

CIO Outlook 2001: Architecting Mobility

*Ten Critical Steps in Supporting
Mobile Enterprise Computing*



Table of Contents

Table of Contents..... 2

Published By..... 3

Introduction..... 4

#1: Develop a Mobile Strategy Now 4

#2: Keep an Eye on Wireless..... 5

 Wireless Today..... 6

 Wireless Tomorrow 7

#3: Accommodate the Occasionally Connected User 8

 Real-Time or Synchronization?..... 8

 The Case for Synchronization 9

#4: Deploy Email and PIM to Handhelds..... 10

#5: Plan for Multiple Devices..... 11

#6: Structure and Automate Content Distribution..... 13

#7: Implement a Robust Asset Management Solution..... 14

#8: Mobilize Applications Through Synchronization..... 15

#9: Beware Consumer-Focused Vendors..... 16

 Security..... 17

 Scaleable..... 17

 Administrative Control..... 18

#10: Avoid Point Solutions 18

About Synchrologic 21

Appendix A: Glossary of Wireless Protocols..... 22

Appendix B: Device OS Primer..... 24

End Notes..... 26

Published By

Synchrologic, Inc.
200 North Point Center East
Suite 600
Alpharetta, GA 30022

Copyright © 2001 by Synchrologic, Inc.

All rights reserved worldwide. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any human or computer language in any form or by any means without the express written permission of:

Synchrologic, Inc.
Documentation Department
200 North Point Center East
Suite 600
Alpharetta, GA 30022
or documentation@synchrologic.com

This publication is provided as is without warranty of any kind, express or implied, including, but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement.

This publication could include technical inaccuracies or typographical errors. Changes are periodically added to the information herein. These changes will be incorporated in new editions of the publication. Synchrologic, Inc., may make improvements and/or changes at any time to the product(s) and/or the program(s) described in this publication.

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. Synchrologic cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or servicemark.

CIO Outlook 2001: Architecting Mobility

Ten Critical Steps in Supporting Mobile Enterprise Computing

Introduction

CIO Outlook 2001 is a direct response to common challenges raised during Synchrologic's discussions with over 200 CIOs worldwide over the past eight months. The whitepaper is a comprehensive look at the concerns your peers raised, and will help shed light on the issues you face in addressing mobile computing.

Topics include:

- *Application mobilization*
- *Controlling communications and support costs*
- *Managing and supporting mobile devices*
- *How to cut through the wireless hype*
- *Lowering TCO of mobile devices*
- *Understanding the big picture*

What follows is the top ten action items organizations are doing today to build competitive advantage and deal with increasingly critical mobile & wireless computing issues.

#1: Develop a Mobile Strategy Now

Increasing market pressures coupled with the rapid-fire growth of mobile computing has created a booming population of mobile and remote workers. The drive to stay competitive has

tasked today's enterprise with exploiting any and every means necessary in optimizing service levels, increasing sales, boosting efficiency, and cutting costs. Mobile computing provides the enterprise with several compelling competitive advantages, including:

- Faster, decentralized decision making
- Increased responsiveness to customers
- Increased sensitivity to market changes
- Lowered commuting costs/time for staff
- Increased staff morale and productivity
- Reduced travel costs company-wide
- Decreased facilities costs

“True business agility requires flexible technologies and the ubiquitous proliferation of computing power.”

- **Gartner Group**

Enterprise demand for support of mobile computing initiatives now requires extending the full complement of enterprise resources to do business anywhere, at any time. The enterprise that proactively pursues a comprehensive mobile computing strategy will be successful in building competitive advantage. Leading IT analyst Gartner Group adds, “True business agility requires flexible technologies and the ubiquitous proliferation of computing power.”¹

Failure to architect and build a mobile strategy today will have the same effect of ignoring the invasion of PC's back in the 80's. By developing a mobile strategy which includes adopting standards, developing mobile infrastructure, and embracing mobile devices, your enterprise can effectively use mobile computing to stay competitive.

#2: Keep an Eye on Wireless

Wireless holds much promise for mobile computing. From real-time access for mission critical applications to automated dissemination of competitive information, wireless will dramatically affect the mobile computing landscape. But mobile and wireless are not interchangeable terms. Wireless is one component of mobile. A component with substantial potential and some interesting uses today, though myriad applications may prove more useable via wireline connections. Wireless computing is a tricky endeavor, with numerous pitfalls ready to snare the enterprise that moves without careful consideration.

“No single network technology or operator will meet all your wireless network needs.”

- MobileInfo.com

Wireless Today

Today’s wireless networks are characterized by competing standards and protocols. MobileInfo.com, a leading voice on mobile computing contends, “no single network technology or operator will meet all your wireless network needs.”ⁱⁱ Most of the current wireless data networks -- known as 2G networks (GSM, CDPD, Mobitext, Motient) -- are built on analog and cellular digital networks – infrastructure designed to support voice communications. Data transmission is a more complex endeavor and the current public networks are ill-suited to efficiently support acceptable wireless data transmission rates. 3G networks are better equipped to handle data transmission, but are not slated for completion for years to come. Figure 1.1 cites a Yankee Group study into enterprise concerns regarding wireless adoption.

Barriers to Wireless Adoption

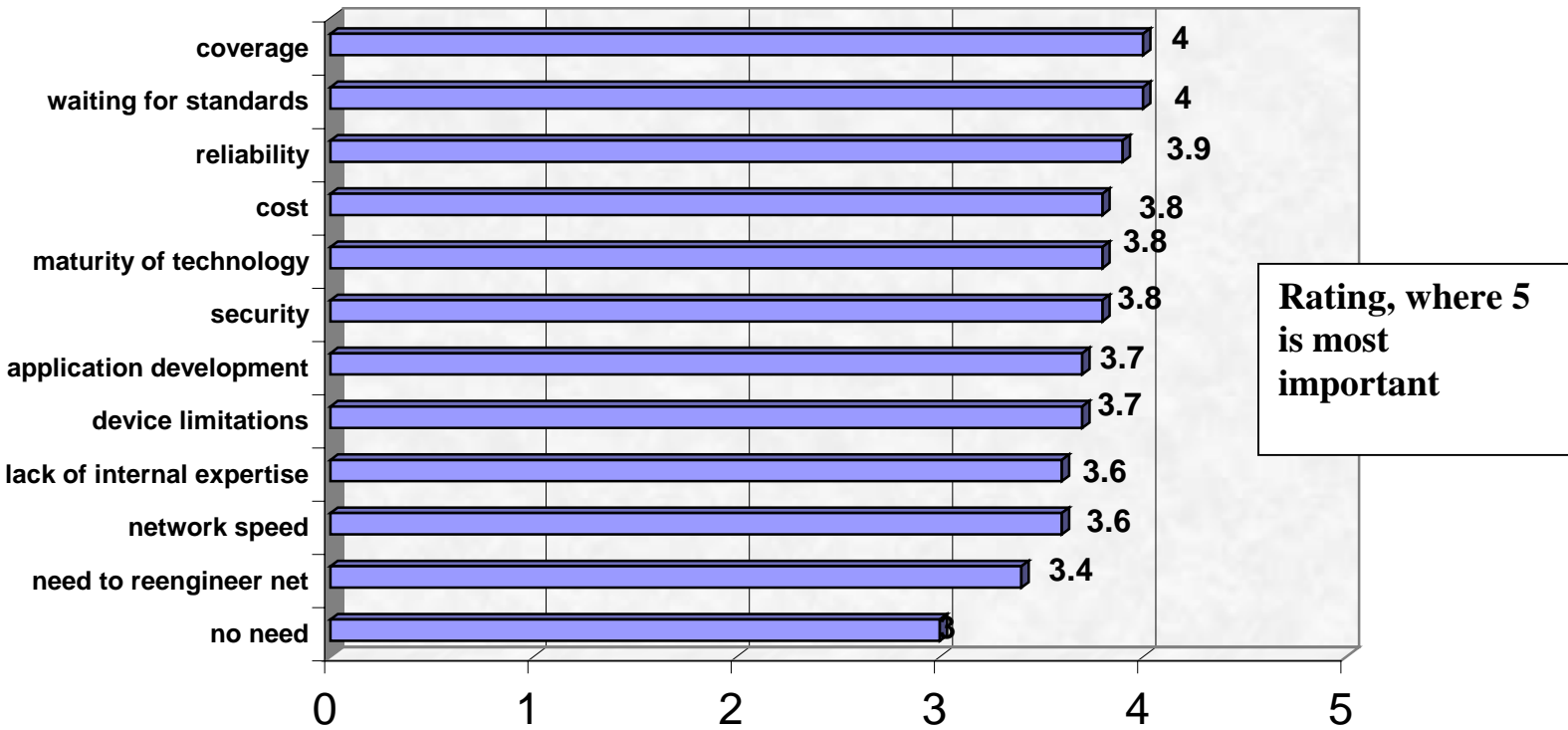


Figure 1.1

Source: Yankee Group

Performance

As of press time, practical wireless data speeds seldom eclipse 14.4 kbps. Because users are typically accustomed to quick wireline connections, the allure of connecting wirelessly slackens in the face of limited bandwidth.

Reliability

2G wireless data networks are built on HTTP and TCP/IP based protocols. Because HTTP and TCP/IP are particularly chatty packet-based technologies, they are better served by a high-speed wireline connection protected from interference and safeguarded against dropped signals.

Coverage

Wireless coverage is spotty at best. Due to the lack of standard wireless protocols, coverage is governed by regional infrastructure. The most widespread wireless networks like Mobitex and Motient leverage existing cellular and digital infrastructure at the expense of speed (typically around 2 kbps).

Lack of Standards

2G networks are clogged with a number of competing proprietary protocols. 3G seeks to alleviate this problem by offering one universal protocol. For a more in-depth discussion on protocols, see the *Glossary of Wireless Protocols* in Appendix A.

Wireless Tomorrow

Predictions on the future of wireless run the gamut from total ubiquity with the advent of third-generation (3G) networks, to incomplete worldwide infrastructure buildout and lack of standardization for years to come. The reality is most likely somewhere in between. According to MobileInfo.com, “3G networks, when fully implemented, will move mobile computing to a new level after five years. Meanwhile, wireless applications should be implemented carefully.”ⁱⁱⁱ

3G networks aspire to be better stewards of available bandwidth while offering constant connections. Despite its potential, 3G currently faces only passive interest in the United States, with Europe beginning to invest the necessary billions to build out this next-generation infrastructure. Meanwhile, a host of other companies are trying to build new proprietary

networks that offer a compromise between what is available today and what will be available in the distant future with 3G. Indeed META Group, an expert technology industry analyst, argues “Mobile wireless technologies will remain in almost constant influx until 2006/07.”^{iv}

Wireless is exciting technology that will change the face of mobile computing. It is important to understand how wireless fits into your business model so that your infrastructure is capable of supporting wireless as it exists today, and as it will exist tomorrow.

For a more in-depth discussion of competing wireless protocols, see the *Glossary of Wireless Protocols* in Appendix A.

#3: Accommodate the Occasionally Connected User

Real-Time or Synchronization?

The fundamental challenge in mobilizing your enterprise is determining how to a variety of mobile device users to interact with data and information currently located on company servers. In addressing the challenge, the enterprise must decide between two scenarios:

“The goal of 24-7 network availability can be shattered by the unreliability of a dial-up connection, and remote access to applications could prove useless when software is not in sync with desktop PCs.”

- Network World

- **Real-Time Access** - Real-time environments offer wireline or wireless access to a variety of enterprise applications. Users are dependent on a network connection to interact with the necessary information.
- **Synchronization** – Also referred to as store-and-forward, synchronization allows users to work off-line, connecting to the network only occasionally to sync up

With real-time access, mobile devices are essentially viewers of server data, maintaining no local data stores. Because synchronization stores some data locally, users are not required to maintain constant connections to servers.

The Case for Synchronization

While constant, real-time access is appealing, and well-suited for certain functions, synchronization may often be the more practical, smarter solution for the majority of enterprise needs. Synchronization offers the following benefits over real-time access:

- Reduced queries and network traffic
- Reduced user idle time
- Compression of staged data
- Reduced concurrent server processing loads
- Controlled communication costs

As wireless protocols mature, the lines will begin to blur between real-time and store-and-forward architectures, and organizations will deploy both options in a complementary fashion. According to Gartner Group, “The convergence of synchronization and real-time mechanisms is crucial in accommodating varying bandwidth and connection scenarios, and in graceful switching between modes of operation.”^v *Network World* agrees, adding, “The goal of 24-7 network availability can be shattered by the unreliability of a dial-up connection, and remote access to applications could prove useless when software is not in sync with desktop PCs.”^{vi}

The best way to accommodate the reality of occasionally connected users is to build a flexible infrastructure. Whether connected to corporate networks in a real-time environment, or working with localized applications in a deferred access environment, the optimal solution is to afford end users the luxury of being indifferent to, if not unaware of, whether or not they are connected. Perhaps META Group says it best: “Users must avoid strategic investments in transitioning mobile wireless technologies and focus instead on developing back-end logic that is device/network-agnostic and developing expertise in mobile application usability.”^{vii}

The current state of wireless technology, coupled with the inconvenience of staying perpetually connected via wireline, has created the reality of the occasionally connected user. Your enterprise should build a mobile infrastructure flexible enough to support both real-time access and synchronization.

#4: Deploy Email and PIM to Handhelds

Since its debut, Email's tenure as the most killer enterprise application has remained relatively unchallenged. *Industry Standard* magazine, a leading voice in high-technology, lists Email as the application wireless adopters are asking for the most.^{viii} Gartner Group contends that "as e-mail continues to be a vital method of communication, the ability to synchronize anywhere at any time and have access to the corporate intranet will provide significant productivity gains."^{ix}

The advent of robust groupware applications like Microsoft Exchange and Lotus Notes has complemented enterprise Email systems with PIM (Personal Information Management) data including Calendars, Contacts, To-Do lists, and Memos, providing one unified package for corporate workers to manage their busy lives.

Mobilizing groupware applications to handhelds is more complex than first glance would suggest. Early solutions featured a handheld-to-desktop synchronization model. With these products the full burden of installation, support, and troubleshooting rested entirely on the shoulders of those least likely to be able to perform these functions -- end users. Because these applications are not server based, the flood of mobile devices through the corporate backdoor is further complicated.

A new breed of Email and PIM sync solutions now allows the exchange of data directly between handhelds and more functional server-based groupware applications. Important features of a server-based Email and PIM sync solution include:

- One-step Synchronization
- Connection Transparency for Users
- Complex Filtering
- Encryption
- Flexible Conflict Resolution

For more information about selecting an Email and PIM synchronization solution, read Synchrologic's whitepaper *Synchronizing Handhelds to Notes & Exchange Servers*.

"As e-mail continues to be a vital method of communication, the ability to synchronize anywhere at any time and have access to the corporate intranet will provide significant productivity gains."

-Gartner Group

Enabling anywhere access to email and groupware servers is the critical first step in empowering mobile workforces. Mobile workers are immediately more productive and the sense of disconnect associated with being away from the office is minimized.

#5: Plan for Multiple Devices

If your organization is like most, there is already a mix of laptops, Palm devices and Pocket PCs in use by staff, and probably purchased by the company if only via expense reports. This is creating challenges for most IT shops. These range from network/data integrity issues, to an overtaxed helpdesk fielding support calls on devices it may or may not know exist, to inefficient systems management tools that don't work well for occasionally connected devices.

It was hard enough just trying to support laptops, then handhelds invaded your company through the back door. As the popularity of these devices continues to grow, and the variety of models increases, feature lists on these devices continue to grow, so too does the threat they pose to your corporation's information integrity as well as the costs, skills, and time required to support these devices. The time to take action is now.

Device Diversity

One need only look at the success of Palm and other handheld PDA manufacturers to gauge the blossoming proliferation of mobile devices used as companion devices to the venerable laptop. That flood of mobile devices is only going to continue: Meta Group has predicted that, "by 2004, each corporate knowledge worker will have three to four different computing and information access devices that will be used to access various applications."^x

While Palm's market share in the consumer handheld space has remained dominant, various device manufacturers are gaining ground -- especially in the enterprise market. According to IDC, by 2004, Microsoft's market share will surge to 40 percent, compared with 51 percent for Palm.^{xi}

With the popularity of handhelds reaching a fevered pitch, it's easy to forget about the laptop. For most, the laptop is the

"By 2004, each corporate knowledge worker will have three to four different computing and information access devices that will be used to access various applications."

- Meta Group

mobile workhorse. The effects of the recent slackening in growth of the PC market have not been mirrored in the laptop and notebook PC market. According to Gartner Group, “the worldwide mobile PC market grew by 32.7 percent in the third quarter of 2000 compared with the third quarter of 1999.”^{xii}

The promise of Bluetooth and the growing popularity of wireless LANs will further encourage enterprise adoption of laptops over the coming years. Many experts predict that over 50% of PC shipments will be laptop or notebook units within a few years. Falling prices and improved features, coupled with the increased market pressures forcing enterprise mobilization contribute to the adoption of mobile PCs and handhelds instead of traditional desktop workstations.

One of the most important points to take from this discussion is the notion that multiple device proliferation will continue, as figure 2.1 suggests. In a study conducted by Yankelovich Partners, a high technology research firm, when given the choice of carrying a wireless phone, two-way email device, PDA, or pager, only 34% of professionals said they still wanted only one device.^{xiii}

You should not be bound by selective mobile infrastructure solutions that exclude certain devices. Business drivers should determine which devices are appropriate for which user groups, not your mobile platform software. In this way you maximize business value and return.

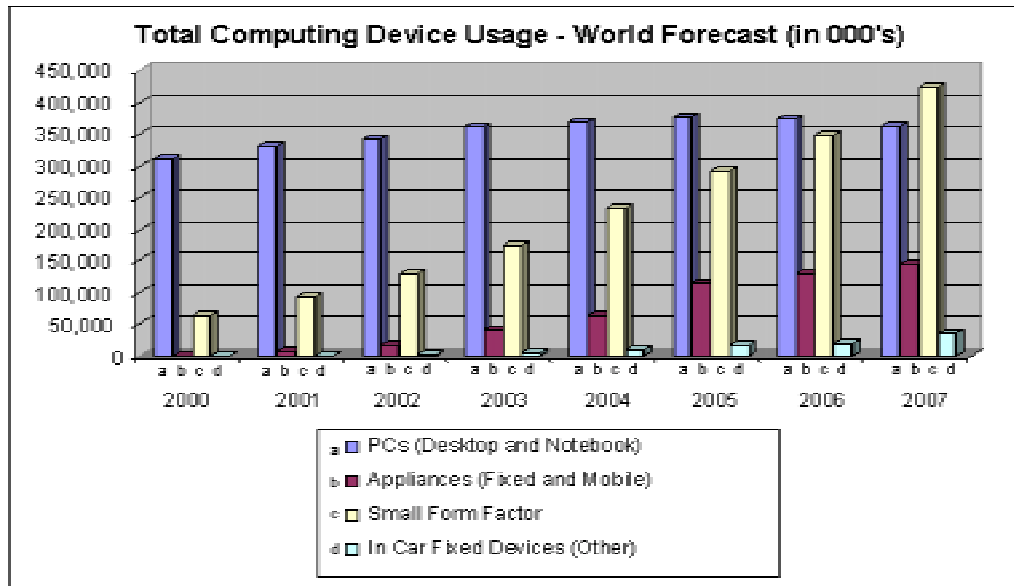


Figure 2.1

Source: ResearchPortal.com

For help in choosing devices, see the *Mobile Device Primer* in Appendix B of this whitepaper, or read Synchrologic's *Handheld Applications Guidebook*.

#6: Structure and Automate Content Distribution

Getting access to file-based content and Intranet pages is another area that can be challenging to mobile workers. Automated content distribution makes things much easier for the end user, enabling access to unstructured data including, spreadsheets, word processing documents, presentations, and graphics files. Ideally this information is replicated throughout the mobile network. Without any effort, users have access to important files when on the road – even if a network connection is unavailable.

While data synchronization helps proliferate structured data, there is typically a wealth of information that is unstructured and saved in a variety of popular file formats. Many companies rely on Email to publish these files to end users. This methodology unnecessarily exposes the enterprise to several risks, including:

- **Email viruses** – No longer relying on email attachments to move files through your network reduces the risk of exposure to viruses
- **File versioning pitfalls** – Users don't have to sift through Emails to find the latest version of a file
- **Mailbox administration** – As attachments are less necessary, the stress on groupware servers due to large mailbox sizes is reduced

With automated content distribution, the most current files are automatically maintained and delivered to the appropriate personnel with no user intervention required. Content distribution also enhances the effectiveness of your corporate intranet. By making the site available offline as well as online, your intranet becomes a more effective, relied-upon communication tool.

Components of a robust content distribution mechanism include:

- Publish & Subscribe Architecture
- Web Publication
- Remote Device Backup
- Overwrite vs. Rename
- File Differencing
- Delivery Logging
- Subscription Management
- File Versioning

Through implementing a content distribution protocol, your mobile users get access to the most current, time sensitive information found in files, including management reports, operations statements, pricing and product info, contracts, company forms and policies, and competitive information.

#7: Implement a Robust Asset Management Solution

Critical to the mobilization of your network data is the deployment of a solution that will enable your IT staff to remotely manage device hardware and software inventories. Gathering devices or burning CDs can be expensive and wastes valuable resources when remote software distribution can automate software installs, upgrades, and removals. Likewise, fielding support calls from mobile staff without an image of their device is extremely difficult.

Traditional LAN-based asset management solutions fail in the reality of the occasionally connected user. These solutions presume high-bandwidth, always connected devices, with high network reliability. The reality for mobile workers is different – they connect their devices with the

network only occasionally, and typically over low bandwidth connections and frequently dropped connections. Traditional systems management vendors have been slow to support mobile users, and as a result these capabilities are typically sourced from the new breed of mobile infrastructure solutions

LAN-based asset management solutions fail in the reality of the occasionally connected user.

vendors. Of course integration with the existing systems management solution is important here.

The systems management application you select should be comprehensive and flexible, providing customizable tools for systems maintenance, support, and troubleshooting. Must-haves in an asset management solution include:

- Comprehensive User Profiling
- Condition-Triggered Alert Mechanisms
- Flexible Real-Time Logging
- Hierarchical Log Construction
- Console-Based Log Views
- Encryption
- Full-Device Refresh
- Checkpoint Restart
- Transaction Rollback
- File Compression
- Default User Profiling
- Offline Synchronization

With a powerful systems management solution in place, you are poised to deliver top quality support to end users, avoid undue strains on your scarce IT resources, and lower the total cost of ownership of mobile devices.

#8: Mobilize Applications Through Synchronization

For the enterprise dedicated to building competitive advantage through extending the reach of its network, the mobilization of core enterprise applications is of utmost importance.

The following applications can yield significant benefits through mobilization for your field-based and frequently-traveling workforces:

- Sales Force Automation
- Customer Relationship Management
- Enterprise Resource Planning
- Field Service Applications
- Supply Chain Management
- e-Business applications

An advanced data synchronization package, capable of supporting mobile PCs and handhelds alike, is the only way to ensure mobile workers have constant access to critical corporate data.

Careful consideration should be given to selection of data synchronization technology. Your solution should fit inside your existing applications elegantly and cleanly, freeing your technical staff from writing complex conduit code and extensive integration effort. Make sure that the synchronization logic you define can be leveraged across multiple devices, and that you are not saddled with different administrative tools to support PCs, handhelds, and other devices.

Important things to look for in data synchronization tools include:

- Multiple platform support
- Multiple database support
- Open application development
- Field-level synchronization
- Offline synchronization
- Flexible change capture
- Graphical rules wizard
- Store-and-forward architecture
- Flexible conflict resolution tools
- Non-intrusive to applications

With an advanced data synchronization engine, you will be able to easily mobilize your core enterprise applications without extensive integration and conduit coding – making mobile workers more productive by allowing them to do business anywhere.

#9: Beware Consumer-Focused Vendors

In evaluating partners to help architect and build your mobile strategy, be sure your vendors have demonstrated enterprise experience. Many “enterprise” solutions are repackaged consumer solutions and lack the features required for success

in the enterprise environment. Your solution should be built from the ground up with the enterprise in mind.

Security

Enterprise mobilization is inherently susceptible to security breaches. One reason some enterprises have delayed “going mobile” is security. Though their hesitance is understandable, it should not be a deterrent. Handheld devices are already carrying valuable enterprise data out the door everyday. As previously mentioned, the more functional they become, the more data is left uncontrolled. Everyday your corporation goes without a firm mobile strategy in place the integrity of your network is jeopardized.

Your infrastructure should incorporate industry standard security techniques to encrypt the connection between devices and servers. Certicom’s Elliptic Curve Cryptography™ is an excellent tool to protect handheld data during communications sessions. Open APIs should be available to enable more advanced security features if desired. Direct integration of other security related products and processes is made available via published APIs to ensure maximum flexibility for this sensitive topic. For mobile PC’s, a relatively straightforward solution is to use a web server utilizing SSL to secure communication with the laptop or tablet device.

Scaleable

Look for a vendor with significant enterprise experience that is willing to take the time to understand your environment and assure you of system scalability. Be sure to consider not only the number of users you will need to support, but also the sync patterns which determine the number of concurrent sync sessions.

The mobile communications server must offer a clustered architecture to ensure basic scalability. In addition, dynamic load balancing reduces the stress on your servers by elegantly allocating users to different servers based on capacity. This architecture stands in stark contrast to static systems where users are married to specific servers, often resulting in unnecessary hardware purchases. Failover and recovery ensure that when a server fails during a transaction, it is transparently

switched to alternate servers. The failed transaction is recovered and applied correctly by the new server.

Administrative Control

Your solution should contain flexible administrative controls that enable your mobile infrastructure to change as dictated by business dynamics. At a minimum, your Administrative Console should allow you to:

- Define the user base
- Define synchronization activities
- Set default configurations for sessions
- Configure the amount of user control allowed
- Subscribe users to activities
- Prioritize the order of activities
- Review extensive system logs
- Set alerts and notifications
- Remotely troubleshoot and address problems

Make sure your mobile solutions partner has demonstrated experience in the enterprise market and can offer secure, scalable, and flexible tools so your mobile infrastructure can grow with your business.

#10: Avoid Point Solutions

Integral to the development and execution of a robust mobile strategy is a commitment to infrastructure development and extension. Your IT team should not waste time integrating piecemeal mobile solutions. Gartner Group contends "...because infrastructure is the basic, enabling framework of the organization and its systems, a holistic approach to its design, deployment, and management is pivotal to organizational success."^{xiv}

A comprehensive mobile infrastructure, remotely managed through a well-equipped administrative console allows corporations to deploy groupware to handhelds, mobilize enterprise applications, control assets, and manage and deliver content. The alternative is a mix of incompatible point solutions with proprietary systems management and support consoles – overtaxing enterprise resources and jeopardizing network integrity.

Your infrastructure should be capable of supporting a variety of devices and platforms including:

- Laptop and tablet PCs
- Remote Desktop PCs
- Palm OS Devices
- Windows CE/Pocket PC Devices
- Industrial Handeld Devices
- Point-of-Sales Systems
- Barcode Readers
- Portable Data Terminals

Figure 3.1 below shows the components of a mobile infrastructure robust enough to support all of the mobile initiatives previously mentioned.

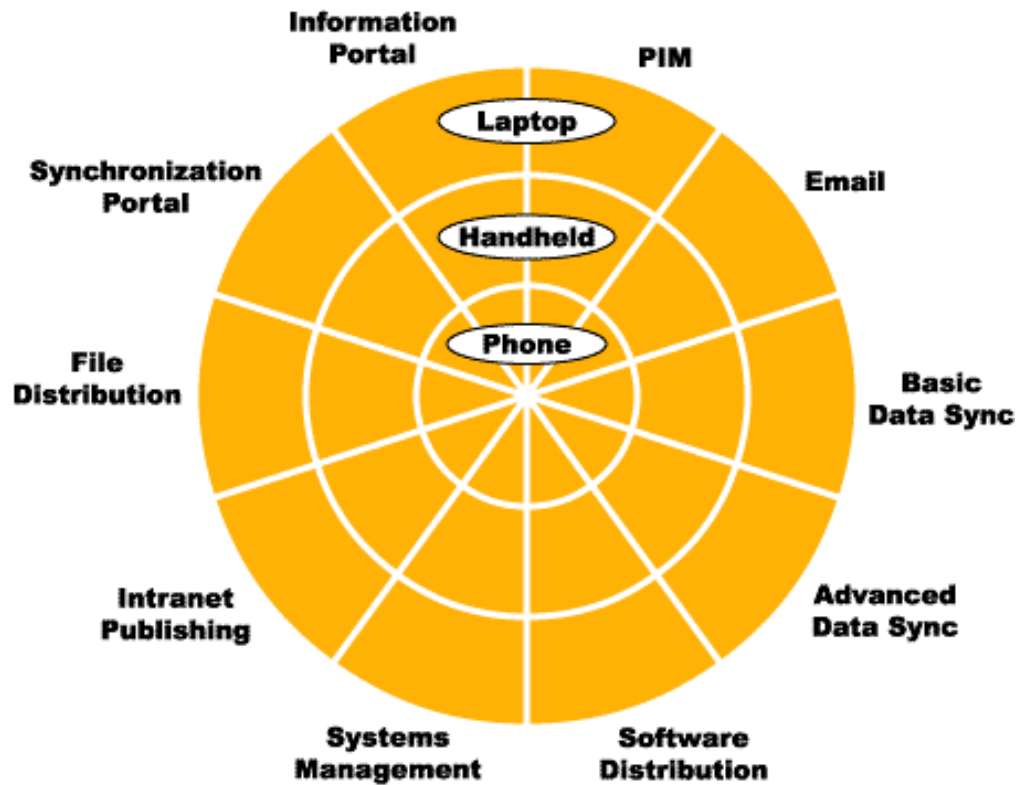


Figure 3.1

When considering mobile infrastructure products, map their solutions against the above model. Even if you don't require all of this functionality today, building an infrastructure capable of supporting these functions will help you avoid the

pitfalls of point solutions and recognize the long-term benefits of a comprehensive infrastructure solution. These benefits include:

- Lowered training costs for administrators
- Easier for users – less effort to “get all their stuff”
- Flexible and easy for administrators
- Decreased support costs
- Decreased integration costs
- Support for all your devices
- Lowered software license costs
- Less time evaluating/negotiating vendors
- One-point of contact for support/troubleshooting
- Increased user and administrator productivity

We’ve learned a lot over the past eight months. Today’s CIO is being asked to architect a mobile enterprise and extend the reach of the business. We hope this whitepaper has provided you with the set of action items you need to support mobile computing, and shed light on the complex swirl of issues surrounding mobilizing your enterprise -- anywhere, anytime.

Synchrologic has unparalleled expertise in supporting the mobile operations of over 150 blue-chip customers. We understand the issues, and can help you put in place the right solutions to solve your business problems.

About Synchronologic

Synchronologic creates solutions that give mobile workforces access to the information they need, wherever, whenever, and however they need it. By delivering the most powerful, comprehensive mobile and wireless infrastructure software available, Synchronologic's product suite supports all aspects of mobile computing while lowering the total cost of implementing, managing, and supporting enterprise mobile initiatives.

The company's infrastructure solution features all the tools necessary to architect and implement a mobile strategy - including contacts, calendar, tasks, to-do and email synchronization; systems management; software distribution; data synchronization; file distribution; intranet publishing; and content aggregation. Synchronologic solutions are uniquely flexible in allowing access to vital business information regardless of application, regardless of hardware, and regardless of connectivity.

Synchronologic offers an intuitive and user-friendly experience, robust administrative capabilities, open platform architecture, and the only complete mobile infrastructure solution available. The company's product suite generates a variety of benefits including more informed mobile workers, increased productivity, improved resource management, lowered cost of ownership, and reduced communication costs.

Synchronologic's unparalleled technology is the winning product of over five years' experience supporting mobile and wireless initiatives for over 150 world-class corporate and OEM customers including Citicorp, Cisco, Hertz, FedEx, 3M, JD Edwards, and Nintendo. The company is privately held with headquarters in Atlanta, Georgia.

For additional information, contact Synchronologic at:

(1) 888-345-SYNC
(1) 770-754-5600
info@synchronologic.com
www.synchronologic.com

Appendix A: Glossary of Wireless Protocols

To help shed some light on the confusing world of wireless protocols, Synchrologic has prepared a brief glossary explaining coverage, speed, and commentary on wireless networking. Figure 4.1 summarizes the data below.

GSM

Global System for Mobile Communications – is a digital cellular radio network operating in over 200 countries worldwide. Widespread in Western Europe, GSM coverage is expanding rapidly in the Americas and Asia. Typical GSM networks operate at 9.6 kbps – not quite as fast as desktop PC modems 10 years ago.

CDPD

CDPD - Cellular Digital Packet Data – is a digital technology created for the express purpose of sending data over the cellular network. Because CDPD is based on TCP/IP, standard applications like email and web browsing operate similarly to current Internet connections. CDPD networks currently offer connection speeds topping out at 19 kbps with practical speeds significantly lower.

CDMA

CDMA– Code Division Multiple Access – is a “spread spectrum” voice technology, because it allocates data over all available bandwidth. CDMA’s roots are in the military, originally developed to shield communication from enemy detection^{xv}. CDMA became available for civilian use with the development of digital integrated circuits. The preferred platform for PCS (Personal Communications Systems) providers, CDMA is used by AT&T, Verizon, and Sprint for cell phone coverage.

MOBITEX

The Mobitex network was developed by Ericsson in 1984 as a data-only, packet-based radio network. Mobitex offers fairly broad coverage in over 20 countries worldwide. Performance is generally limited to 8kbps. Palm VII devices currently run on Mobitex networks.

MOTIENT

Motient is the product of a joint venture between IBM and Motorola in 1990. While the coverage is wide, the performance is lackluster; Motient speeds generally do not exceed 8kbps. The popular RIM Email devices operate on Motient networks.

GPRS

Between the existing 2G networks and 3G networks are interim technologies, like satellite-based GPRS (General Packet Radio Service) networks -- essentially modified GSM networks. GPRS could eventually offer speeds of up to 144 kbps. A recent study conducted by Strategy Analytics, a high-tech consulting organization, points to a lack of demand for 3G speeds and argues GPRS will offer acceptable speeds for most network applications.^{xvi}

iMODE

iMode is the brainchild of NTT DoCoMo, the wireless arm of Japanese Telecommunications giant NTT. iMode is a packet-based technology that lets users send email, play music files, and send/receive instant messages. It is enormously popular in Japan, at press time boasting an install base of over 19 million users since it's inception in 1999. iMode offers speeds of up to 9.6kbps. Perhaps most significant about NTT DoCoMo is it's proprietary markup language cHTML, a direct challenge to WML (the current markup language used by WAP). NTT DoCoMo plans on delivering it's 3G solution in Japan by May 2001^{xvii}.

BLUETOOTH

Bluetooth is a short-range radio network built to replace cabling connecting computing devices. The Bluetooth network operates in the 2.4GHz ISM spectrum, and avoids interference by shifting to new frequencies in noisy environments.

802.11b

Wireless LANs will continue to grow in popularity, especially with the advent of 802.11b, a data transmission system offering speeds of up to 11Mbps. 802.11b will challenge cabled Ethernets in enterprise adoption, prompting the use of mobile PCs.

Wireless Networking Cheat Sheet

3G →	3G	384kbps
2.5G →	GPRS	144kbps
} 2G	CDPD	19kbps
	GSM	9.6kbps
	iMode	9.6kbps
	Mobitex	8kbps
	Motient	8kbps

Figure 4.1

Appendix B: Device OS Primer

Device uncertainty will continue as multiple vendors seek to capture some of Palm’s market share. Their efforts are working. According to London-based market research firm Context, Pocket PC market share in Europe is climbing, already at 30%, with the U.S. not far behind.^{xviii} In light of this uncertainty, your infrastructure should be able to support a variety of the more popular devices including:

Windows CE/Pocket PC

Microsoft’s third foray into the handheld OS market is its most effective to date. Windows CE/Pocket PC devices capture many of the features of a desktop PC. Replicating the familiar Windows platform, these devices offer color, the ability to view/edit MS Office documents, and multimedia functionality. Windows CE offers the ability to write applications in traditional languages (Visual Basic, Visual C++, etc.), contributing to its emerging popularity in the applications development community.

Palm

Palm Powered devices were originally built to extend the power of organizer type activities to mobile workers. Offering a convenient data store of contacts, calendar, mail, and to-do

items, the Palm's functionality has been expanded to support enterprise initiatives. Myriad device manufacturers and software developers use the Palm OS platform, affirming Palm's status, if only temporarily, as the top device/platform vendor in the handheld market.

RIM

The Blackberry wireless email device is an integrated package bundling software and airtime on its proprietary Motient network. Blackberry devices are quietly gaining momentum with RIM partnering with several premier organization including IBM.^{xix}

EPOC

Merging mobile phones and handheld PDAs, smartphones are becoming increasingly popular. Though there are a variety of manufacturers developing Palm OS and Windows CE smartphones, Symbian's EPOC phone, operating on GSM networks, has had the most success.

End Notes

- ⁱ Gartner Group. *The Nature of the Software Ecosystem*. 2/9/01
- ⁱⁱ MobileInfo.com. *Hot Topics: 3rd Generation (3G) Wireless Networks*
- ⁱⁱⁱ MobileInfo.com. *Hot Topics: 3rd Generation (3G) Wireless Networks*
- ^{iv} META Group. *Global Networking Strategies*. 3/7/01
- ^v Gartner Group. *Toward the Supranet: An Adaptive Application Architecture*. 10/30/00
- ^{vi} Network World. *The Bumpy Road to Managing Mobility*. 1/22/01
- ^{vii} META Group. *Global Networking Strategies*. 3/7/01
- ^{viii} Industry Standard. *Wireless, who wants it?* 10/11/2000
- ^{ix} Gartner Group. *The Wireless Office: Evolution, Revolution, or Bust*. 1/31/01
- ^x META Group. *Entering the Mobile Millenium*. 2/14/2000
- ^{xi} c|net news. *Pocket PC Devices Making Headway Against Palm*. 11/28/00
- ^{xii} Gartner Group. *Worldwide Mobile PC Market: Third Quarter 2000 in Review*. 1/15/01
- ^{xiii} MbizCentral. *Americans Willing to Tote Multiple Devices*. 3/8/01
- ^{xiv} Gartner Group. *The New Face of Infrastructure*. 9/19/00
- ^{xv} CDMA Development Group. *About CDMA Technology*. 3/01
- ^{xvi} allNetDevices.com. *2.5G to Dominate, Not 3G*, 12/28/00
- ^{xvii} Guardian Newspapers. *DoCoMo to Start 4G Four Years Early*. 3/19/01
- ^{xviii} TechWeb. *Palm Losing U.S. and European Market Share*. 3/14/01
- ^{xix} Infoworld.com. *IBM to offer BlackBerry device to enterprise customers*. 1/24/01