban…)

6. What resources will help the mobile worker better accomplish his/her job

7. Incremental revenue opportunities by performing services/sales at that point of customer contact

8. What information are their customers/clients looking for

9. Problems encountered when communicating/working when mobile

10. What other devices, equipment, hard copy data, etc. the mobile worker now carries to perform his/her tasks

This is just a starting list, which should be customized according to your specific business.

After completing this analysis of current business procedures, the operational team members should then document an improved business process designed to solve any problems identified in the study and meet the overall objectives of the project. This business process should then be reviewed by senior management involved in decision making, business unit managers, key users and other project team members to ensure complete buy-in. If everyone does not agree at this stage, there is a greater opportunity for the project to fail or not meet expectations at a later date.
Designing the System Architecture

The next step is to design the system architecture based on the business process specification. This includes developing system requirements for each component of the system architecture including:

- Mobile computing device(s)
- Mobile/wireless network(s)
- Software application(s)
- Middleware
- Modem(s)
- Wireless gateway
- Back end applications/servers
- Service and support requirements

Since many of these items are new to some wireless project managers, they are discussed in more detail in the following sections to help guide you through the decision making process.

**Issue RFPs**

After determining the system requirements, the next step is to identify potential vendors and issue a Request for Proposal (RFP) to qualified vendors. Good sources for identifying vendors include industry consultants, trade publications, referrals or web research. Be sure to clearly state your system needs and require responding companies to address how their product meets each need.

When reviewing responses to RFPs, don’t let cost be your sole determining factor. Oftentimes the most critical element is experience. That said, you also have to be aware of hidden costs such as training, consulting or development fees. In addition to product specifications, there are many other factors to look for when reviewing an RFP.

**What to Look for in an RFP**

1. Has the vendor provided a solution similar to yours before? Ask for references and call them! Look not only at the type of solution, but also SIZE of deployments. Does it have any large-scale deployments? If not, you don’t want to be its guinea pig.
2. What WIRELESS experience does the company have? It may have been producing mobile computers for years but does it understand wireless?

3. What is the long-term viability of the company and the products? Is it committed to wireless? If it is going to be part of your solution, you want to make sure it is committed to the project and you are assured that it will not abandon or discontinue support for its products in the future. If you are deploying a large number of users, you have every right to expect upper management involvement to show its commitment.

4. What other resources does it offer such as consulting, application development, training, etc. and what are the related fees for such services?

5. Are its offerings available today or are you going to have to wait?
Elements to Consider when Choosing a Mobile Device

There are many different types of mobile computers and devices, each with different features, functions and purposes. The majority of devices are broken into approximately five to seven categories. These categories and some major hardware vendors offering products in these categories are listed below. For more information on mobile computer types, read Nettech’s *Introduction to Wireless Data* white paper, available at www.NettechRF.com.

1. Laptop (Dell, IBM, Toshiba)
2. Rugged laptop (Itronix, Panasonic)
3. Handheld (LG Electronics, HP)
4. Rugged handheld (Symbol, Intermec/Norand, Handheld Products)
5. Palm-size or Personal Digital Assistant (Palm Computing, Casio, Psion)
6. Pagers (Research in Motion, Motorola)
7. Smart Phones (Nokia, Ericsson, Motorola)

Unlike desktop computers, which are fairly homogenous, the purchase of mobile computers involves many decision factors, many of which are outlined and explained in greater detail in the sections below. Each of these criteria should be evaluated in terms of your company’s specific needs and requirements to determine the best fit. Mobile device costs can vary greatly from a $200 phone or pager to a $7,500 rugged laptop computer. Therefore, you should carefully evaluate the true needs, but don’t be quick to take the low road, trying to use a device that doesn’t fully accommodate your needs will cost you more in the long run when its replaced with the correct solution.

**Durability**

It is important to consider durability in relation to how the device will be used in the field. How well the device needs to respond to environmental elements such as stress, shock, temperature extremes and water are dependent on the environment in which it is used. Some questions to consider are:
1. Will the device need to operate outside? If so, you will most likely require a ruggedized device that is built to withstand all temperature extremes and is water-resistant. Also, be sure to test the quality of the display in bright light. Many screens are not designed for operation in direct sunlight and therefore may be difficult to read in that environment.

2. Will the device be vehicle-mounted? If the device is vehicle-mounted, as often found in field service or public safety applications, the computer you choose needs to be able to withstand the stress and shock inherent in travelling along bumpy roads.

3. What is the possibility of droppage? The average mobile professional will drop his or her notebook computer from time to time; therefore, most laptops today are built to withstand a certain amount of stress and shock that occurs when dropped from three to four feet off the ground. But if you have workers that will have a tendency to toss their device into the back of a truck or bang it when wearing it on their belt, you will probably require a rugged device.

**Form Factor**

Yes, size does matter, but so does form factor. When you are mobile you want a device that is easy to carry and operate. Form factor involves the size, weight, input mechanism and ease of use of the device. Each of these items should be prioritized to help determine the best overall form factor. Which is most important, that the device be light, small or easy to input data with? Some items to consider when evaluating which form factor is the best for your users are listed below. Remember, get the users’ opinion too, they are the ones that will be operating it on a day-to-day basis.

1. What else will users be carrying? How much total weight can they be expected to carry? Are they carrying the device all-day or just between appointments?

2. Does the device need to fit in a briefcase, on a belt, in one hand, etc.?

3. What input mechanism is best for your users? Non-PC users may find a tablet device with an easy-to-use touchscreen interface the most user-friendly. If your users wear gloves, be sure that the input device accommodates this. Other workers, such as delivery personnel may be holding packages with both hands and have only a thumb to input information. If there is a lot of text to input, most users will prefer a full-size keyboard. Whereas if they are sending short messages or bits of information, the hunt-and-peck on a two-way pager or PDA may be suitable because size is the key factor.
Battery Operation

For many organizations, battery life is one of the most critical elements when choosing a device. Once again, it all depends on your users’ needs. Issues to consider when evaluating the battery operation include:

1. How long will your users need to operate devices on their own power source? This will determine the necessary battery life of the device.
2. What types of batteries does the device operate on? Many small devices such as pagers and PDA operate on standard AAA or AA batteries that are inexpensive and easily accessible.
3. What type of adapters are available? Can they plug into standard automobile cigarette lighters like most phones?
4. Does the device offer in-cradle recharging?
5. What is the recharge time required?
6. If used with a wireless modem, does the modem utilize the device’s battery or have its own power source? If it uses the device’s power, add in extra time to the required battery life for normal operation.
7. How large or heavy is the battery and charger?
8. If the device was vehicle-mounted, can it utilize the vehicle’s power or battery?

Operating System

Mobile devices come in different flavors, including a multitude of operating systems varying from industry-standards to proprietary systems. When choosing a device, you need to consider the power of the underlying operating system, as well as the compatibility with existing applications. If you plan on supporting multiple devices, your best bet is to use mobile middleware, which provides platform independence, allowing your application to be easily ported to varying devices. Some issues to consider include:

1. How robust is the application? Does it need a full-powered 32-bit operating system to function properly?
2. What are the application’s memory requirements? Many devices with proprietary operating systems offer only small memory capacity. If you are not willing to re-engineer your application for the mobile device, you will require a more robust operating system.
3. Do you need to run multiple applications simultaneously? If so, the proprietary operating systems or those devices running DOS (which many still do because of the low memory requirements) are not for you.
Application Requirements

Before making a final decision on a mobile computer, you will first need to understand what requirements your application(s) will have in terms of CPU speed, RAM, hard drive memory, operating system support, etc. to be sure that your desired choice meets those requirements.

Modem Support

Many mobile devices are designed specifically to work with certain wireless networks and have packaged modems to support those networks. Others offer the option of choosing from various packages depending upon your network of choice. Still others don’t support specific networks and will require purchasing a separate modem to support the network of choice. Following are some questions to consider when deciding what type of modem support you require in a device.

1. Do you want the modem to be internal or external to the device? Wireless modems come in a variety of forms. Integrated modems are inside the device and therefore offer an integrated package that doesn’t require any separate pieces or cables that could be easily lost or damaged. On the other hand, external modems, which are offered in either the form of PCMCIA cards or separately, allow you to easily switch out a modem if you are encountering problems, wish to upgrade, or decide to switch networks.

2. What level of coverage do you require? Mobile modems, such as vehicle mounted modems that are “mobile” but not “portable,” tend to offer better network reception, due to their higher wattage output and externally mounted antennas, as compared to portable, internal or PCMCIA, modems.

3. Does the modem use the device battery or have its own? In some instances, it may be preferable for the modem to have its own power source, which is easy to maintain with standard 9-volt batteries, rather than to draw from the device’s battery supply.

4. What information regarding the modem is required by your users? For example, do they need to be able to determine their battery level or network signal connection at a glance? If so, then you require a modem that offers these indicators via LED displays, or makes this information available to the application or middleware, which in turn will display this data on screen.

5. What cables or connectors are required?

6. Will you be able to support multiple networks with the device? For example, if you want to provide backup or nightly access via a wireline
dial-up connection, you may want to consider using a device with a built-in modem and a PCMCIA slot for a wireless modem. Or, if you want to be able to swap out modems according to coverage conditions, you will surely require a device with external modem slots.

**Peripherals**

You should also consider what peripherals your users require, or will make their jobs easier. For example, it will be much faster and easier to obtain accurate data by using bar coding and a barcode scanner within the mobile device then requiring the user to input a code. If your application is ideal for bar coding, you should consider a device with a built-in or easily attachable/connectable scanner.

Some applications also require connection to a printer. This could be a small, wearable printer or a device that mainly resides in the vehicle. Connecting to printers and other peripherals will soon be much easier using Bluetooth technology, which allows devices in close proximity to communicate wirelessly, acting as a cable replacement. If peripherals are a requirement, you may want to consider choosing a hardware vendor that is planning near-term support for Bluetooth.

**Price and Support**

Finally, it is critical that you consider price, warranty, and technical support during the decision making process—but you probably knew that already. When choosing a vendor, you should also inquire about its upgrade policies, future product pipeline and support plans and possible leasing options.
Issues to Consider when Choosing a Network Provider

Just as there are many mobile devices to choose from, so are there network providers. Before getting into the issues to consider when choosing a network provider, let’s first examine the major types of wireless data networks currently available. To learn more about these network technologies, please refer to Nettech’s Introduction to Wireless Data White Paper, available at www.NettechRF.com.

Wireless Data Network Types

There are two types of data networks—circuit switched and packet switched. A device using a circuit switched network only connects to it when data is to be sent and you pay for the amount of time that you are “connected.” While connected on a circuit switched network you have the exclusive use of the connection you have established and can send data continuously. Many major wireless voice carriers are currently announcing support for circuit switched data. A number of these carriers also have plans to move to a digital packet switched technology over the next three to five years. Switched circuit technologies include CDMA, GSM, iDEN (Nextel), and TDMA.

A packet switched network is one where you are connected all the time and only pay for the actual data sent. On a packet network, your data is divided into small packets. The network bandwidth is shared with other customers also sending packets of data at the same time. Packet data technologies come in three flavors: public packet data, private packet data (wherein the entire network infrastructure is owned and operated exclusively by one organization) and satellite packet data, which provide ubiquitous coverage reaching remote areas not covered by terrestrial networks. Public packet data technologies include DataTAC, Mobitex, and CDPD (Cellular Digital Packet Data). Private packet data technologies include DataRadio, Ericsson’s EDACS, and Motorola Private DataTAC. Satellite networks include NORCOM, Orbcomm, and Qualcomm.

When you are choosing a network provider, you need to carefully evaluate each of the following criteria in relation to your requirements.
Coverage

Coverage is an obvious issue but one that goes much deeper than simply looking at a coverage map. In addition to making sure the network providers under consideration offer coverage in all the areas that you require, you must also determine the level of coverage that they offer. Some areas to consider are listed below.

1. What type of inbuilding penetration to do they provide (if you require in-building communication)?

2. Do they have enough base stations in heavily populated areas to handle the volume of traffic? There could be a circle on a coverage map indicating coverage, but what is the level of that coverage?

3. Test the signal strength in various areas in which you require coverage to determine that the coverage provided is truly adequate to communicate effectively.

Speed

The most important thing to realize when considering the speeds of wireless networks is that the speed of wireless will always lag behind wired network environments and applications must be designed to work in these environments. You can’t expect to send streaming video over a wireless connection with any level of success. Test the wireless network to see how it performs for communicating the information you really need. Chances are you will be surprised at how adequately what you would consider a “slow” speed in this Internet-age really performs. Also realize that there is a lot of hype in the market in terms of speed. Faster networks are coming but wireless is working well in many applications around the world today! There is no need to wait for the promise of faster networks.

Additionally, the speeds published by the network operator are raw bandwidth exclusive of any network overhead. Typical throughput will actually be lower, particularly in packet data networks.

Network Capacity

One of the issues mentioned previously in relation to speed and coverage is network capacity. It is important to probe beneath the surface to determine the capacity of the network in your critical coverage areas and what percentage of capacity the network is operating under. Also ask what capacity is being used during high points of the day when your users will need to send their data. Network congestion has peaks and valleys, similar to highway congestion during rush hour. By understanding the conditions of the network congestion, you can make a more informed network choice and, possibly design your application to upload large amounts of information during times when the network isn’t very congested.
Reliability

Obviously a key issue is network reliability. If your mission-critical application is dependent upon getting data through, you need a very reliable system and network partner. There are a few key issues to look at when evaluating reliability:

1. What is the percentage of network downtime?
2. What does your partner’s network operations center look like? What monitoring and troubleshooting tools does it use to support the network?
3. Does it have redundant servers and connections to the main operations centers?
4. How quickly can it fix things when something goes wrong?

Latency

Network latency refers to time delay between submitting a message and when it is received by the recipient of the message. Latencies can be affected by many different factors, including congestion, poor coverage conditions due to natural elements or obstructions, etc. These are impossible to calculate and will vary over time. There is, however, certain latency inherent to the network technology that can be evaluated on a consistent basis. The latency may not be a strong enough reason to not consider a certain network, but it should be a factor that you are aware of.

Protocol Support

While the trend is clearly moving toward IP-based networks, a number of wireless networks specifically designed for wireless data have implemented their own proprietary protocols that were more efficient in a wireless environment. If efficiency is an issue, you may lean toward one of the non-IP-based networks. Using middleware, you can easily support their protocols and not have to worry about getting locked into using that network if you wish to switch in the future. If IP-compatibility is important, middleware is also available that allows you to optimize communication over IP-based networks to make them more efficient, such as Nettech’s Smart IP. Also note that many IP networks are planning rollouts that will address the bandwidth issues, practically making efficiency a non-issue in the future.

Host Network Connection Options

When evaluating network providers, you should determine what types of host network connections they provide. In other words, how do you connect your wireless server to the wireless network? Via the Internet? Through an X.25 connection? What options are available? Look at each option in terms of the following issues:

1. How long does it take to set up?
2. What is the cost to establish and maintain the connection?
3. How much traffic does the connection support?
4. Is there a limit or recommendation of number of users supported by the connection?
5. What is the reliability?
6. What is the backup plan in case the connection goes down?
7. What information or monitoring can be done of the connection?

**Functionality**

Many networks, particularly those that were designed specifically to communicate wireless data, have built in features and functionality designed to improve the performance, usability and manageability of the system. Be sure to investigate each network’s unique differentiators to see if they can make an impact on your planned solution.

**Complementary Networks**

When choosing a network provider, you should also consider using a complementary network to supplement coverage in low or no-coverage areas, provide a back-up in case the primary network goes down, or send larger amounts of data. Some networks offer complementary network services, such as satellite, within their product portfolio. Depending upon what you require, the most common complementary networks are satellite, circuit-switched cellular and wireline dial-up.

1. **Satellite.** Satellite networks are used to complement terrestrial networks when complete coverage is not available from the primary network and it is critical to communicate data to and from remote rural locations.

2. **Circuit-switched cellular.** Circuit-switched cellular networks may sometimes reach suburban areas not always covered by packet-data networks and therefore may be used as a back-up, or they may be used in case the primary network experiences difficulties.

3. **Wireline dial-up.** Wireline dial-up networks are also used as a backup in case the primary network goes down, although it is not preferable because it creates a need to find a landline phone with a modem jack. Most typically, wireline dial-up is used to communicate large amounts of data in the morning or at night when the user is at a fixed location. Examples include nightly uploads of daily job information or overnight/morning downloads of work orders. Wireline dial-up may also be used to synchronize data, remote diagnostics or remote distribution of software updates.
Technical Support

Beyond the technology issues, there are always the business issues to consider to ensure that you get the best product, with the most support, for the best price. For such a critical link in your wireless data solution, your network provider’s technical support needs to be world class. Be sure to ask:

1. What are its technical support hours?
2. What is its response time?
3. What is the escalation procedure?
4. How are you notified if the network is experiencing difficulties?

Cost/Pricing model

Cost is an important consideration when choosing a network carrier. Pricing models usually fall into one of three categories, either buckets of minutes in circuit switched, by consumption or flat rates. While this may make budgeting easier, you may end up paying more than you need to. The most important factor in considering different pricing models is to truly understand how much data you will be sending. To do this you must have a measure of how much data, in bytes, will be communicated daily. When comparing pricing, also look at the overage charges, roaming charges if applicable and any other connection fees that may apply.

Developer Support

Most wireless data networks offer developer programs, which include a software development kit, developer subscription to the network and access to other tools and resources. As a new wireless data developer, these programs can allow you to get up and running quickly and easily and provide you with the support you need to develop wireless applications.

Reporting

Investigate what types of reporting and statistics the network operators can provide. Sometimes this information can provide great insight into how much traffic is generated, peak times of the day, average message sizes, etc. Plus it helps you analyze your airtime expenses!

References

Many of these issues discussed are difficult to determine through reading marketing literature or talking to an account manager. To get the real data, talk to system engineers and real customers that are actively using the network for large-scale deployments.
Mobile application development is a different paradigm from standard application development because the mobile application will communicate with the back office in a disconnected fashion. Mobile users will also communicate using a variety of devices, sometime even multiple devices. Therefore, information needs to be formatted and filtered appropriately for each device.

These and other issues listed below are all things that developers need to consider and accommodate for when developing a mobile application. Some organizations may choose to purchase a packaged application from a third-party software vendor (see Packaged Application sidebar) instead of building it themselves. Mobile middleware can also be employed to handle many of the information retrieval, filtering, formatting, synchronization and optimization issues (see Mobile Middleware sidebar).

**Information Delivery**

Most mobile devices, with the exception of full laptops, offer small screens to display information. Still others have limited input mechanisms such as tiny keyboards, graffiti handwriting or numeric keyboards. Information should be delivered to these devices in such a way that it is very easy to read and respond. For example, your application should include many built-in standard responses that are a one-key operation such as “Job Complete” in a field service application. Many devices offer
Packaged Applications

There are many packaged wireless-enabled software applications on the market today, particularly in vertical markets. Using a packaged application allows you to deploy your solution faster and leverage the expertise the vendor provides, instead of recreating the wheel.

A sample listing of application providers for a variety of vertical markets follows.

**Field Service**
- Astea, Brazen Software, FieldCentrix, iMedion, Metrix, Nexent, Oracle, Siebel, Utility Partners, Vantive, Videre

**Transportation**
- Roadnet, Synergistic Systems, Transcore, TMS

**Public Safety**
- Allinson-Ross, Cerulean, PRC Litton, Public Safety Management, Software Kinetics, Versaterm

**Insurance**
- ADP Claims Solutions Group, CCC

**Synchronization**
- Puma Technologies, Sybase Corporation

**Mobile Internet**
- Palm Computing, Transcore, WolfeTech

You also need to understand that users want to receive and interact with information differently depending upon the device. For example, some people may use smart phones for voice and short messages, Palm Computing organizers for schedule and contact information, and laptops for email and other office applications. In this instance, they don’t want to read full email on their smart phones. It is inappropriate for that device. Your application needs to be able to filter information appropriately for each device. One way to do this is to send only short messages and email headers and address information to devices such as a smart phone, interactive pager or PDA. Depending upon the importance, the user can then decide whether to request the full message on that device, wait until later to receive it or use their laptop to retrieve the message.

You may also wish to include the capability to prioritize messages so that the most important message gets to the user first. Consider this: You have messages queuing up for a user when suddenly an urgent call comes in and you need to dispatch your user to that location right away. You need to make sure that this message gets through first. Sender address and other such criteria can also prioritize messages.

**Multiple Devices**

As mentioned previously, many users will wish to carry multiple devices for different purposes, or you may choose to deploy different devices to workers with different roles within your organization. How will your application handle communicating to multiple devices within the field force or per person? And how will it handle a user connecting with one device one-minute and another the next?

Your application needs to include some intelligent routing capabilities to be able to recognize what device and network the user is on and switch easily between devices and networks. By developing user profiles, you can determine what devices users are carrying and what information they wish to receive on each device. When users connect or log in, you can then determine what they are currently using and
communicate appropriately. This is much simpler than it sounds. However, there are mobile middleware products on the market today that provide this type of message routing.

Data should also be synchronized appropriately between devices. For example, if a user receives email headers on a two-way pager and chooses not to view the entire message, the message should be saved so that he or she can then access it later using a more appropriate device such as a laptop computer. An important issue for enterprise users, particularly mobile professionals, is the elimination of multiple addresses. Mobile users want to access the same information from each device. They want information to be synchronized between devices. They do not want to maintain multiple addresses for different devices. This is another area where the intelligent messaging capabilities of the back-end server come into play.

**Push Technology**

A critical component of a successful mobile application is the ability to push data to users. Remember that mobile workers are operating in a disconnected fashion and often roaming in and out of coverage. Therefore, they can not be expected to constantly check to see if they have any data or messages waiting for them. Information should be pushed to mobile users.

This can be done in a variety of ways. For example, the message could be pushed to all devices carried by the user since the host application won’t necessarily know which one they are using. Or, if the user is connected, information could be pushed to that device. Finally, information can be filtered and pushed to different devices as discussed in the prior section. However it is accomplished, the ability to push is a key function of mobile applications.

**Coverage Fluctuations**

Network coverage is continuing to expand but users will always experience coverage holes or fluctuations in coverage levels. Just compare it to your experience using a mobile phone while driving—conditions often vary. A variety of factors can influence coverage including rain, tall buildings, and hills and going deep inside a building. Virtually all-mobile users will experience these conditions and your application needs to be able to handle users moving in and out of coverage.

One way to accommodate changing coverage is to implement store-and-forward message queuing. In this instance, messages are stored in a queue when the user is out of coverage or offline and then pushed to the other side once the connection is re-established. This ensures that messages are guaranteed to be delivered as soon as the user is back online. As you can see, a good implementation of store-and-forward goes hand in hand with push technology. Mobile middleware technologies, such as Nettech’s ExpressQ, provide these functions for mobile application developers.
In order to improve performance, your application should also include optimizations that allow it to adjust automatically when coverage conditions are poor to retain the connection whenever possible. For example, when poor coverage conditions are identified through a drop in signal strength, the application will slow down the data transfer rate and then speed it up again when good coverage resumes. This will help prevent the connection dropping completely.

You may also want to consider adding features that allow the application to automatically reconnect to the network if the connection is dropped and resume transmission where it dropped often. You can do this by maintaining a virtual connection with the application so that once the actual connection is automatically re-established, the application can resume without having to restart or resend. This too can be accomplished using mobile middleware products or transport protocols that have been optimized for wireless.

**Bandwidth**

As you know, wireless networks currently offer much narrower bandwidth than traditional wired or even dial-up networks. This will change in a few years with the delivery of next-generation wireless networks, but optimization for wireless will always be an issue as wired bandwidth increases and mobile applications become more robust. Therefore, even assuming you will be using networks that can offer speeds equal to or faster than dial-up connections, you should still optimize your application for wireless communication.

This can be done in a variety of ways. First, data sent over the air should be compressed. Second, unnecessary headers and “handshake” packets should be stripped out of the communication. Finally, the application should be designed to send the minimum amount of data over the air. To cite an extreme example, examine the inefficiency of doing a 3270 terminal emulation session over the air. For each keystroke, the entire screen is being sent over the air. Clearly this is not an application well suited for wireless. Nearly all-mobile middleware products offer some level of bandwidth optimizations.

**Application Portability**

An important issue to consider is your migration path and future plans. While you may use one device or network today, you may choose to switch to a different platform in the future. Or, you may even find that different devices work better for different users within your mobile work force. How will you support all these different devices? You don’t want to rewrite your application each time you switch out a device because that is time consuming and resource exhausting. In this instance, you may want to consider using a mobile middleware product that supports
many different devices and operating systems to protect your investment in your application.

**Ease of Use**
Mobile applications must be very easy to use and recover when problems occur. Due to the remote nature of mobile workers, it becomes increasingly difficult to provide troubleshooting and support when problems arise. Applications should be very robust and reliable to work well in the field. Also keep in mind, if you are developing an application for a vertical market, chances are your mobile workers may not be very PC-literate. Therefore applications require an easy-to-use interface with simple and clear screens.

**Scalability**
As with all enterprise applications, scalability is an important factor in developing wireless applications. When designing your system, be sure to develop your application to be highly scalable and reliable. You may want to consider implementing technologies such as redundant servers for increased reliability and load balancing across multiple servers.

**Security**
Security is an important concern in the mobile and wireless world. The same level of security you implement within your organization should extend beyond the walls to your mobile users. Consider implementing firewalls as well as security and privacy technologies such as user authentication and data encryption as part of your mobile solution.

**Thin Clients**
Keep in mind when you are developing your application that most mobile devices have limited memory available. In a highly distributed environment such as mobile computing, thin clients are prevalent. Your client application should be designed so that the server does the majority of the processing. This paradigm follows the emerging paradigm of Internet computing.

**Wireless Awareness**
Since your users will be mobile, it is important to provide them with important information that affects the performance and usage of the application. For example, your application should let users know if they are in coverage so they don’t waste valuable time and battery power attempting to continually resend messages or connect to the network.
Users also need to know how much battery power they have remaining so that they can make appropriate arrangements. You don’t want your users to be caught unaware without power.

**Power Management**

Just as battery power is an issue to users who need to understand how much power they have in order to plan appropriately; power management is also an issue for the application. Sending and receiving data uses battery power. Therefore, your application should be designed to manage the user of power. For example, it should send the minimal amount of data over the air. It should also have a “sleep” mode during periods of inactivity to minimize the user of power.

**Network Management**

As mentioned previously, remote users are especially difficult to manage, monitor, troubleshoot, and support. When developing an application, consideration should be given to how support staff can perform remote diagnostics and manage mobile users. Consider implementing a mobile network management product that will provide alerts and statistics, let your network managers know how many users are connected, how much data is being sent, how many messages are waiting, when users last connected, what network/device they are using and other such key data.

Remote distribution of software updates is also a key issue for mobile applications. Unless mobile workers regularly come into the office with their computers, you will need to plan for how you will remotely distribute software upgrades to their devices. Software packages exist to help you manage this process and remote distribution of software is typically done over a wireline dial-up network connection in the evening or morning.

**Backward Compatibility**

While the issue may appear minor, backward compatibility is particularly important in a mobile environment where not all users’ computers will be updated at the same time. You will therefore have servers running with clients of varying versions. If backward compatibility is not ensured, the system will undoubtedly fail.

These are just some key issues that should be considered to allow your application to perform optimally in a mobile environment. If you are implementing a new system for your field force, you may want to consider a packaged application that has already incorporated many mobile-specific functions for your market that you would need to develop, such as mapping, routing, and dispatching, which are not part of your current back-end applications.
Things to Look for in a Middleware Provider

If you decide to develop your own application incorporating mobile middleware, there are a number of issues you should consider. Keep in mind that middleware is a very broad category and some companies’ products only fulfill specific needs so it is important that you find a provider that offers the solution that you are looking for. It is even possible to utilize multiple types of middleware within your solution. For example, you may choose a mobile middleware provider that offers a broad development platform and a variety of high-level mobile services that are required in your solution and utilize a different vendor’s middleware to provide database connectivity or legacy to html conversion. Issues to consider include the following:

**Platform Support**

One of the basic features of mobile middleware is to provide a unified development platform across multiple devices. This protects your investment in your application and makes it easy to move from one platform to another. Therefore, it is important to choose a vendor that offers a broad spectrum of mobile device platform support. This should include emerging mobile devices such as Palm Computing organizers, interactive pagers, and smart phones. It should provide a powerful server that allows you to incorporate all mobile devices into the enterprise to make them manageable and more useful to the users.

Ensure that all platforms are available today, and ask to see a vendor’s future plans as well. Make sure that the company has a history of proactively introducing new technologies as they emerge and has long-term dedication to the market.

In addition to multiple platform support, make sure it offers feature-rich solutions for each platform that allow you to maximize the features and functions of the underlying platform.

**Network Support**

Similar to mobile platforms, your mobile middleware provider of choice should offer support for a broad range of wireless networks. This support should include any complementary networks you may consider such as satellite, as well as emerging networks such as GSM and CDMA. Its middleware should incorporate any unique features provided by the networks as well as offer the services discussed earlier such as automatic fluctuation to coverage changes, automatic re-establishment of connect, optimizations, compression and wireless awareness.
High-level Services

Ideally, the middleware products you choose should be flexible enough to meet your needs. They should also provide high-level services in addition to the development platform that will solve additional challenges or allow you to include value-added services in your application. Examples include store-and-forward message queuing, mobile network management, email gateways, optimized web browsing, and other advanced application agents or applets. This may also include the ability to add on applications that increase the overall value proposition of the total solution.

Scalability and Reliability

As with other elements of a wireless solution, scalability and reliability are key factors in middleware. When choosing a middleware vendor, you should evaluate the products to determine statistics such as percent of CPU used at peak times, server capacity, failure rates, etc. Most importantly, make sure your vendor has already deployed to large-scale customers and ask for references. Don’t be someone else’s guinea pig. Instead, you want to choose partners that have done it before and can guide you down the path of wireless success. Additional features to consider when choosing a wireless server are covered in the following section.

Experience

Experience is key in choosing all of your solution partners. Make sure they have within their organization the skills and expertise that don’t exist yet in yours and that they fully understand wireless and what it takes to deploy a wireless solution. Also, choose a vendor that specializes in middleware. If its success is linked with yours, chances are you will get better overall results. Here are some things to look for:

1. Does it have multiple customer deployments of 1,000 or greater?
2. How many years of wireless experience does it have?
3. What percentage of its overall business does middleware represent?
4. What is the average wireless experience of its development team?
5. How many users have deployed applications?
6. What are its long-term plans? Is it a long-term player in this space?

Product pipeline

One way to make sure that the middleware provider you choose today will be able to meet your needs in the future is to understand its product development plan and product pipeline. Some questions to ask are:

1. What platforms/networks will it support in the future?
2. When does it plan to add support for specific platforms, networks or features you are interested in?
3. When was each of its last product versions released?
4. When will the next version be released?
5. How many product releases does it expect in a given year?
6. Where does it see the product line evolving? Is it in line with your future expectations?
7. Will it support emerging technologies such as WAP, 3G networks, and Palm VII (if not already)?
8. What higher-level services does it plan to offer in the future?
9. What additional value-added services is it planning?
10. What is the mission of the company? This may seem odd related to product pipelines but often looking at a company’s mission statement will show you what its vision is and where it may evolve to in the future.

**Value-Added Services**

Many organizations will also offer value added services designed to facilitate the proliferation of their software. These services may be invaluable to you as you begin to develop and deploy your solution. Value added services may include product or wireless training, system design, application development, integration services, deployment assistance and server or application hosting. You should look to partner with a company that offers all or some of these value added services, especially if you are new to wireless as it may ease your task and speed deployment.

**Technical Support**

Evaluate technical support programs and quality when choosing a vendor. In addition to investigating technical support policies such as hours, response times and escalation procedure, you should also look at what kind of support it offers to developers through a Developer Program.

**Price**

Of course price is a key factor in your decision making. When evaluating price, also determine how willing the vendor is to work with you. Does it offer alternative pricing models that fit well with your business? Find out what the price includes. Do you get ongoing support and upgrades? Since pricing models may vary, be sure to compare the total costs and their representative values.

The following section should also be reviewed when choosing a middleware provider, as a wireless server will most likely be part of its product offering.
Key Features of a Wireless Server

Whether you are using a wireless server or gateway provided by a middleware company or developing your own, you should look for the following key features to provide a robust, enterprise-strength solution.

**Platform Support**

The server you choose should run on standard industry platforms such as Windows NT or UNIX and provide the ability to interface easily with back-end legacy systems. Some wireless servers require special or dedicated hardware. If cost is an issue, you should evaluate servers that can run on any standard server and can reside on the same server as that running the application or other gateways.

**Capacity and Scalability**

Your wireless server should offer high capacity and scalability to meet your growing needs. When evaluating products, be sure to investigate capacity limitations, user statistics and benchmarks. If you are planning a large deployment, the server you choose should support failure mechanisms and load balancing between servers. You may also want to employ backup servers for redundancy in the case of a server failure or to allow you to disable a server for maintenance or upgrades without disrupting your system.

**Host Connection Options**

Just as you evaluated the host connection options offered by the network providers, you want to make sure that the wireless server you choose supports these different options. Since setting up and maintaining the server and network connection can be intimidating to those new to wireless or cost prohibitive for small companies, you may want to look into alternative hosting options. Ask your middleware or wireless server provider if they would host the server for you. Some vendors offer these wireless server-hosting services for a monthly service fee.

**Multiple Network Support**

If you plan on using multiple networks to connect to your server applications, be sure you choose a wireless server that supports these networks and has the ability to connect multiple networks to a single server. The server software should also be able to switch seamlessly between networks and accommodate users on multiple networks.
Security
As stated previously, security is crucial. The wireless server you choose should support firewalls as well as provide user authentication capabilities.

Server Management
The wireless network server should be able to be run at remote locations and provide management information and statistics to network management software applications. The server itself should provide an administrator’s interface that shows how many users are connected, the amount of data transferred, number of messages sent and received, number of messages in queue, last log in and other such information crucial to managing and monitoring a mobile work force. In addition to these reports, the server should also offer the ability to provide some basic troubleshooting capabilities and diagnostics of remote users such as the ability to “ping” a user.

Multiple Application Support
Finally, the server should not require you to dedicate a separate server for each application you wish to run. Instead it should support a variety of applications and the ability to run different applications simultaneously.
Testing

Before starting to pilot or roll out your wireless solution in the field, it first must be put through a rigorous quality assurance testing process. In addition to testing in the lab, it cannot be stressed enough the importance of also testing in the field. For mobile applications more then any, the lab environment is extremely different from the actual environment the application will be used in; no application deployment will be successful off the bat without extensive field-testing. The following leads you through the steps you need to take to develop and execute a quality assurance and testing process for your wireless solution.

Testing Checklist

1. Develop the test plan. This should include what items will be tested, required results, who will be responsible and involved in the testing and the testing timetable.

2. Build the test bed. The testing environment must be exactly the same as the production environment to ensure accurate results. Therefore, before advancing to this stage, final decisions regarding the hardware, network and software elements must be completed and the components must be purchased in enough quantity to complete effective testing.

3. Execute testing.

4. Document test results and provide feedback to development. If the test results do not meet the required specifications, the solution must be refined until all requirements are met.

5. If necessary re-test all subsequent revisions until it matches specification.

Developing the Test Plan

To effectively test the system, you must first develop a test bed and test plan. If possible, the majority of the testing should be automated, rather than manual. A complete test plan should include the following tests/items:

1. Traffic stress testing. Many applications will perform well with only one user. If you are planning a large-scale rollout, traffic stress testing is increasingly important. In this process you need to test how the application, server and network handle large volumes of traffic. This testing should also be conducted at various times throughout the day to determine the performance even at “peak” traffic times.
2. Coverage conditions. Coverage and coverage conditions will vary in the field. In addition to testing for coverage, you should also test to see how your application performs when users move in and out of coverage.

3. Speed. The solution should also be tested to determine if it is communicating at adequate speeds. If not, what can be done to optimize the communication to improve performance? If speeds are poor and the application is experiencing many disconnections from the network, you may want to consider adjusting the timers that are set within the application determining when the connection is deemed a failure and dropped.

4. Soak testing. Perform long term tests of usual traffic loads to determine the performance over a period of time.

5. Making sure that “read” is keeping up with “write.” By this, you should determine if the application is processing data quickly enough to work effectively.

6. System failure testing. The solution should be tested to see how it would react if a component of the system failed or went down. This testing should be performed for each element of the component including the network, server, application server, mobile device, modem, battery, etc.

7. Error testing. All possible error scenarios should be tested to see the effect on the solution. This would include everything from user error to system crashes. Testing should include not only what happens, but also how the application handles different errors.

8. Testing of all possible functions and uses of the application and system. Each feature that has been built into the system needs to be tested under each scenario. This would include things like testing to see if messages are stored when the user is out of coverage (if that feature is offered).

9. Message size. How does the solution handle large messages? Does message size affect the performance? If so, should elements be adjusted to make the application work more effectively.

10. Network switching effects. If you plan on using multiple networks, be sure to test to see how well the solution responds to network switching. This should be tested under many different scenarios to determine the consistency of the solution.

11. Performance statistics. Performance statistics should also be documented and compared to the solution requirements to determine if the solution is meeting those requirements.

12. Test of simulators developed in test bed. If simulators were used in the test bed, these also should be tested to ensure they are working properly and adequately portraying real-life scenarios.
The test plan also needs to provide a mechanism for tracking, documenting and reporting test results and comparing these results with the required specifications. If the results do not meet the specifications, this must be fed back to the system architect and application developers so that they can improve the performance. Each new revision of the product must then go through the same rigid test procedures to provide quality assurance.

**Creating a Test Bed**

The test bed environment must be virtually identical with the production environment to successfully intercept potential problems and to be as realistic to actual use as possible. The testing environment should include all required infrastructure and connections to the network(s). As stated earlier, the test bed should be created in the lab and in the field.

**Execute Testing**

Conduct complete testing on each of the elements in the test plan. If you find problems report them to the project team. Once the next version is created, the solution must be retested from the beginning. Go through the entire testing process with each product because it is impossible to ensure that one fix will not adversely affect another element of the solution. This process must be continued until all requirements are met. In the future, as the solution is enhanced or upgraded, repeat this process until it can be assured that the solution is working properly and performing according to requirements.
Staging

Before deploying your solution, you need to first “stage” the equipment in preparation for rollout. This step should be taken prior to the pilot stage and continue with each new device that is deployed. The steps required of this stage are outlined below.

1. Loading of software onto the mobile device.
2. Configuring the device and software for the individual user. This includes setting up the user name and password.
3. Registering the modems with the wireless network provider.
4. Testing of each device to ensure that everything is loaded and working according to specification.
5. Asset management. Each device should be tracked and managed so that it is easily determined who is using what types of equipment and where is device resides.
6. Training. As mentioned in other section, each user should be trained on the operation of the device, application and modem prior to sending them out into the field.
Piloting Your Application

Your primary consideration when piloting your application is to test and see if the new way of doing business works. Therefore, you need to get as representative a sample as possible and include training and feedback mechanisms for users. Ideally, the system will run in parallel to existing systems so that if problems are encountered, it is easy to cut back to the existing system. A proper support system is absolutely essential for a successful pilot. The pilot phase is important not only in testing results of the new system, but also in generating user buy-in. If the pilot users like the new system, they will become your champions and you’ll have a much easier time getting all users excited about using the system.

Developing the Pilot Plan

The first step in a successful pilot is developing a comprehensive pilot plan. These steps are outlined below.

1. Identify your pilot users. As stated, this should consist of a representative sample from each area or job role.
2. Determine what you want to get out of the pilot. For example, are there specific results that need to be documented to determine ROI or effectiveness? Is additional performance testing required? Through this analysis you will be able to determine what you want to test during the pilot phase.
3. Decide upon the necessary length of the pilot. To show true representation, all pilots should be a minimum of 30 days.
4. Train users on what the solution is supposed to accomplish, new business processes, the application, device operation, troubleshooting, who to call in times of difficulty and feedback requirements.
5. Slowly roll out to pilot users. Anticipate a lot of hand holding in the first week as users get used to the new system. You may even want to consider having someone from the project team riding along with the pilot users to assist them if they are confused or experience difficulties.
6. Gather feedback. Be sure to provide your users with feedback guidelines or formats such as reports, surveys, focus groups or interviews.
7. Adjust the system as required and continue to full-fledged rollout efforts.
Pilot Testing

During the pilot phase, you should test the performance as well as the results generated by the system. This will determine not only if the system is designed correctly and usable in the field, but also if it has affected the business process to such a degree as to generate a competitive advantage. Without showing substantiable business results, the project will not move beyond the pilot phase. The following list outlines some items to test:

**Performance Testing**

1. Scalability
2. Usability
3. Application usage with network coverage
4. Coverage
5. Radio awareness
6. Wireless performance

**Business Testing**

1. Time saved
2. Number of visits/calls/jobs conducted compared to prior results
3. Ability to generate additional revenue (e.g. through selling warranties on the spot)
4. Quantifiable improvements in customer service (may be tested through before and after customer surveys)
5. Jobs or tasks eliminated
6. Job safety improvements

Once you’ve convinced the project team and company that the solution is operating smoothly and have demonstrated positive results, it is time to move on to complete roll-out.
Rolling Out

When fully deploying your application, it is often best to do so in stages to groups of users. Each stage will include training for users, distribution of equipment and mechanisms to provide feedback and measure results. These are similar steps to those followed when performing the pilot testing, but on a much broader scale. At this stage, it is absolutely critical to have all your ducks in a row including documentation, training and support.
Getting Started

Developing and deploying a mobile solution is a major project that requires buy in and commitment from many areas of the organization if it is to be successful. While it may seem like an intimidating task for those unfamiliar with wireless data communication, there are many experts available to help guide you through it and assist you with the design, development and deployment of your solution. A successful deployment is much easier achieved with the backing of strong partners with a deep understanding of the wireless industry.

Nettech Systems’ Professional Services Group offers many such services that help customers deploy faster and more easily by leveraging our expertise.

Services provided by Nettech’s Professional Services include:

- Preparation of RFPs
- Review of RFP responses
- Evaluation of software, hardware or network and provision of evaluation results
- Preparation of specification/requirements documents
- Coverage analysis
- Application design review or development
- Application development
- Application integration with backend systems
- Development of application agents
- Review of wireless test plan
- Design and construction of wireless test environment
- Wireless testing
- Development of deployment plan
- Set up of support environment
- Support of system troubleshooting and fine-tuning
- Training on middleware
- Training on applications we’ve developed
- Integration of middleware into applications we’ve developed

If you are implementing a wireless solution, partner with Nettech for all your middleware and services needs. Put Nettech’s eight years of experience in wireless behind you to ensure a smooth and successful rollout. With over 75,000 users from more than 500 companies worldwide, Nettech knows wireless. It is time to put our expertise and experience to work for you. To learn more, call today at 609-734-0300, or visit us on the web at www.nettechrf.com!