

Expanding the Productivity Zone of Locally/Corporate **Mobile** Workers







Cisco Wireless LAN and IP Communications Solutions Extend Corporate Networks to Common Work Areas

The PC and Internet revolutions have enabled businesses to run leaner. The electronic tools available to knowledge workers today empower a single employee to achieve a level of productivity that once required several individuals.

As budgetary belts continue to tighten, however, employees are challenged to carry even greater workloads. They struggle to keep up with volumes of electronic communications to make better and faster decisions while spending most of their workdays in meetings, visiting customers and business partners, and conferring with managers and colleagues.

This situation presents a productivity paradox. The office-bound desktop, which contains PC connections to the corporate data network and telephone connections to the voice network, is considered a worker's primary "productivity zone." Yet mainstream knowledge workers now spend less than a third of each business day—just 30 percent—at their office desks, according to industry studies. And they spend nearly 50 hours a month in meetings.

Professionals must be away from their desks to collaborate with co-workers—yet moving beyond the reach of their desktop network connections and applications impedes their ability to make informed decisions and respond to urgent communications.

To resolve this conundrum, organizations are adjusting their business processes to expand the productivity zone of mobile knowledge workers. For users who are locally mobile within their corporate offices, this involves extending employee access to network resources using two primary tools: wireless LANs (WLANs) and IP communications.

The "productivity paradox" is that employees often must be away from their desks to work effectively—yet moving beyond the reach of their desktop connections and applications impedes the decision-making process.



WLANs enable high-speed, over-the-air access to corporate data networks from user laptops and other mobile devices. Cisco IP Communications is a comprehensive system of powerful enterprise-class solutions—such as IP telephony, unified communications, IP video/audio conferencing, and contact center—that dramatically improve operational efficiencies, increase organizational productivity, and enhance customer satisfaction to create a collaborative workforce, increase competitive advantage, and deliver measurable ROI. IP communications delivers plug-and-play access to the voice network and associated telephony applications from anywhere around the office using IP handsets or PC software applications. For example, users “log on” to any available IP phone, for example, and their extension and phone applications appear on that phone.

Expanding the productivity zone of mainstream corporate workers with these tools is fast becoming a competitive corporate strategy for companies with employees that move around or away from their offices. For a small incremental cost—a few dollars per worker per day—organizations can quickly realize a return on investment (ROI) with WLANs and IP communications through increased productivity and business efficiency.

The Benefits of Onsite Mobility

The corporate office is no longer the sedentary work environment it once was, particularly in very large organizations where professionals must collaborate frequently. Secure WLANs, IP telephones, and associated communications applications can add additional minutes or hours each day, during which workers can make productivity gains.

Perhaps most significant, WLANs substantially improve the effectiveness of employee collaboration by providing access to all the information needed to make better and faster decisions. In many organizations today, meetings often spawn additional project work and follow-up meetings, generating still more time commitments for workers who are already stretched thin. By contrast, having a wireless connection to network resources that participants can share often enables project completion to take place on the spot.

Extending network access to mobile employees who are at work affords the following organizational advantages:

- Improved workgroup collaboration
- Enhanced employee productivity
- Improved responsiveness to customers and colleagues
- Business resilience by providing alternative connections to corporate resources
- Better utilization of existing technology investments (laptops, the data and voice network, applications)
- Increased competitive advantage for company
- More efficient use of office space
- Reduced errors (by replacing paper with wireless output)
- Improved company image
- Lower support and maintenance costs

The benefit of mobility equates to more than mere convenience for workers. Large organizations can realize millions of dollars more each year in profits due to increased productivity and business efficiency—all for a per-user daily investment that is little more than the price of a cup of coffee.

The WLAN Business Case

The benefits of WLANs have long been enjoyed in the warehouse and on the factory floor, as well as in highly mobile vertical-market industries such as health care, education, and retail. Now that WLAN standards have matured, costs have dropped, and security challenges have been solved, the benefits of WLAN access for highly mobile mainstream knowledge workers are compelling.

For a modest cost (US\$300 to \$500 per person, including equipment, installation, training, and annual support amortized over two or three years), corporations can extend their existing wired networks to locally mobile professionals using WLANs. The wireless network extensions perform comparably to the multimegabit speeds of wired LANs, making the WLAN a portable version of the corporate network.

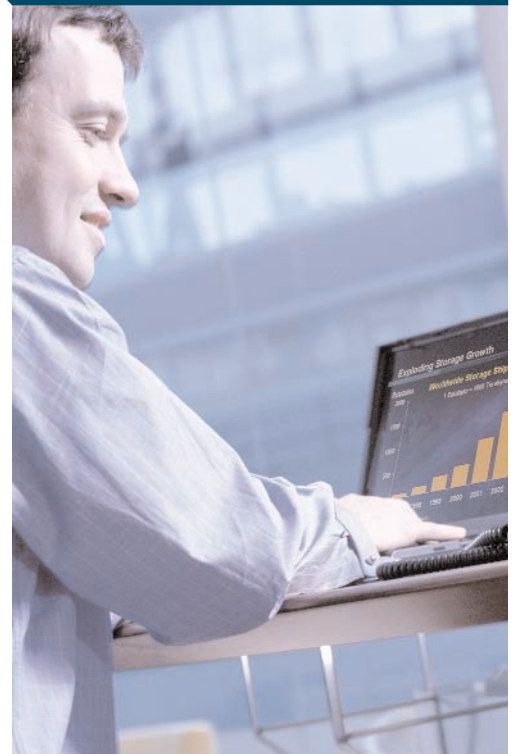
As a result, WLANs protect and extend corporate investments in existing wired networks because those networks become accessible to more users for more of the time.

For example, because laptop computers now have processing power and other capabilities equal to traditional desktop computers, many businesses have installed them as primary user workstations to gain mobility advantages. The Wi-Fi Alliance, a vendor consortium focused on interoperability testing of WLAN products, estimates that about 40 percent of enterprise-class laptop computers now ship with WLAN network interface cards (NICs) included.

The current premium for these NICs is about \$50 (and the cost is still decreasing). Older laptops can be outfitted with NICs for about \$130.

In addition to laptop NICs, wireless mobility requires a network of radio access points (APs), which connect to the corporation's wired network. These APs constitute the point of network access for employee laptops. Meeting rooms, lobbies, lunchrooms, and other common areas of the enterprise are ideal spots for installing APs because this is where users tend to be when not at their desks. When APs are placed in these locations, workers can securely access the same resources available to them at their traditional workstations.

Resolving a few e-mails or phone messages between appointments might seem like a trivial gain. However, staying on top of critical communications throughout the work day rather than waiting until the end of the day to address a day's worth of messages could mean supplying a colleague with vital information in time to close a deal or reinforce a customer's loyalty. Multiply this by hundreds or thousands of employees across the company, and the returns accumulate quickly.





Measuring Productivity Gains

Some corporations might be surprised to discover that the cost of installing a secure WLAN infrastructure is only \$1 to \$2 per person per day (see the section later in this document, “Doing the Wireless Math”). But just how valuable is the wireless connection?

On average, according to a study conducted by NOP World–Technology in late 2001, WLANs enable users to be connected to network resources 1.75 additional hours per day. This number translates into the average user becoming as much as 22 percent more productive.

Assuming an average salary of \$64,000 for a professional worker, as reported by industry research, the annual productivity improvement per user, on average, is \$7,000. For a large corporation, this productivity improvement equates to as much as \$6.3 million each year. Figures 1 and 2 below show where WLANs are being deployed, and areas of WLAN access, respectively.

Figure 2
Where WLANs are Being Deployed

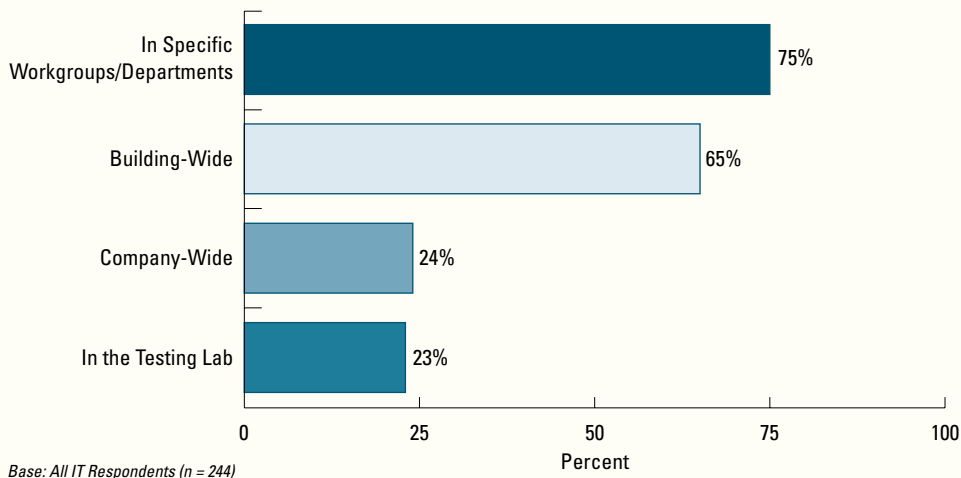
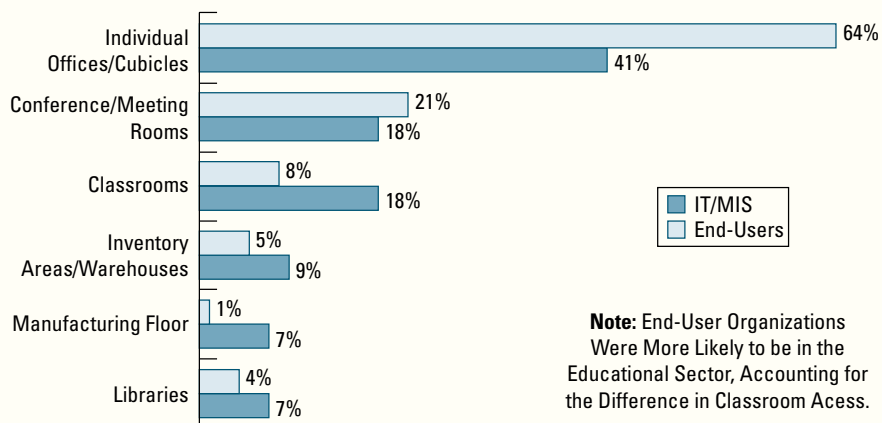


Figure 3
Areas of WLAN Access (Applications)



Base: All IT Respondents (n = 404)

NOP World – Technology, Fall 2001



Doing the Wireless Math

Another way of conducting a cost and benefit analysis of WLANs assesses deployment costs compared with employee compensation. The math can be explained as follows (using the assumptions described):

- The per-employee average total compensation (salary, benefits, bonus, facilities, etc.) is \$70 per hour. This assumes that total compensation is roughly twice the average hourly rate of gross compensation to the employee and that the average salary of a North American knowledge worker is \$35 an hour.
- All time saved is used for productive activities and is not wasted in other ways.
- Savings of an hour per week for each employee, and each employee takes two weeks of vacation a year.

Based on these assumptions, the yearly savings for each employee is:
 $\$70 \text{ per hour} \times 1 \text{ hour per week} \times 50 \text{ weeks per year} = \3500

The ROI analysis must now subtract the cost of deploying the network from these savings. 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 \$130, retail price).
- Each user “portion” of an access point (about \$600 list price, shared by 20 users) is \$30.
- Each access point requires a network switch port to plug into (about \$90 per port).
- The organization requires a primary and a backup access control server, used to authenticate users for security purposes, for the entire enterprise. Assume 1000 employees for simplicity, which translates into about \$12 per user.
- Installation per access point takes two hours at the average rate, including pulling Ethernet cable (about \$10 per user).
- Assume the equipment is used for three years.

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

Wireless NIC:	\$130
Access point (per-user portion):	30
Ethernet switch port:	90
Authentication (per-user portion):	12
Installation (per-user portion):	10
	\$272 total cost
Divided by 3, for 3-year amortization:	\$91 cost per user, per year, for three years
Per-user cost subtracted from per-user calculated savings, above:	\$3500 – 91
Net Savings	
Total per-user savings per year:	\$3409

Accomplishing Real Work in Meetings

The average professional spends as much as 48.8 hours a month in meetings, according to a 20-year study of 1800 corporate managers conducted by Roger K. Mosvick, a professor of communication studies at Macalester College in St. Paul, Minnesota. Mosvick, who is also president of Mosvick and Associates, a management communication consulting firm, calculates that badly run meetings cost businesses nearly \$100 million a year in lost or wasted time.

Other industry studies indicate that as much as 50 percent of meeting time is wasted because meetings often don't start on time and information necessary for making a group decision is inaccessible to meeting participants. For example, meeting attendees might schedule an hour or two for a collaborative session only to discover after 15 minutes that they all need to go back to their desks to gather the proper data required to make the meeting productive. This means another meeting must be scheduled. Sound familiar?

In the long-term, these situations can affect competitiveness and, ultimately, degrade customer loyalty and retention.

In contrast, when users and meeting rooms have wireless connections to corporate resources and the Internet, real work can be accomplished dynamically because all a user's tools and data are readily available. WLAN technology can reduce group decision making time, thus adding a boost to the productivity of an organization.

Minding the Budget

Organizations feeling today's economic squeeze might consider WLANs and other mobility solutions a "nice to have" rather than a necessity.

Indeed, depending on the corporate culture of a given organization, not all employees will require extended access to the network because the majority of their time is spent at their corporate desktop. One way to gauge where to start is realizing that the more often highly paid knowledge workers are away from their desks, the stronger the business case becomes for deploying wireless technology. The payback is very rapid for this population of users, particularly those who must communicate regularly with key people within the organization and with customers and business partners.

Wireless networks, then, do not necessarily have to be deployed company-wide to be useful. For organizations not convinced of a widespread payback, it is prudent to outfit a highly mobile work-



group with wireless access in their laptops and deploy a few APs in key meeting rooms and common areas. The capital investment is very small, and companies can begin to determine whether the enhanced collaboration and communication productivity gains are significant enough to justify a wider scale deployment.

IP Communications

As mentioned, IP telephony is just one component of IP communications. Available when organizations run converged data and voice networks, IP telephony enables employees to log on to a phone anywhere on the corporate network and access their extension number, corporate dial plan, and calling features. To help workers manage and streamline these real-time calls, rules-based applications are available from Cisco that allow workers to specify how incoming calls should be managed; for example, to filter and redirect calls when they are in meetings.

Another component of IP communications is a productivity-enhancing capability called unified messaging. Unified messaging applications streamline workers' message management burden and increase responsiveness by sending all messages, regardless of format, into a worker's e-mail inbox.

The need to check messages in a variety of formats all day—e-mail, voice mail on multiple phones, faxes—can be a full-time job in itself. Collapsing all these messages into a single mailbox and allowing employees to retrieve those messages in the format convenient to them at a given time (for example "listening" to e-mail or "reading" voice mail) is a huge timesaver. The Radicati Group, Inc., a research firm in Palo Alto, California, for example, estimates that unified messaging generates 25 to 40 minutes of additional productivity per employee per day.



At Work Requirements and Cisco Solutions

What is needed to support locally mobile knowledge workers with WLAN and IP communications capabilities?

Wireless LANs

A basic WLAN consists of APs, which comprise the WLAN infrastructure, and a NIC for each user's laptop. The number of APs needed depends on the number of users to be supported and how broadly an organization wishes to provide WLAN coverage. In an office environment, a single Cisco AP covers a radius of about 130 feet at a speed of 11 Mbps.

In addition to the network hardware components, authentication and encryption are required for securing WLAN communications. These capabilities are embedded in the NIC, AP, and in a back-end wireless authentication server that uses the same protocol as the other components. The wireless server can be a Remote Authentication Dial-In User Service (RADIUS), Lightweight Directory Access Protocol (LDAP), or other server already in place to enforce user access rights. Or it can be a separate server that connects to these other servers specifically to enforce the access rights of wireless users.

Finally, a scalable system for configuring and managing the AP infrastructure is required as implementations expand.

The Cisco solutions to these WLAN requirements include the following:

- **Cisco Aironet® 1100 Series Access Point**
This IEEE 802.11b (11 Mbps) AP connects to the user's laptop across a radio access network on one side and to a wired LAN switch using Ethernet cabling on the other side. This product supports the Cisco IOS® Software features found in Cisco Ethernet LAN switches, including virtual LANs (VLANs) and quality-of-service (QoS) capabilities. Because a user connection does not have to travel an extra hop to the wired Ethernet switch for these services to be applied, wireless users benefit from a performance advantage.
- **Cisco Aironet 1200 Series Access Point**
This dual-band, dual-mode IEEE 802.11a/802.11b AP enables wireless user access to the wired corporate network regardless of which IEEE technology is supported by the laptop NIC. IEEE 802.11a is a newer WLAN standard that supports 54 Mbps network speeds. These multifunction APs designed by Cisco support new technologies as they become available, protecting an organization's WLAN infrastructure investment.

- **Cisco Aironet Wireless LAN Client Adapters**

Wireless NICs connect mobile users to the wired network infrastructure through secure radio connections using the Cisco Wireless Security Suite Solution.

- **Cisco Wireless Security Suite Solution**

Designed for use with Cisco Aironet APs and a range of client NICs, these products provide enterprise-class WLAN security using IEEE 802.1X-based authentication and significant enhancements to the IEEE 802.11 Wired Equivalent Privacy (WEP) encryption standard. The security algorithms defeat hijacked sessions and eavesdropping through mutual authentication of the user and the AP, as well as by rotating and refreshing encryption keys. The software supports several 802.1x authentication types, including Extensible Authentication Protocol (EAP) Cisco Extensible Authentication Protocol (LEAP), EAP-Transport Layer Security (EAP-TLS), and Protected EAP (PEAP).

- **Cisco Secure Access Control Server**

The Cisco Secure Access Control Server (ACS) is a back-end authentication, authorization, and accounting (AAA) server that centrally controls the access rights of wireless users and network administrators. Accounting services track and report on user network access behaviors and record remote access connections and device configuration changes.

- **CiscoWorks Wireless LAN Solution Engine**

The CiscoWorks Wireless LAN Solution Engine (WLSE) is a specialized management appliance that configures and manages up to 500 Cisco Aironet APs. The device resides in a central operations center and plugs into the wired corporate LAN. The appliance handles auto-discovery, initial configuration, and firmware updates across the WLAN infrastructure so that IT staff does not have to individually configure and manage APs.

IP Communications

To take advantage of IP communications, an organization must run a converged data and voice network. There are several configurations for deploying converged networks, but they all include at least one IP private branch exchange (PBX)—a special server, such as Cisco CallManager, running IP telephony software.

After data and voice become simply IP packets to be forwarded, applications that take advantage of this integration become available.

The components of this solution include IP PBX server software, IP phones (in the form an IP handset or PC client application software), unified messaging, and communications management software.

The Cisco solutions to these IP communications requirements include the following:

- **Cisco 7960 Series IP Phones**

These operate much like traditional handsets. Because these phones have a fixed IP address associated with each user in the IP telephony database in the IP PBX, they can be ported around the enterprise and plugged into any PC or Ethernet port with no moves, adds, or changes required. They have Extensible Markup Language (XML)-based screens, enabling users to move among geographical locations and “log on” to the corporate network using any phone port at a remote location.

- **Cisco CallManager Using Cisco IP SoftPhone**

IP telephony can be deployed using this Windows-based PC application as the worker’s corporate phone extension. Knowledge workers hopping between meetings during the day often prefer to carry their data and voice network access with them in the laptop, and use a headset to make IP telephony phone calls.

- **Cisco Emergency Responder**

This piece of software in Cisco CallManager IP PBXs is used to track a mobile user’s location for 911 or other emergency services. The CallManager IP PBX stores each user’s phone extension and associates it with a Layer 2 Media Access Control (MAC) address. Cisco Emergency Responder communicates with wired Cisco Ethernet switches, such as a Cisco Catalyst® switch, and determines which Cisco Catalyst port a given MAC address is currently using. It then updates the CallManager database in real time and updates the network service provider so that users can easily be located.

- **Cisco Unified Communications**

Cisco Unity™ Unified Messaging uses the worker’s traditional e-mail application interface, such as Microsoft Outlook or Microsoft Exchange. The Cisco Unity Bridge enables voice message interoperability between IP- and time-division multiplexing (TDM)-based voice-mail systems.

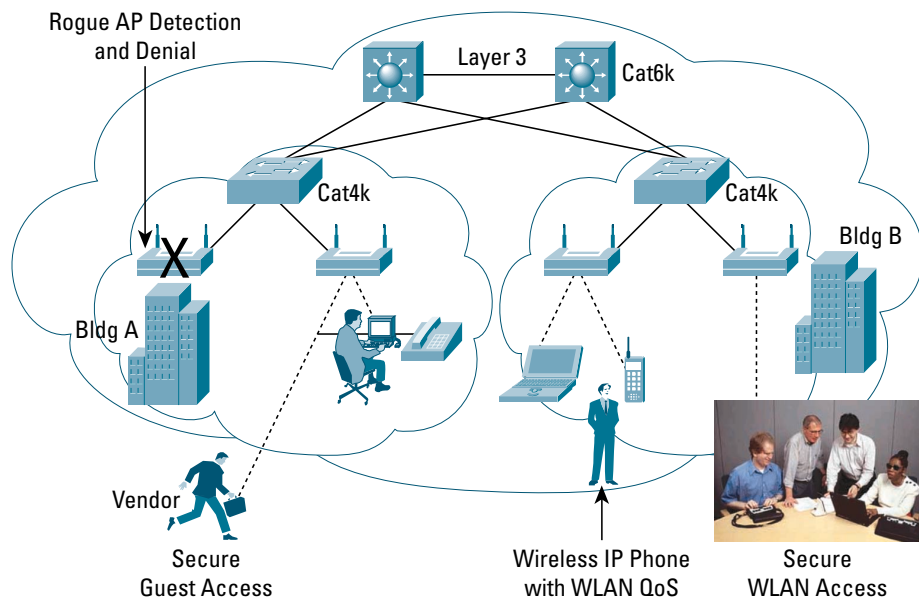
In addition, the Cisco Personal Assistant application enables rules-based routing of phone calls so that mobile users can choose to be interrupted only by certain critical callers, route other calls to voice mail, and allow callers the option of sending a page. It also enables voice-activated commands so that users can “dial” a call by speaking the intended recipient’s name or a phone number, rather than dialing. Figure 3 displays the Cisco At Work Solution.



The Cisco At Work Solution

Figure 3

The Cisco Mobile Office At Work solution extends the corporate network to employees moving around the work place increasing productivity, enhancing employee collaboration, and improving customer relationships.



Cisco Service and Support

Advanced Services

Cisco Advanced Services is a unified suite of professional engineering support offerings designed to assist customers in realizing business ROI through high-performance networking and enabled communications applications. Cisco Advanced Services offers a unique portfolio of complementary service components that span the continuum of device, network, and application.

Cisco provides individual technical support from its world-class engineers and technical staff members. This highly experienced team will be familiar with your operations, your network infrastructure, and the network's effect on your business. With this insight, Cisco will speed network restoration time and help you to continuously improve your operational efficiency and network productivity.

Taking advantage of Cisco networking expertise and industry-leading best practices enables you to effectively operate a high-performance, robust network infrastructure and to quickly deploy new technologies to meet your business needs and stay ahead of the competition.

Only Cisco Offers an End-to-End Solution

Workplace mobility solutions can be deployed at a pace that is comfortable for an organization. For example, those companies that have not yet deployed an integrated data and voice network would start with the WLAN access component, which can be deployed in pockets of the organization or enterprise-wide. Because forward- and backward-compatibility has been built into the Cisco Aironet WLAN product line, organizations are not penalized for implementing wireless extensions to their networks in stages.

As time passes and capital costs continue to plummet, enterprises will realize that there is a huge benefit associated with empowering locally mobile corporate workforces with both WLAN and IP communications capabilities. At that juncture, Cisco can provide the end-to-end capabilities required, from wireless network access with the highest level of security to the IP telephony infrastructure and associated converged applications that make IP telephony a profitable investment.

For more information about the Cisco At Work Solution, contact your Cisco representative or visit www.cisco.com/go/atwork.

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