

2.0 The Mobile Business Value Scenario

Business processes are often tied to times and places by the need to physically visit locations to acquire information or carry out tasks. However, wireless technology has the potential to relax these restrictions by connecting information, equipment and people in ways impossible in a society dependent on wires. The combination of wireless and mobile computing will drive the most fundamental changes to enterprise data collection and distribution capabilities that have occurred in a decade. Mobility will be a necessary ingredient of trends, such as the real-time enterprise, because being “real time” requires that staff and information be connected at all times.

Connectivity is not just an enterprise infrastructure issue. It will also enable new products and services — adding communications to a product provides the opportunity to transform it into a service. For example, an Italian electricity supplier is experimenting with networked washing machines, which are operated on a “charge per use” basis.

The changes to enterprise capabilities will also be mirrored in society. Many parts of the world are fast approaching an “always on” society, in which citizens are accessible by at least one wireless device at all times. This trend is particularly evident among young people who, as tomorrow’s workers, will enter a workforce with connectivity as a basic expectation. The combination of social and enterprise trends means mobility is inevitable, with the key issue being not “if” but “how fast.” As a result, enterprises must have a mobile and wireless capability.

The research in this chapter addresses the following Key Issues:

- What key technologies will enable wireless mobility and business offerings and how will they evolve through 2008?
- What major mobile issues will confront mobile network operators and enterprises through 2008?

2.1 Key Wireless Technologies

Key Issue: What key technologies will enable wireless mobility and business offerings and how will they evolve through 2008?

Strategic Planning Assumption: Through 2007, there will be a high rate of change in the capabilities of mobile technology, infrastructure and telecommunications networks (0.8 probability).

Tactical Guideline: Through 2005, when financial return on investment (ROI) is the primary goal of a mobile application deployment, organizations should seek ROI periods of less than 24 months.

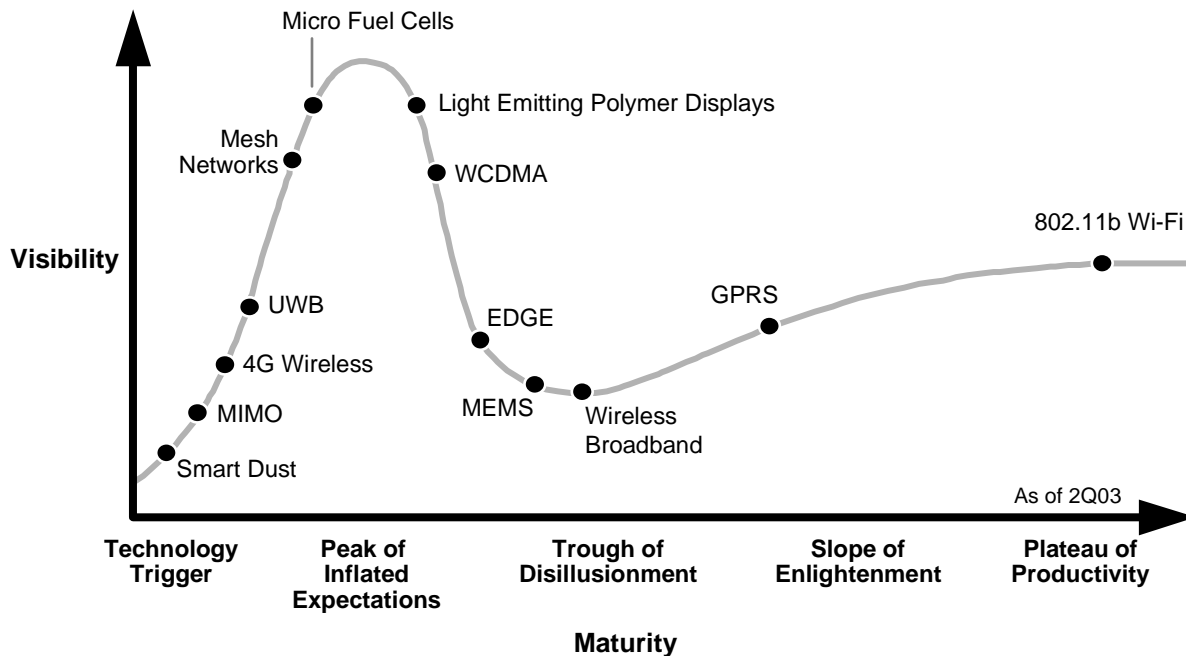
The mobile revolution has been enabled by the simultaneous evolution of a set of key technologies such as phone networks, wireless local-area networks (WLANs), personal-area networks (PANs) and software infrastructure. This domain is a treadmill, in which organizations must “run to stand still,” because core technologies are evolving quickly with little prospect of significant stability before 2006. The Hype Cycle in Figure 2-1 illustrates this point.

Developers and users must, therefore, expect short life spans for personal devices, applications and business solutions that are made obsolete by technical advances. Multiple generations of network and device technology will coexist in the marketplace — second-generation (2G), 2.5G and third-generation (3G) phones — which may force developers to opt for lowest-common-denominator solutions. Slow and politicized mobile standards processes will fail to keep up with technology evolution so enterprises will sometimes be forced to adopt proprietary solutions.

The high rate of technical evolution will also prompt discontinuities when the arrival of a new facility (for example, precise network location sensing, biometrics or video on mobile phones) may enable new business opportunities or invalidate current business models.

Action Item: In addition to implementing only tactical mobile solutions, enterprises should also fund an R&D function charged with monitoring the evolution of mobile technology and assessing its future business impact.

Figure 2-1: Mobile and Wireless Technology Hype Cycle



Source: Gartner

4G fourth generation
EDGE Enhanced Data Rates for Global Evolution
GPRS general packet radio service

MEMS microelectromechanical systems
MIMO multiple input/multiple output
UWB ultrawideband
WCDMA wideband code division multiple access

2.1.1 Wide-Area Networks

Strategic Planning Assumption: *Through 2007, wide-area network (WAN) capabilities will continue to evolve for data throughput capability, but advertising and hype will cause service providers to fail to meet user expectations for speed, cost and capability (0.9 probability).*

Mobile phone networks will continue to evolve for several years, although the pace and characteristics of this evolution will vary on a regional basis influenced by market conditions, legislation and technology. The major trend is the evolution from 2G, via 2.5G, to 3G technology. However, one factor that will be common worldwide is that whatever network technology is deployed, the achievable data rates and quality of service will fall far below their theoretical peak capacity. A reasonable expectation is no more than 50 percent of peak. Also, in the United States and most European countries, it will be many years before new technologies (for example, 3G) will be rolled out to the same coverage as 2G. Therefore, applications must be designed to perform adequately on poor connections and previous-generation networks.

While the 3G rollout is incomplete, 4G is being designed. Though its details are not fully defined, our expectation is that it will provide an Internet Protocol (IP) connection at multiple-megabit data rates. In the shorter term, two emerging and incomplete wireless broadband standards — 802.16 (WiMax) and 802.20 — could disrupt some 3G markets. Both are likely to have ranges of several kilometers at high data rates. Proprietary precursors to these standards are already being tested in some parts of the world. 802.11 variants will not be a major public network technology through 2008.

Action Item: Enterprises should design mobile applications conservatively so they will operate in worst-case conditions and will not be tied to any specific network bearer.

2.1.2 Short-Range Wireless Networks

Strategic Planning Assumptions:

- *By 2007, more than 50 percent of enterprises with more than 1,000 employees will exploit at least five wireless networking technologies (0.6 probability).*
- *By the second half of 2005, enterprises should expect ultrawideband (UWB) to appear in enterprise multimedia products (for example, for conference rooms) (0.6 probability).*
- *Bluetooth interoperability and usability problems will persist until the second half of 2005 (0.8 probability).*

The number of short-range wireless networking options continues to grow and become more confusing (see Figure 2-2). From the enterprise perspective, key points to note are:

- No single technology will be suitable for all applications because each provides different trade-offs in terms of bandwidth, range and cost. Consequently, many types of short-range wireless networks will coexist in most organizations.
- The standards processes are not always effective. Bluetooth continues to provide poor usability and interoperability because of political problems in the Bluetooth Special Interest Group (SIG). Key groups' inability to agree may fragment UWB standards while mesh networks are not yet subject to standards.

During the last 12 months, domestic wireless networking has grown. Initially, this has been predominantly for distributing broadband throughout the home, but in the next few years, a variety of consumer devices — such as televisions, hi-fi systems, set-top boxes, cars, game consoles and remote-control light switches — will acquire short-range wireless networking. Mesh networks in particular have significant potential for home-automation applications. However, as with corporate products, standards development is likely to be a slow and painful process.

Action Items: All organizations should develop policies to support multiple wireless networking technologies. Organizations developing consumer products should look for ways to add value by interacting with other home devices that might become networked.

2.1.3 Innovative Handheld Devices

Strategic Planning Assumption: Smartphones will become the handheld device of choice for both IT-driven corporate standards and choice-driven professional consumers (“prosumers”) (0.7 probability).

All types of mobile handsets and personal digital assistants (PDAs) will continue to evolve rapidly through 2006. Gartner expects that:

- Key innovation areas will include media services, improved imaging (that is, 1 megapixel or higher resolution), and software platform enhancements for media and messaging. The first combined WAN/Wireless Fidelity (Wi-Fi) handsets with Voice over IP (VoIP) capability will be delivered in 2004. Though they will be commercially insignificant, they will generate much hype.

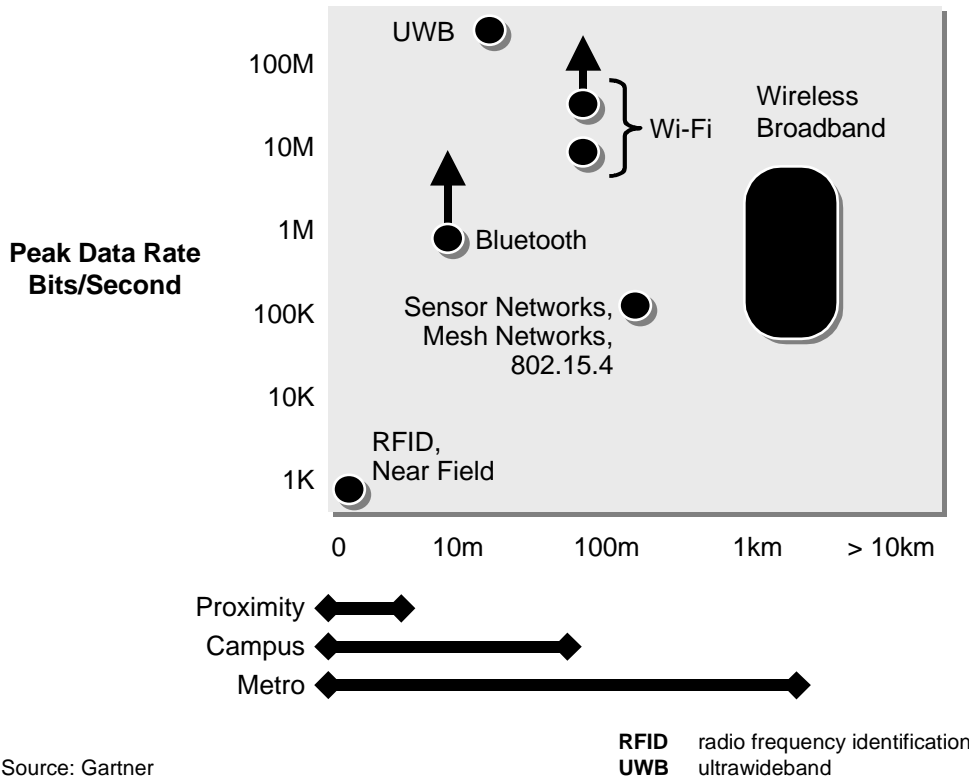
- Messaging will be a key application with increased numbers of devices having e-mail client software and keyboard hardware support.
- The smartphone will emerge as a significant prosumer and enterprise device category. By year-end 2004, the Microsoft smartphone will be “good enough” to be a candidate for a corporate standard.
- Low-end prices will continue to fall with basic unsubsidized handsets selling for less than \$100 retail.
- Asian suppliers such as LG Telecom will grow their market share.
- Imaging devices will pose corporate and social challenges, spawning futile attempts at prohibition.

2.1.4 WLANs

Strategic Planning Assumption: By 2007, 802.11a will be superseded by 802.11n, which will provide 200 Mbps or higher WLAN capability (0.6 probability).

Through at least the second half of 2004, 11 Mbps 802.11b will be the mainstream choice for WLAN

Figure 2-2: Short-Range Wireless Network Options



Source: Gartner

deployment. While 802.11b provides only three channels and operates in an increasingly crowded band, it is more than sufficient not only for light-duty home and small-office needs but also as a complement to wired LAN systems. 802.11b will be the choice for hot spot access and for internal network interface cards (NICs) in a variety of devices requiring long battery life.

The next standard is 54 Mbps 802.11a, which will appear in combination with 802.11g (802.11a/g; note 802.11g implies backward compatibility with 802.11b). 802.11a/b will be a short-lived offering, superseded by the more-advanced 802.11a/g offerings. The only issue for 802.11a/g will be its requirement for Card Bus support, limiting its use to notebook computers until handheld chips are improved.

In 2004, Advanced Encryption Standard (AES) and the installation of 802.11h for European frequency management will be added to most adapters. From that point forward, most changes will occur in firmware and drivers to add features such as quality of service (QoS), power management or radio management. In 2007, Gartner expects a new standard to emerge based on the newly invoked 802.11n standard body that will improve throughput significantly, probably exceeding 100 Mbps.

Action Item: Enterprises should deploy 802.11b now and 802.11a/g starting in the second half of 2004.

2.1.5 Machine-to-Machine Wireless

Strategic Planning Assumption: *By year-end 2007, there will be between 40 million and 120 million machine-to-machine (M2M) connections worldwide that use wireless mobile phone networks (0.6 probability).*

M2M is enabled by the combination of several technologies including:

- *Multiple types of wireless networking.* The types range from near-field through short-range PANs, to WANs, to national mobile phone networks, to global satellite systems.
- *Location sensing.* Much M2M value is derived from knowing the location of items. This can be obtained directly from systems (for example, Global Positioning System, or GPS) or deduced from network properties (for example, signal levels).

- *Sensors.* Inexpensive and easily integrated sensors such as complementary metal-oxide semiconductor (CMOS) cameras or microelectromechanical system (MEMS) accelerometers will enable a new range of sensing capabilities to be integrated with silicon electronics.
- *Low-cost, low-power processors.* These processors allow logic to be incorporated into a wide range of devices.
- *Low-cost assembly techniques.*

Although driven by technology, the real promise of M2M is its potential to create new business models (for example, transforming products into services, significantly changing the cost base of models, and transforming scheduled maintenance into predictive maintenance). Other opportunities are in areas such as:

- Logistics
- Security
- Automotive telematics
- Product tagging
- Product history/environment logging
- M-payments (for example, from credit cards to readers)
- Environmental and building control
- Remote-controlled domestic appliances
- Plant monitoring
- Healthcare

Action Item: M2M will be a complex and fragmented domain, so mobile operators should create a partnership strategy to address niche needs with vertical skills.

2.1.6 PDAs

Strategic Planning Assumptions:

- *Through 2005, Palm will remain attractive to low-cost and smartphone consumers and prosumer buyers (0.7 probability).*

- Through 2007, Microsoft will dominate on PDA platforms for thick-client corporate applications (0.8 probability).

Figure 2-3 summarizes some of the PDA market's key attributes. "Enterprise application platform" refers to the suitability of the operating system (OS) as a platform on which to deliver a broad range of thick- and thin-client enterprise applications. Highlights of this PDA platform competition include:

- In 2003, the PDA market shrank to around 11.5 million units. Smartphones have many similar personal information management (PIM) functions to PDAs and are starting to erode low-end PDA sales.
- Windows CE (Pocket PC) is already the dominant platform for enterprise deployment of thick-client PDA applications based on its strength as an application platform and Microsoft's steady efforts to address weaknesses in areas such as e-mail.
- Research In Motion (RIM) shipments have been growing slowly, and RIM will continue to excel as an easy-to-use niche e-mail and messaging device. We do not expect RIM to become a mainstream application platform and would caution against

developing applications specific to the RIM client or server architecture.

We expect PalmOS to remain viable for thin-client applications and users whose primary requirements include excellent battery life or who are predominantly using the device for PIM and e-mail. The release of PalmOS 6 may provide a platform for Palm to regain some corporate credibility; however, this is an issue that requires more than merely technology.

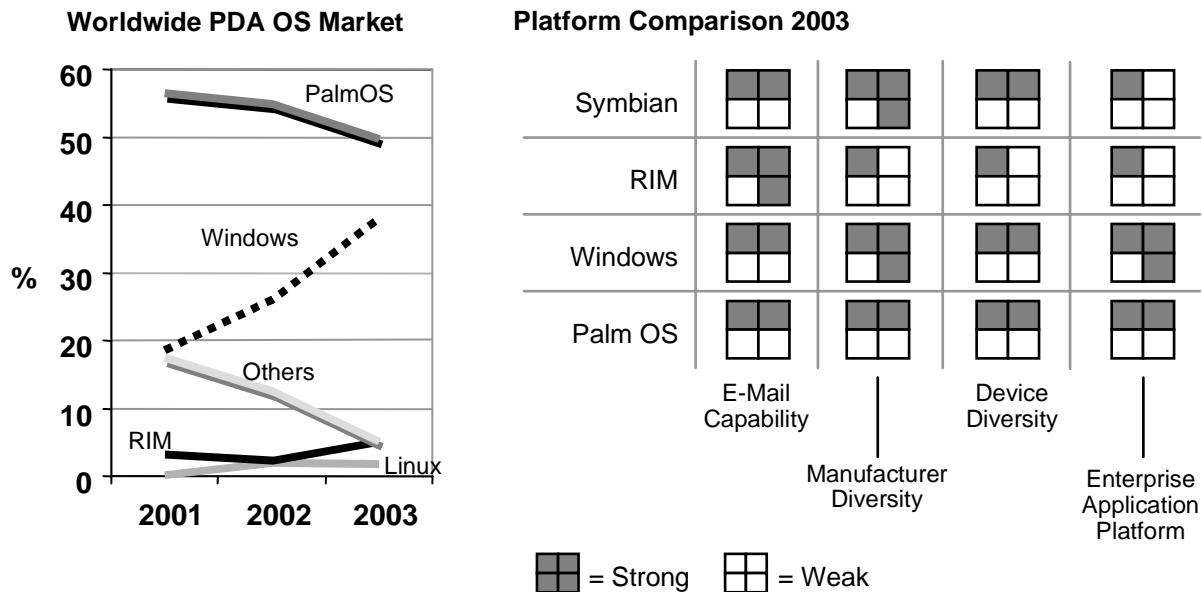
Action Item: Enterprises should consider Microsoft platforms for thick-client PDA applications.

2.2 The Mobile/Wireless Market Through 2008

Key Issue: What major mobile issues will confront mobile network operators and enterprises through 2008?

Strategic Planning Assumption: Average enterprise spending on mobile/wireless initiatives will increase through 2007 with greater than 10 percent compound annual growth rate (0.8 probability).

Figure 2-3: Worldwide PDA OS Market: Key Attributes



Source: Gartner

OS operating system
PDA personal digital assistant
RIM Research In Motion

The recession has resulted in two lean years for mobile application spending. However, Gartner's annual CIO survey reveals an expectation that IT budgets will rise modestly in 2004 with an average growth of a few percentage points. Mobile/wireless spending is likely to exceed IT budget growth in many organizations, growing at an average of approximately 12.5 percent (see Figure 2-4). Mobile spending expectations vary significantly by region with Asia/Pacific notably ahead.

The CIO survey also suggests that mobile/wireless spending will continue to grow above the general level of IT spending because the average position of mobile and wireless technology in the CIO's priorities is rising. Industries in which mobile/wireless technology is projected to be among the top 3 CIO technology priorities in 2007 include construction, telecommunications, nonprofit organizations, retail and service industries.

2.2.1 The Three Phases of Mobility Adoption

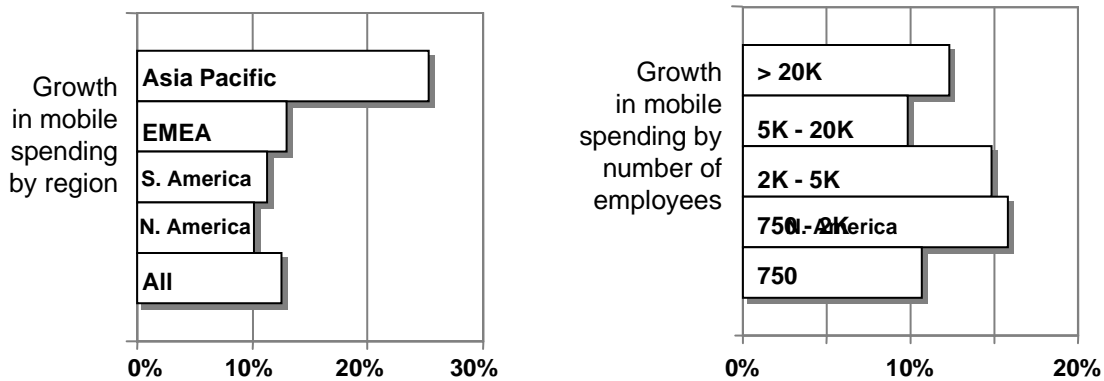
Strategic Planning Assumption: By 2010, 80 percent of key business processes will involve the exchange of

real-time information involving mobile workers (0.7 probability).

Organizations adopt mobility at varying rates and in many ways. However, from a high level, mobility adoption can be seen in three major phases (see Figure 2-5). These phases are:

- *Horizontal mobility.* This is where horizontal applications (for example, mobile e-mail and messaging) are deployed to support generic communication and collaboration.
- *Support a process.* A more advanced and typically more valuable use of mobility is when it is deployed to support a specific business process. Typically, such processes include two key elements: mobility (do it anywhere) and immediacy (do it now). Examples of common mobilized processes in 2004 are sales force automation, inspection, field engineering automation, bedside healthcare data collection, parcel delivery, equipment tracking and radio frequency identification (RFID). Such deployments may impact working practices and modify processes but seldom change the business in a fundamental manner.

Figure 2-4: Enterprise Mobile Spending Growth



Industries rating mobile/wireless as a "top 3" IT priority in 2007:
 construction, telecommunications, nonprofit, education, retail, services

Information obtained from the Gartner Executive Program worldwide survey of 956 CIOs, conducted in 2H03.

- *Enable a new business capability.* For example, wireless sensors could enable a pharmaceutical company to move from selling medication to a model in which the company provided both medication and sensors, and entered into a contract with a medical practitioner to perform continuous monitoring and keep a patient’s blood pressure within an agreed range.

Action Item: Business strategists should immediately begin looking for opportunities to use mobile and wireless technology’s ability to capture or deliver information anywhere, anytime, to fundamentally change the value proposition of products and services.

2.2.2 Mobilizing the Workforce

Tactical Guideline: Organizations should categorize their mobile workforce by role and by need to serve as a basis for technology selection and management decisions.

One key to investing correctly in mobility is to understand the organization’s “classes” of mobile workers and their information needs. Mobile worker classes include:

- *Traveling workers* (for example, sales staff), who spend the majority of their time outside the office

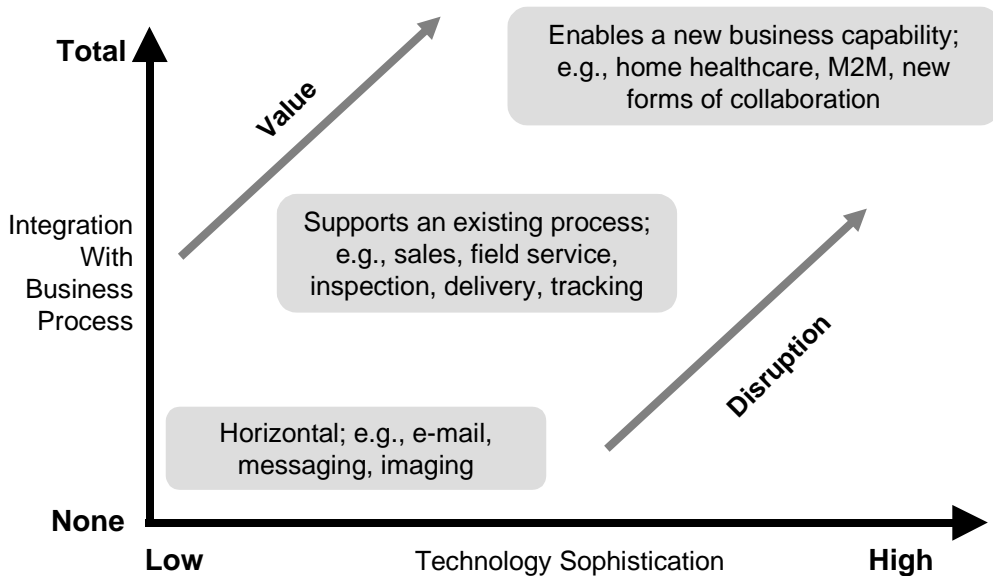
- *Day extenders*, who may make occasional use of facilities (for example, mobile e-mail) while commuting
- *Campus workers*, who are mobile but within a restricted area such as a factory or hospital
- *Teleworkers*, who are based outside corporate offices

Workers can also be categorized by their information needs. For example:

- *Message workers*, who typically need some form of e-mail access
- *Forms workers*, who perform simple data entry/lookup, but on a small subset of enterprise data
- *Knowledge users*, who need access to a substantial proportion of the organization’s back-end systems and information
- *Power workers*, who require all the previous information plus personal tools such as Microsoft Office

Action Item: Enterprise should use Gartner’s mobile worker categorizations to save money by understanding technology and network service requirements of their users and appropriately prioritizing investments.

Figure 2-5: The Three Ages of the Mobile Enterprise



Source: Gartner

M2M machine to machine

2.2.3 Mobile Security Strategies

Strategic Planning Assumptions:

- Through 2006, 70 percent of successful WLAN attacks will be due to misconfiguration of WLAN access points and client software (0.7 probability).
- Through 2005, 90 percent of mobile devices that contain enterprise data will have insufficient power-on protection and storage encryption to withstand casual to moderate hacker attacks (0.6 probability).

Portable, personal devices and wireless networks offer many new security challenges to the organization. For every risk, there are typically a range of technical or vendor strategies to address it, as well as a trade-off between cost and security. There are no simple answers, nor is there a single product or service that can address all of the risks. Some key guidelines include:

- From the top level, security breaks into three parts: protect the enterprise, protect the data, and protect the devices. Each of these requires a detailed strategy (see Figure 2-6).
- Do not trust intermediaries such as network operators. Their definitions of security are not the same as those of the enterprise.

- Don't assume that your devices (or their operating systems) are trustworthy. Verify trust upon access and use.
- Prioritize and plan against threats according to the degree that you have embraced working and accessing your IT systems "on the run."
- Embrace mistakes and exploits. Learn from them; don't deny them.
- Remember the small office/home office (SOHO) environment is also mobile and wireless. Assess SOHO risks.

Action Item: Enterprises should appoint staff members who are responsible for wireless and mobile security.

2.2.4 Architecture for a Multichannel, Multimodal Future

Tactical Guideline: Organizations should isolate back-office, mobile and partner infrastructures using techniques (for example, Web services) to facilitate technology and partner switching.

Figure 2-6: The Three Parts of Security

Protect the Enterprise	<ul style="list-style-type: none"> ■ WLAN Intrusion detection ■ Strong authentication ■ Training, procedures
Protect the Data	<ul style="list-style-type: none"> ■ Traffic encryption ■ Stored data encryption ■ Automated backup ■ Training, procedures
Protect the Devices	<ul style="list-style-type: none"> ■ Power-on password ■ Firewall, antivirus ■ Own the devices ■ Training, procedures

Selected (incomplete) strategies

Source: Gartner

WLAN wireless local-area network

Strategic Planning Assumption: *By 2007, the majority of large corporations will use at least five mobile architecture styles (0.8 probability).*

Wireless mobility implies at least four separate architectural domains. These domains are:

- *Corporate back-office infrastructure.* This evolves relatively slowly in response to non-mobile demands.
- *Internal, server-side mobile infrastructure.* This refers to server code owned and operated by the enterprise. It performs tasks such as provisioning, content adaptation, data synchronization, bridging corporate and mobile e-mail systems, and providing portals to supply corporate applications to mobile devices. Such technologies are tactical and fast moving; in the long term, many will be absorbed into enterprise software tool suites.
- *Internal, client-side code.* There will be five common client-side architectures: voice, messaging, microbrowser, code-only client (for example, J2ME), and thick client (both code and data stored on a device capable of disconnected operation). Client-side code and vendors will often be tactical and evolve quickly.
- *External partner services.* The evolution of these services is both fast and outside corporate control. Key partners will include network operators, employees, customers and external service providers. They will deliver functions such as messaging, micropayment, geoservices, authentication and location services. There are no interface standards yet in many areas — for example, geoservices, location services and Short Message Service (SMS) gateways. Alliances such as that between Microsoft and mobile operators may lay the foundation for some de facto standards.

Action Item: Enterprises should use techniques such as Web services to isolate separate architectural layers, allowing each to evolve at different rates and in different ways.

2.2.5 Enterprise Wireless Management Resolutions

Strategic Planning Assumption: *Through 2010, the most common reason for the failure of mobile projects to achieve their goals will be workforce issues, not technical issues (0.7 probability).*

Gartner's top eight action items for managers responsible for mobile systems and devices are:

- *Control the devices before they control you.*
- *Make smartphones and PDAs an IS responsibility, not a telecom responsibility.*
- *Review security and liability separately for every application deployment.*
- *Recognize that the future is not just mobile, but also multichannel and multimodal.* This will likely require a new IT architecture.
- *Buy management tools to help control and provision the devices.*
- *Gain skills in social issues.* If your development processes are sound, it's likely that more applications will fail for social reasons than technical ones.
- *Manage the new risks of mobility via appropriate processes and short expected life cycles.*
- *Manage operators and service contracts.* Some issues such as Multimedia Messaging Service (MMS) messaging costs may be best dealt with at the contractual level (for example, ask the operator to disable the service). Many desirable contractual issues are unavailable in 2004, such as quality of service and multinational contracts. As operator-billing strategies are changing fast, contracts should be of limited duration in most locations.

2.2.6 WLAN Hot Spots

Strategic Planning Assumptions:

- *Through 2005, no business model for public WLAN “hot spots” will succeed if its only source of revenue is paying customers (0.7 probability).*
- *By 2008, there will be more than 167,000 public WLAN hot spots worldwide (0.7 probability).*

As enterprises adopt WLANs, the theory is that specialists or established providers of mobile phone services could provide public WLAN services in public hot spots by installing WLAN equipment in airports, hospitals, hotels, restaurants, convention centers, airplanes, trains, shopping malls, entertainment venues and so on. Operators of mobile network services would benefit from supporting mobile computer users.

Hot spot types include:

- *Unauthorized, free* — Informal setup, not authorized by the backhaul provider. There is no guaranteed quality of service, and there is a small risk of legal issues associated with unauthorized use of services.
- *Public, free* — Examples include town hot spots (such as in Long Beach, California). These may be used, but there are no guarantees of service quality.
- *Commercial* — In venues such as restaurants. Use selectively and select a charging model (monthly vs. opportunistic) that matches worker needs. Monitor charges to avoid excessive spending.
- *Premium venue* — Use selectively only for workers with a clear need, as it is costly.
- *Private campus* — Work with campus owners to determine commercial arrangements and cases where employee usage is appropriate.
- *Neighborhood systems* — Avoid at this time; this is an unproven business model.

Action Items: Enterprises should:

- Use hot spots tactically and selectively.
- Not sign long-term contracts.

- Investigate aggregators that can provide roaming and bundled charging when they become available.
- Look for bundled hot spot and mobile phone billing.
- Check expense records for excessive hot spot spending outside corporate communication budgets.

2.2.7 M-Commerce

Strategic Planning Assumption: *By 2006, operator revenue from consumer data services in the United States and Europe will not exceed 30 percent of 2002 average revenue per user (0.7 probability).*

Apart from a few promising services such as those from Vodafone in Europe and DoCoMo in Japan, most mobile commerce has been a disappointment. If messaging is excluded, operators make only a small percentage of their revenue from data and applications. Most of this data revenue is from trivial deliverables dominated by ring tones, logos and screen savers (RTLS). The slow evolution of this market is a result of several factors:

- *Operator business models are still overly oriented toward selling technology rather than services.* Mobile business will require thousands of applications and partnerships. Few operators make it easy for small partners with new ideas to enter an ecosystem and profitably deliver applications over the network.
- *Ecosystems are developing slowly.* A mobile business ecosystem must allow all the participants in the value network to prosper and use applications safely and effectively. Key elements of the ecosystem such as payment and standards for content/service delivery are immature.
- *Battles for control.* Operators, handset manufacturers and content providers are locked in battles for brand and consumer control. None wants to share power.
- *Insufficient consumer value.* A consequence of the obstructive ecosystems is that there are few innovative applications delivering significant value beyond basic RTLS, so there is little for consumers to buy.

Action Item: Operators must relinquish some degree of customer control and open the mobile channel to a

wider range of partners to shift business models from voice to data revenue.

2.2.7.1 Potential M-Commerce Growth

Tactical Guideline: Operators should seek catalytic applications (for example, commuter ticket payments) to drive consumer familiarity with mobile commerce.

Although m-commerce has been rather limited, a number of interesting applications suggest the potential for some growth when operator ecosystems are friendlier. For example:

- *Marketing.* Messaging has been a very effective marketing tool for products as diverse as beer, football teams and movies.
- *Time-sensitive information.* M-commerce can be effective for information such as sports results, flight information and tourist information.
- *Entertainment.* Consumers can leverage m-commerce for uses such as downloaded games (mostly Java) and links with television programs.
- *Multichannel commerce.* Applications include sending URLs in messages, and reading printed bar codes using imaging phones. The alliance between mobile operators and Microsoft to allow Windows PCs access to network services such as authentication and payment is interesting.
- *Music sales.* The area has potential but may need 3G performance and lower prices to become attractive.

- Smartphones and PDAs. Such applications have shown modest success.
- *Location-based services.* Though some services such as finding a taxi have potential, this use is still very immature, and pricing models are a deterrent.
- *Payment and ticketing.* Modest success has been realized in applications that have an element of mobility and immediacy, such as parking, road congestion charging or commuting.

2.3 Recommendations

Enterprises are advised to:

- Control device diversity before it controls you.
- Pay attention to security, but don't be overcautious; adequate security is achievable — at a cost.
- Ensure your emerging technology group is watching mobile technology evolution, as there's a lot happening.
- Remember that social issues are as important as technical issues in both corporate and consumer applications.
- Focus on the tactics, not the long-term strategy.
- Explore M2M as a source of new business models.
- Realize architecture will be the foundation for your mobile future.