

Mobilizing the Small- and Medium-sized Business

Extending network access to mobile employees

Introduction

In response to flat or shrinking budgets, today's small and medium-sized businesses are searching for ways to generate more value from the resources, systems, and customers they already have in place. As organizations strive to improve productivity, increase customer responsiveness, and cut operating costs, companies are increasingly relying on networked applications and Internet technologies. More and more, businesses view the company network as a cornerstone of their ability to succeed.

The electronic tools available to knowledge workers today empower a single employee to achieve a level of productivity that once required multiple employees. However, employees can only use network-enabled tools and resources when they are connected to them, usually within the confines of an office workstation. And, as companies strive to become more collaborative and responsive to customer needs, employees are spending less time at their desktops. Instead, they are spending more of the workday in meetings, visiting customers and business partners, and conferring with managers and subordinates.

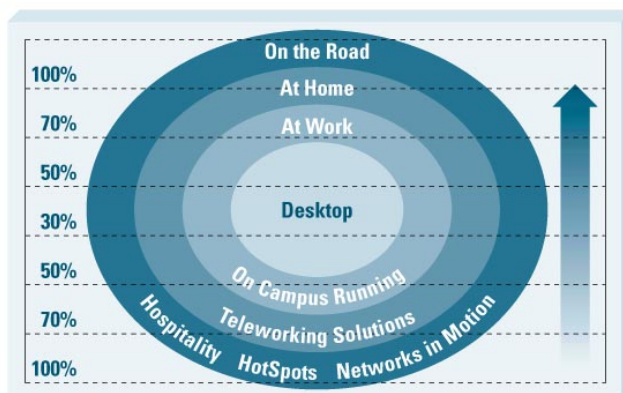
How can businesses make the most of the company network while adapting to the needs of a more mobile workforce? The solution lies in mobilizing the business—extending network access to employees while they are away from their desks. Intelligent wired networks, intelligent wireless LANs, and teleworking capabilities are the technology enablers. Together, these mobile office solutions expand the “productivity zone” of knowledge workers away from their desks, and keep them better connected to customers, partners, and business tools.

Mobility in the Mainstream

When professionals conduct business away from their desks, they lose access to valuable network resources. This impedes their ability to respond rapidly to customer requests, to collaborate effectively in meetings, and sometimes even to close a deal. Now that mobility solutions have matured, however, companies can afford to extend their information infrastructures to workers in meeting rooms, in public areas at the main business location, in airports and hotels on the road, and even at home. A recent study conducted by NOP World—Technology for Cisco Systems shows that doing so can add one to two hours a day of productivity per worker while empowering them to respond more quickly to customers, partners, and colleagues (Figure 1).



Figure 1 Cisco Mobile Office Solution Categories



As businesses add mobile office solutions, they extend employee access to the company network, beyond the desktop, thus increasing employee productivity.

In addition, mobile network extensions give workers more flexibility in where and how they do their jobs—a boon to employee satisfaction.

Mobilizing the business by extending network access to mobile employees at work and at home yields benefits in the following areas:

- Increased employee and workgroup productivity
- Improved responsiveness to customers, partners, and colleagues
- Improved workgroup collaboration
- Increased use of the existing wired network infrastructure
- Enhanced employee satisfaction and retention

Today, many companies view mobile office solutions as a “nice to have” rather than a critical business requirement. However, the return on investment (ROI) for mobility transcends mere convenience. Organizations can actually save millions of dollars each year on their profit lines—all for a per-user investment of less than US\$2 per day (see section below, “Doing the Wireless Math”).

Challenges Facing Professionals

Because of the rise of more sophisticated company networks, applications, and Internet-enabled tools, each knowledge worker now has the electronic resources to accomplish much more than a single individual could have possibly achieved a decade ago. However, the advent of these tools, coupled with tightening budget constraints, is forcing employees to carry greater workloads than ever before.

Adding to the challenge is the fact that, according to industry studies, professionals are actually at their desks just 30 percent of the time. And they spend nearly 50 hours a month in meetings. These users have access to their valuable wired desktop network connections for less than a third of the business day.

To keep up, knowledge workers are trying to make full use of small pockets of free time. Cisco Mobile Office: At Work solutions enable this by extending access to critical applications, content, and communications channels to workers away from their desks. Employees can take advantage of time between meetings and retain access to critical information resources wherever and whenever they need them—in a meeting room, at an airport or hotel, or from home.



Perhaps most significantly, though, deploying wireless access to network resources in the office can actually improve the quality and productivity of meetings. When employees can access the information they need during the meeting itself, they can more effectively reach collaborative decisions and complete projects right then and there (see section, “Taming Meeting Mania”). This will reduce additional project work and follow-up meetings.

The primary building blocks for mobilizing the business and extending network access to mobile knowledge workers are the following

- *Wired local-area networks (LANs)*— Intelligent network infrastructures that deliver the performance, reliability, quality of service (QoS), and network security that critical business applications require, as well as the scalability to meet evolving business needs.
- *Wireless local-area networks (wireless LANs)*—Intelligent wireless technology with support for virtual LANs (VLANs), QoS, and proxy mobile IP that extends access to the wired network to workers in meeting rooms and in common areas at the office.
- *Virtual private network (VPN)*—A technology that enables workers at remote locations to securely connect to the company network over the public Internet.

Technologies that can further augment mobile office solutions include:

- *IP communications*—When companies converge their phone systems with the data network, they can bring intelligent tools and applications to the management of voice communications. For example, using IP phones or PC software applications, employees can “log on” to the company data network from any location and communicate as if they were at their own desks.
- *Messaging applications*—“Unified messaging” and call-management applications enable workers to filter and manage phone calls in real time, and can even combine voice messages with e-mail and faxes into a single, manageable inbox.

This paper explores mobile office solutions and discusses where and how they can be deployed (and at what cost) for business benefit.

Cisco Mobile Office: At Work

It might seem like an oxymoron to talk about users being “mobile at work.” However, the main business location is no longer the sedentary work environment it once was. Even for small organizations, effective collaboration between employees, vendors, and customers is a cornerstone of business success. Secure wireless LANs, as well as IP telephones and associated communications applications, can substantially improve employee collaboration by providing workers with access to all the information they need to quickly respond to customers, and make better, faster decisions.

In addition, for many organizations today, meetings often spawn additional project work and follow-up meetings, generating still more time commitments for workers who are already very busy. By contrast, when participants have a wireless connection to network resources during the meeting, projects can be completed on the spot.

Extending network access to places where it was previously unavailable can buy workers additional minutes or hours each day during which they can make productivity gains. And, by making the network accessible to more employees, more of the time, companies improve the ROI of their wired network investment.



The Wired Network

For any mobile office deployment to be successful, a company's wired LAN must be capable of supporting and making the most of mobile technologies. Cisco core networking solutions deliver the performance, reliability, and network security to support critical business applications and meet the demands of customers and employees. And, because a network built on intelligent Cisco routers and switches is inherently scalable, companies have the flexibility to easily add mobile office solutions—as well as other future technologies—as they grow and evolve.

Cisco Intelligent Network Services deliver important business benefits, including high availability, QoS, and enhanced network security. Highly available Cisco routers and switches help ensure that business applications and data are always available when employees need them, and intelligently manage network resources to meet fluctuating demand. Cisco QoS technology classifies, prioritizes, and controls network traffic so that the most time-sensitive network data—such as voice communications—receives preferential treatment. Cisco routers and switches also employ advanced authentication, user-access, and data-routing technologies to help ensure that all business data remains secure from unauthorized access.

By starting with a network foundation of intelligent Cisco infrastructure technologies, companies can help ensure that mobile office solutions—as well as all other business applications—will meet their present and future needs.

Wireless LANs

For a modest cost (approximately US\$200 to US\$300 per person, including equipment, installation, training, and annual support), companies can extend their existing wired networks to locally mobile professionals in the office using wireless LANs. These wireless network extensions deliver speeds comparable to those of the wired network, making the wireless LAN basically an equivalent, portable version of the company network.

Wireless LAN benefits have long been enjoyed in the warehouse or the factory floor, in retail settings, and more recently in highly mobile vertical industries such as healthcare, higher education, trucking, and public safety. Now that wireless LAN standards have matured, network security challenges have been solved, and costs have dropped, the time is right to also deliver wireless LAN advantages to mainstream workers.

To some degree, the foundation for a wireless LAN infrastructure is already in place. For example, because laptop computers now have processing power and other capabilities on par with traditional desktop computers, many businesses have already installed them as primary user workstations to gain mobile advantages. The Wi-Fi Alliance, a vendor consortium focused on interoperability testing of wireless LAN products, estimates that about 40 percent of business-class laptop computers now ship with wireless LAN network interface cards (NICs) already included.

For laptops that don't already include wireless NICs, the current cost to install one is about US\$50 (and the cost is still falling). Older laptops can be outfitted with such connections for US\$100 to US\$250.

The other main component required for wireless mobility is a network of radio-based access points, which connect to the company's wired network. These access points constitute the point of network access for the wirelessly enabled employee laptops. Meeting rooms, lobbies, lunchrooms, and other common areas of the company office are ideal locations for installing these access points. Now, as employees move about these common areas, they gain the ability to securely tap the same resources available to them at their traditional wired workstations.



Responding to a few additional e-mails between appointments might seem like a trivial gain. However, a wireless LAN user's flexibility to stay on top of communications throughout the workday—rather than waiting until 5 p.m. to deal with a day's worth of messages—could supply a colleague or a customer with vital information in time to close a deal or seal a customer's loyalty. Multiply this by dozens or hundreds of employees across the company, and the returns accumulate quickly.

Cost versus ROI

Some business decision-makers might be surprised to discover that the cost of installing a secure wireless LAN infrastructure, when divided among the number of users, is only about US\$1 to US\$2 per user per day (see section below, "Doing the Wireless Math").

But just how valuable is the wireless connection?

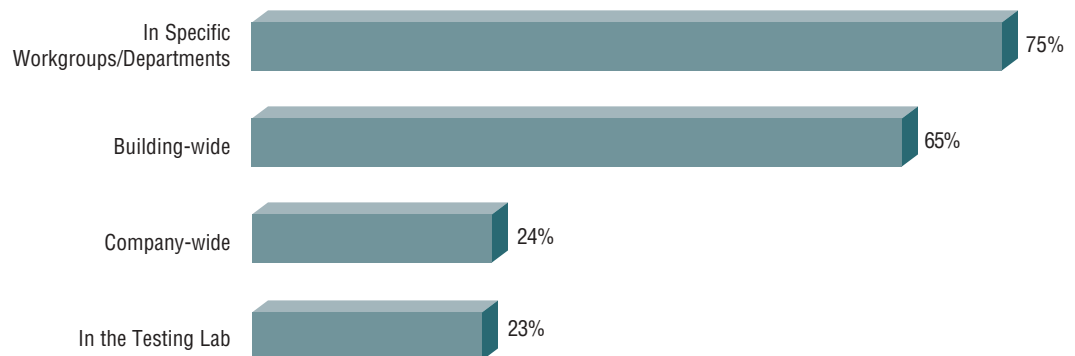
According to a study conducted by NOP World—Technology for Cisco Systems in late 2001, wireless LANs enable users to stay connected to network resources an additional 1.75 hours per day, on average. This translates into the typical user being as much as 22 percent more productive.

Assuming an average salary of \$64,000 for a professional knowledge worker, as reported by industry research, this per-user productivity improvement is worth, on average, US\$7,000 per year. For an organization with 500 knowledge workers, that equates to as much as US\$3.5 million each year.

NOP World—Technology interviewed end users across more than 300 organizations, each with a minimum of 100 employees. Of the respondents, 56 percent reported that they are using their wireless connections "constantly" or "on a daily basis."

And consider: According to the Hackert Best Practices 2002 Book of Numbers, the average company has invested US\$11,600 per user to deliver network applications to the desktop—a resource that users access just 30 percent of the day. For only US\$200 to US\$300 more per user, companies can expand the accessibility of that network investment by more than 50 percent (See Figures 2 and 3).

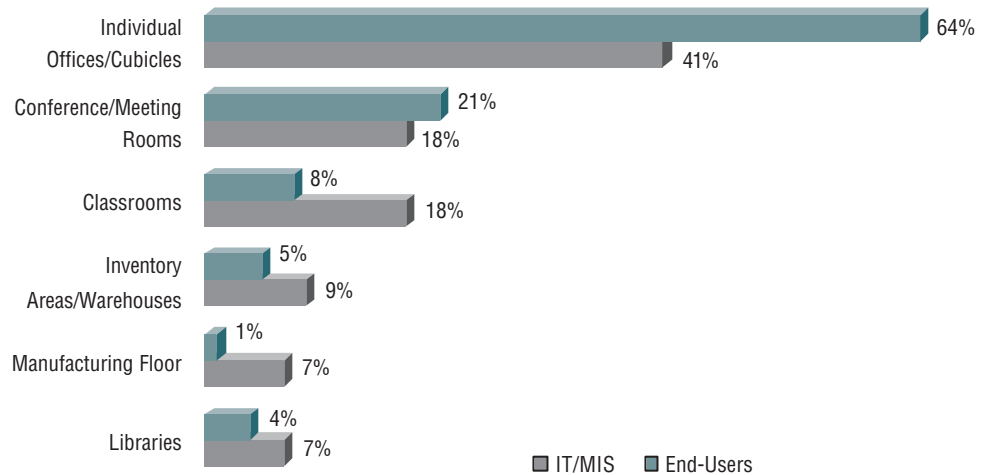
Figure 2 Wireless LAN Deployment Locations



Base: All IT Respondents (n=244)
from "Wireless LAN Benefits Study," Fall 2001, conducted by NOP World-Technology for Cisco



Figure 3 Areas of Wireless LAN Access



Base: All Respondents (n=404)
from "Wireless LAN Benefits Study," Fall 2001,
conducted by NOP World-Technology for Cisco

Note: End-user organizations were more likely to be in
the educational sector, accounting for the difference in
classroom access.

Doing the Wireless Math

Another way of conducting a cost versus benefit analysis of a wireless LAN implementation is to assess the deployment costs compared with employee compensation. The math can be broken down as follows (with the assumptions as described):

- The per-employee, average total compensation (salary, benefits, bonus, facilities, and so forth) is US\$70 per hour. This assumes that total compensation is about twice the average hourly rate of gross compensation to the employee and that the average salary of an employee in an organization in North America is US\$35 an hour.
- Assume that all time saved is used for productive activities and not spent in other ways.
- Assume savings of one hour per week for each employee and that each employee takes two weeks of vacation a year.
- Thus, the yearly savings for each employee is: $US\$70/\text{hour} \times 1 \text{ hour/week} \times 50 \text{ weeks/year} = US\$3,500$
- Now, the ROI analysis must subtract from these savings the cost of deploying the network. Here is a sample scenario:
 - Assume users already have laptops at their desks.
 - Each employee requires a wireless connection in the laptop to access the network (about US\$100, retail price).
 - For the network of radio access points, the company should deploy one access point for every 15 users. The per-user cost of deploying each access point is about US\$40, retail price.
 - Each access point requires a network-switch port to plug into (about US\$42 per port).
 - The company requires two access-control servers (a primary and a backup), used to authenticate users for network security purposes. For a company with 500 employees, this translates to about US\$24 per user.
 - Installation per access point takes two hours at the average rate (about US\$20 per user).
 - Assume the equipment is used for three years.



Given these variables and assumptions, the per-user investment figures are as follows, based on Cisco equipment prices:

Wireless laptop connection per user:	US\$100
Access point (per-user portion):	40
Ethernet switch port:	42
Authentication (per-user portion):	24
Installation (per-user portion):	20
	US\$236 total cost update cost
Divided by 3, for 3-year amortization:	US\$79 cost per user, per year for three years
Per-user cost subtracted	US \$3,500
from per-user calculated savings, above:	- 79
NET SAVINGS	US\$3,421
Total per-user savings per year:	

Taming “Meeting Mania”

The average professional spends as much as 48.8 hours a month in meetings, according to a 20-year study of 1,800 corporate managers conducted at Macalester College in St. Paul, Minnesota. Other industry studies indicate that as much as 50 percent of meeting time is wasted because meetings don’t start on time or participants don’t have the proper information to complete decision-making during the course of the collaborative session.

For example, meeting attendees might block out an hour or two for a collaborative session, only to discover after 15 minutes or so that they all need to go back to their desks to gather the proper data required to make the meeting really productive. So another meeting must be called. This trend cycles on, wasting time and frustrating workers. In addition, this cycle thwarts a company’s ability to turn around important decisions and projects quickly. Long-term, it can impact competitiveness and, ultimately, degrade customer loyalty and retention.

When users and meeting rooms have wireless connections to company data resources and the Internet, though, real work can be accomplished dynamically because all of a user’s tools are readily available. A NOP World—Technology study of existing Cisco wireless LAN customers indicates that wireless LAN technology reduces group decision-making time by 30 to 40 percent—a substantial boost to the agility of an organization. The same study also reported that 87 percent of knowledge workers who responded believe that the wireless LAN improved their quality of life.

Minding the Budget

Organizations feeling today’s economic squeeze might consider wireless LANs and other mobile office solutions a “nice to have” rather than a necessity. It’s true that, depending on the business culture of a given company, not all mainstream knowledge workers need all types of mobile network access. According to the NOP World—Technology study, though, the longer the technology has been in place at an organization, the more employees are using it and have come to depend on it for competitive advantage.



The more often that highly paid knowledge workers are away from their desks, the stronger the business case becomes for deploying wireless technology. The return is almost instantaneous for these highly mobile users, who must communicate regularly with important people within the company and with customers and business partners.

Businesses do not necessarily have to deploy wireless networks company-wide to benefit from the solution. Companies may choose to begin by outfitting highly mobile workers with wireless access in their laptops and deploying a few wireless access points in important meeting rooms and common areas. The capital investment here is very small, and companies can then begin to gauge whether mobile knowledge workers are benefiting from this extended access.

IP Communications

Having a converged voice and data network is not a requirement for Cisco Mobile Office: At Work solutions, but converged networks can further expand the benefits of these solutions by enabling IP communications applications. These applications enable more sophisticated management of voice communications, reduce phone communication costs, and expand the flexibility, productivity, and responsiveness of mobile knowledge workers.

With IP communications solutions, for example, employees can log onto a phone from anywhere that is connected to the company network and retain their extension number, corporate dial plan, and calling features. Knowledge workers can also use rules-based applications to manage and streamline calls in real time—filtering and redirecting calls, for example, when they are in meetings.

Similarly, a productivity-enhancing application called “unified messaging” simplifies an employee’s message management and increases customer responsiveness. Having to check messages in a variety of formats all day long—e-mail, voice mail on multiple phones, faxes—can be a daunting task. Unified messaging applications aggregate all those messages into a single mailbox and enable employees to retrieve their messages in the format most convenient to them at a given time (“listening” to e-mail, “reading” voice mail), which is a huge time-saver.

The Radicati Group, Inc., a research firm in Palo Alto, California, estimates that unified messaging alone generates 25 to 40 minutes of additional productivity per employee per day.

Cisco Mobile Office: At Home

Like using wireless LAN technology to extend a user’s desktop at the office, using network security technology with a fast Internet connection can keep knowledge workers productive and communicating when at home. Teleworking represents a way to extend employee workdays, reduce real-estate costs for employers, and improve employee satisfaction and responsiveness.

With a formal teleworking setup in place, companies don’t necessarily “lose” a worker who must leave the office early for a doctor’s appointment or go home to be with a sick child. Instead of being totally cut off from work, employees can remain productive for a number of additional hours once they are home. In certain cities with particularly grueling rush-hour traffic, workers could opt to leave early, beat the rush, and then continue work from their home workstations. Such flexibility keeps workers both productive and satisfied, and helps them to respond to urgent customer needs.



Productivity of Teleworkers

A decade ago, managers worried that decentralizing the workplace and enabling employees to work from home would wreak havoc with employee management control—that workers might “slack off” when not closely supervised. History, though, has shown that the opposite is true when it comes to knowledge workers, who are evaluated and rewarded based on quantifiable goals set by their managers. These workers are motivated to work as smartly and efficiently as possible. And for many, teleworking offers the flexibility to work at the times and locations where they can be most productive.

In fact, teleworkers actually tend to achieve more when working from home. A survey by Kensington Technology Group determined that 75 percent of teleworkers polled felt they accomplished 30 percent more in the same amount of time working at home. From a cost-savings perspective, Kinetic Workplace estimates that companies with teleworking programs saved about US\$12,000 per year, per teleworker, and reduced real-estate costs by up to 60 percent.

Work-at-Home Costs and ROI

The cost of outfitting teleworkers with the appropriate equipment, software, network service, and support, based on Cisco prices, is about US\$4 to US\$6 per day per user.

Cisco research estimates that the average, overall yearly cost to an organization for a single knowledge worker, including salary, benefits, equipment, furniture, business expenses, and so forth, is US\$120,000 to US\$300,000. The cost of extending that knowledge worker’s access to the home represents an incremental cost of about US\$1,500 per employee in the first year, dropping to US\$900 in the second year. The return on this investment requires only that a teleworker gain two to four minutes per day in productivity savings.

Less quantifiable but just as important, companies that provide workers with the added flexibility of teleworking solutions can improve the overall satisfaction of their workforce, and thus enhance their ability to attract and retain valuable employees.

For these reasons, more and more companies are adopting teleworking solutions. According to a recent survey of businesses conducted by Webtorials.Com, an educational Web site devoted to networking technology and trends, teleworking is “actively encouraged” in the organizations of 43 percent of the 400 IT and networking managers surveyed. As a measure of the level of interest in teleworking, 66 percent of the Webtorials.com respondents said they would be willing to pay up to a 25 percent premium for “business class” Internet connections—those with reliability and access security guarantees—specifically to support home workers. While the majority of those surveyed worked for large companies, the relatively low cost of deploying teleworker solutions and the productivity benefits are causing smaller companies to consider these deployments as well.

The primary components of a teleworking setup are a broadband Internet access service and VPN technology for enforcing data security across the public Internet.

Broadband Internet Access with VPNs

The proliferating availability of broadband Internet connections, such as DSL and cable modem services, is a primary motivator behind organizations implementing formal teleworking programs. These services deliver speeds comparable to those on the office LAN, so workers can access and use company applications with the same level of efficiency as if seated at an office desk.

For teleworkers, broadband Internet connections most often work in conjunction with VPN technologies, which keep an individual user’s communication private, segregated from other users’ traffic in its own secure “tunnel” as it traverses the Internet.



Giving teleworkers broadband Internet access requires some type of access device, such as a DSL or cable modem, in the user's home. Cisco supplies routers that connect the user's laptop to the Internet while also performing VPN and other network security functions. VPN capabilities can also be provided by a specialized VPN "appliance," desktop software, or a network-based service offered by the Internet service provider (ISP).

IP Communications

In addition to providing access to company data and e-mail from home, a full-service teleworking setup can include an extension to the company voice system. As noted, many organizations are converging data and voice services on the company network to enable IP communications. While companies don't have to support IP communications to deploy a teleworking solution, this technology can further augment the benefits of a teleworking solution.

Using an IP communications solution, teleworkers can be available to customers at their company telephone extension—even while working from home. The solution also reduces the quantity of phone numbers that colleagues and customers must have on file.

IP communications also improves the company's profit line by allowing teleworkers to call customers and partners from their homes while still taking advantage of the corporate dial plan and volume discounts. This eliminates the need to file expense reports for phone costs incurred—usually at higher rates—from a home telephone. Additionally, calls to colleagues within the company are generally free, as they use the Internet and company data network with no toll charges.

Cisco Mobile Office: On the Road

The wireless LAN technology described in the "At Work" section and the VPN technology discussed in the "At Home" section are combining to extend network connectivity to traveling knowledge workers on the road. Major hotels, airports, and convention centers are increasingly becoming network "hot spots," offering broadband Internet access to traveling employees. These hot spots enable knowledge workers to stay connected to customers and company resources while waiting for a flight or staying in a hotel room.

Often, guest rooms in hotels will provide broadband wired LAN connections. Using the secure VPN client software on their laptops, knowledge workers can plug in and access the company network just as if they were working from their own desktop. For more convenient, real-time connectivity, airports, hotels, and convention centers across the country have increasingly deployed wireless LAN hot spots. Now, many coffee shops, restaurants, and other public locations are adopting the technology as well. In fact, Analysys Consulting predicts that by 2007, the number of wireless hot spots in public venues will grow to 41,000, reaching 21 million users.

As part of the Cisco Mobile Office: On the Road solution, Cisco also offers traveling employees the Cisco Hotspot Locator tool, which helps knowledge workers find hot spots in cities around the world. The tool even helps workers create an itinerary complete with driving directions. To find a hot-spot location, go to www.cisco.com/go/hotspots.

Businesses that operate public places, such as hotels, restaurants, and cafes, can also benefit by joining the Cisco Mobile Office: On the Road marketing program, and offering their own customers broadband Internet access.

As increasing numbers of public venues adopt wireless connectivity technologies, knowledge workers enjoy even closer connection to customers and productivity-enhancing tools, and companies realize greater return on their investment in mobile technology.



Is Mobile Technology Secure?

Whether company resources are stored in a data center, on a server connected to a wired network, on employee PCs with or without wireless connections, or on paper locked in file cabinets, information security—both physical and electronic—will always be of tremendous concern to any organization. A company’s credibility, competitive advantage, reputation, and trade secrets all rest on its ability to tightly control access to important information.

While information security once constituted putting padlocks and deadbolts on office and data center doors, it now also includes sophisticated electronic authentication of users and, often, the encryption of information—particularly of information traversing a wireless connection or the public Internet. Fortunately, businesses can now use information-security technology that helps ensure the privacy of company data traversing all types of networks: private company networks, the Internet, and wireless LANs.

In the early days of wireless LANs, grabbing data out of the air and decoding it turned out to be easier than the original technology developers had anticipated. Today, however, companies deploying wireless LANs can employ strong user and network mutual-authentication schemes and complex dynamic encryption to protect their wireless LANs. These network security enhancements make it nearly impossible to eavesdrop on communications or gain unauthorized access to company networks. Strengthening security algorithms has been an IT industry priority taken on by standards groups, Cisco, and even the U.S. government.

Similarly, industry-standard encryption technology for use over the Internet keeps teleworker traffic private. Recent technology advances by Cisco even allow voice and video traffic to be encrypted over mobile Internet connections yet receive the preferential treatment they require for high-quality conversations.

As with any part of the IT infrastructure, network security must be properly configured and managed to be effective. However, with proper management processes in place, today’s data security technologies enable companies to deploy wireless and remote office implementations with confidence.

Conclusion

This paper has discussed the business benefits, costs, and expected ROI of expanding highly mobile knowledge workers’ access to the company network. It has shown that, for a very small, incremental add-on to existing wired networks—US\$1 to US\$2 per user per day for wireless mobility at the main business location and US\$4 to US\$6 per day for teleworking—organizations can increase productivity, improve ROI for the wired network, and achieve greater customer responsiveness.

Of course, a company’s technology, people, and business processes must all work together to realize the full benefits of mobility. Building a successful mobile environment has less to do with evaluating and installing technology than with creating a company culture around mobility that takes into account behavioral norms and best practices.

For example, if employees attending meetings pay no attention to what’s going on and simply sit in a corner answering e-mail, they would defeat the purpose of the company’s investment and might as well remain at their fixed workstations. Setting “etiquette” standards within the organization for how and when to use mobile capabilities is an important step to consider for any deployment of mobile technology.

But, for businesses that intelligently deploy and manage mobile technologies, these solutions can dramatically improve productivity and responsiveness, and position companies to be more competitive than ever before.



CISCO SYSTEMS



Corporate Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters

Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters

Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

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