Expanding the Productivity Zone to Home Offices
Cisco Solutions Extend Corporate Networks to Teleworkers

Today's businesses are challenged to accomplish more with less. Constrained budgets, reductions in headcount, and heightened competitive pressures are forcing them to find ways to improve organizational productivity, enhance collaboration, and respond to customers more quickly.

To accomplish these goals, enterprises are becoming creative at identifying ways to increase the output of their employees and extend the capabilities of existing assets. One strategy is to expand the productivity zone of human resources beyond the boundaries of the corporate desktop. Extending the capabilities of the corporate desktop to employees working at home or remotely provides personnel more flexible work options, enabling employees to remain productive and responsive from alternate locations and at unusual hours.

The maturation of broadband network and security technologies has enabled the expansion of the knowledge worker's productivity zone to home offices and remote locations. The availability of fast, secure, and inexpensive Internet-based access to corporate network resources has empowered companies to distribute their workforces to home locations, with the same access to productivity-enhancing network resources enjoyed by onsite workers.

With these technologies at their disposal, many companies are adjusting their business processes to include teleworking programs. Teleworking programs extend a company’s network infrastructure to reach remote and home-based workforces, enhancing employee productivity, satisfaction, and retention. Teleworkers include:

- Mobile/remote employees—Employees out of the office for most of their work hours conducting most of their business at customer locations or while traveling
- Full-time teleworkers—Employees who work from a fixed external site, most often their home
- Part-time teleworkers—Employees who telecommute a few days per week or part-time employees who work from home
- Day extenders—Employees who telecommute primarily in the evenings or on weekends to stretch their workday
- Others—Part-time teleworkers who telecommute because of a specific project or event
Expanding the employee productivity zone is fast becoming a competitive differentiator. For a very small incremental cost—a few dollars per worker per day—organizations can realize rapid payback on their investment. Part of this equation includes making sure that information technology (IT) departments have the tools they need to support remote-access workers with the same level of responsiveness they provide to onsite personnel.

Cisco Systems offers a comprehensive set of products to accommodate teleworkers and the IT departments that support them. This brochure examines the business case, costs, return on investment (ROI), and products that apply to the Cisco Mobile Office At Home teleworking solution.

**Business Benefits of Teleworking**

Teleworking improves employee productivity, reduces real-estate costs for employers, and improves employee satisfaction and retention.

The office-bound desktop, which consists of PC connections to the corporate data network and telephone connections to the voice network, is the area currently considered a worker’s primary productivity zone. Yet mainstream knowledge workers now spend less than 30 percent of their workday at their office desks, according to industry studies.

For the other 70 percent of the time, they are in meetings, working from home, or on the road. This population of users is seldom leveraging the significant investment made in the wired corporate network.

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**Figure 1: Distribution of U.S. Workforce**

About 21 percent of U.S. corporate workers can be categorized as full-time teleworkers, whether working from a fixed location or as mobile employees, according to Gartner Dataquest, Inc. Nearly 37 percent of U.S. corporate workers telework on a part-time basis under formal or informal teleworking programs.

![Diagram showing the distribution of U.S. workforce.](source: Gartner Dataquest (July 2002))
With teleworking programs in place, companies don’t necessarily “lose” a worker who must leave the office early for a doctor’s appointment or go home to care for a sick child. Instead of being totally cut off from work, employees with teleworking capabilities can still be productive for some number of hours after they are home.

In traffic-congested cities, workers might choose to change their office hours to avoid peak traffic times, and spend a few more hours working from their home workstations. With this flexibility, workers can stay linked to corporate communications and satisfy nonwork needs—while helping the organization be more productive and responsive.

These are among the reasons that teleworking is garnering support from both workers and management. The International Telework Association and Council, for example, reported that in 2001 there were more than 28 million teleworkers in the U.S. alone. According to Gartner, there will be 137 million teleworkers worldwide by the end of 2003.

Limitations of Existing Teleworking Solutions

Until recently, some companies have avoided formal teleworking programs because of the lack of IT tools needed to make such projects a success. Limited broadband access and secure solutions, for example, made connecting to the LAN when away from the office a significantly slower and more frustrating process—with added security risks—than when connecting directly to the LAN. Remote access was used as the exception, rather than the rule.

Now, however, highly reliable broadband connections, coupled with robust network security and remote-management tools, have paved the way for users to have nearly the same network experience when working from home as they do in the office. Remote configuration and management tools enable corporate IT departments to accommodate the remote-worker population much more easily than in the past. For example, software applications are available that allow IT staff to “push” standard security policies and configurations to home-office routers. This means that IT staff doesn’t have to configure routers one at a time or have users figure out configurations on their own.

In addition, security technologies such as IP Security (IPSec), with its robust encryption and authentication algorithms, have matured to the point where they are proven in their capability to protect user traffic as it traverses the public Internet. Encryption, authentication, and other important security technologies can now be relied upon to protect the integrity of remote-user sessions and they are readily available—often bundled directly into laptops and routers.

Real-World Snapshots

- Due to teleworking, Merrill Lynch reportedly saves US$5,000-$6,000 per person per year in real-estate costs.
- Compaq Computer has measured productivity increases as high as 45 percent that are directly attributable to teleworking.
According to Gartner, organizations should start addressing the remote installed base as though it were a new site with some unique requirements. The research firm also advises IT managers to prepare to embrace the changing nature of the labor force that they support.

**Meeting Organizational Goals**

Twenty years ago, few organizations anticipated a widespread need to extend the corporate network to worker homes. However, in today’s electronic business world, if workers must be in the office to remain connected to the corporate resources required to do their jobs, this severely hinders their performance—and, consequently, that of the organization.

Empowering increasingly mobile workers with access to the same resources and communications capabilities that they have while sitting at an office desk, then, is desirable for meeting a number of organizational goals:

- Enhances remote worker productivity. In a survey conducted by Kensington Technology Group, 75 percent of full- and part-time teleworkers polled felt they accomplished 30 percent more in the same amount of time when they worked from home. In addition, using teleworking as a day extender enables workers at home for part of the day to still get some work done.

- Accelerates employee responsiveness to customers, partners, and colleagues by supplying employees with the appropriate information and communications tools when they are away from their desks.

- Leverages and extends the capabilities of an organization’s existing technology investments in laptops, data and voice networks, and applications.

- Enables business continuity in the event of a disaster or other type of outage in primary work sites. If a primary office space becomes unavailable, for example, enabling workers to continue being productive in an alternate location such as a home office or remote site prevents business from grinding to a halt.

- Enhances employee satisfaction and retention as employees seek to balance work and home life.

- Reduces facilities and real-estate costs. Teleworkers can share workstations in the corporate office.

Teleworking has also been encouraged by government agencies for many years as a means to significantly decrease pollution and traffic congestion.

**Doing the Teleworker Math**

Extending that knowledge worker’s access from the office to the home represents an incremental cost of about $840 in the first year. The example below demonstrates the cost savings companies realize from teleworking programs:

For 10,000 part-time teleworkers:

$1320 current cost to support teleworker before converged IP/data solution

$70 for network access per month per teleworker

$40 for phone charges per month per teleworker

$840 cost for network access per year per teleworker

($840–$1320) per year x 10,000 = $4.8 million

Total yearly emission reduction credit (ERC) value: $4,156,774 (tax credit for reducing emissions)

Reclaimed commuting time: 1 hour per day

Assume an average total compensation per employee of $70 per hour: $75.6 million

Total = $84.5 million savings per year

or: $8450 per year per person

**Cisco At Home Requirements and Solutions**

Broadband Internet connectivity and network security technology are the primary components of the Cisco Mobile Office At Home teleworking solution. Broadband connections can be in the form of digital subscriber line (DSL) or cable modem services.

“Enterprises adopting teleworking programs have reported decreases in employee absenteeism, double-digit productivity increases, and higher employee retention.”

—The Robert Frances Group
An important component of security technology for use with Internet connectivity is a virtual private network (VPN). Although the employee shares a wide-area network (WAN) connection with many other users, VPN technology creates a “tunnel” for that worker’s traffic, segregating it from other traffic to keep it private. This can be achieved using IPSec or other encryption technology embedded in router software, hardware router add-ons, or specialized appliances. Firewall filtering and intrusion and virus protection are other important functions when a home user is communicating with a corporate site over the public Internet.

IP telephony is also emerging as a major contributor to ROI in companies running a converged data and voice network. There is enormous potential for savings in voice usage charges when remote workers use the corporate network to make on-net and off-net phone calls rather than traditional phone services that have higher per-minute usage rates.

In addition, wireless LAN technology can enhance the home worker’s work experience in the same way that it does within the corporate setting.

Cisco offers several solutions that address these requirements and can automate the configuration of remote equipment and security settings. Using these solutions, implementing and managing a teleworking environment does not become an all-encompassing IT project.

### Realizing Real Results

#### Real-Estate Financial Benefits

- **Merrill Lynch**—$5000–$6000 savings per person in real-estate costs
- **Nortel**—One-time real estate savings of $61M
- **AT&T**—Saving $500M since 1995, reduced office space by 50 percent
- **Pacific Bell**—Saved $20M over five years
- **Georgia Power**—Saving $100,000 per year, reduced space by two thirds

#### Increased Productivity

- **Accenture (Illinois)**—Reported 25 percent productivity increase
- **Siemens**—15 percent productivity increase, and time lost to bad weather was virtually eliminated
- **BellSouth**—13–30 percent worker productivity increase

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### Broadband Internet Connectivity

The fast proliferating availability of broadband DSL and cable modem Internet access services has been a boon to the development of formal teleworking programs. These networks’ fast speeds are comparable to those on the corporate LAN.

Broadband Internet access requires some type of access device in the user’s home. Options include home routers, DSL modems, and cable modems. What each employee uses is often dependent on the type of service in place and the choices the employee’s Internet service provider (ISP) makes available. In addition, Cisco offers a “universal” access alternative with Cisco 830 Series routers, Cisco PIX, 501 firewalls, and Cisco VPN 3002 hardware clients.

Cisco solutions for secure teleworking with broadband access are aligned with the infrastructure of your organization. There are three categories:

1. **Secure access terminated on a Cisco PIX Firewall**

   This solution uses a Cisco PIX corporate firewall to terminate the VPN connection. The preferred device for this configuration is the Cisco PIX 501 Firewall customer premises equipment (CPE), although a Cisco PIX 506 Firewall can be used if greater throughput is required.

2. **Secure access terminated on a VPN 3000 class aggregator**

   The Cisco VPN 3000 Series line of concentrators is a proven enterprise-class VPN system that scales to a very large number of users. The Cisco VPN 3002 is a CPE device that is easy to configure and manage; it can be thought of as an appliance rather than a router.

3. **Secure access with voice and video VPN (V3PN) services on a Cisco IOS Software device**

   Cisco offers hardware VPN acceleration for nearly all the low-to-midrange Cisco IOS Software-based routers. This results in a system that can be very flexible and scales well. Cisco 830 Series routers are optimal for connecting from the teleworker office to the corporate network. These routers have all the advantages of a Cisco IOS device and include hardware acceleration for encryption and the ability to be managed via the Cisco IE2100 appliance. Furthermore, they have full support for V3PN to enable best-effort, secure telephony now—and mesh easily with service provider quality of service (QoS) later.

The Cisco 837 ADSL Broadband Router can be connected directly to DSL service and act as an all-in-one telework access device. The Cisco 831 Ethernet Broadband Router can connect to a broadband modem, such as a DSL or cable modem, using an Ethernet port. An enterprise can standardize on this device for use by nearly all teleworking professionals, regardless of what type of Internet access service they are using.
Security—Encryption, Firewalls, Intrusion Protection

Network security is necessary to protect corporate data and voice sessions when Cisco Mobile Office At Home workers connect to their companies over a public Internet link. Cisco provides these capabilities in several form factors, giving organizations many deployment choices, including Cisco IOS Software for the router, specialized router cards, standalone VPN appliances, and PC software.

The Cisco solutions for network security requirements include:

• **Router-based security**—Cisco provides routers that connect the user’s laptop to the Internet while also performing VPN encryption and other security functions. These capabilities can be run in Cisco IOS Software or in specialized router blades. For both protecting and prioritizing voice conversations, Cisco IOS Software enforces QoS classifications despite the fact that IPSec is encrypting packets, including the classification markings (see the “IP Telephony” section in this document).

• **Cisco VPN 3002 Hardware Client**—This is a standalone security appliance that can be connected to a router or modem at the user’s home. It supports IPSec encryption, network address translation (NAT), and Network Address Port Translation (NAPT). Generally, specialized security appliances offer a performance advantage over security capabilities integrated into router or laptop software. The Cisco VPN 3002 Hardware Client must connect to a VPN device at corporate headquarters, such as the Cisco VPN 3000 Concentrator or a high-end Cisco PIX Firewall.

• **Cisco PIX 501 Firewall**—The Cisco PIX Firewall is a high-performance, stateful firewall appliance designed for small sites that also supports IPSec encryption. Like the VPN appliance described above, the Cisco PIX Firewall works with a low-end router or modem at the user’s home. This appliance provides up to 10 Mbps of firewall throughput and 3 Mbps of 3DES encryption throughput.

• **Cisco IPSec VPN Client Software**—On the client side, Cisco hardware and software VPN clients enable teleworkers to establish secure, end-to-end encrypted tunnels to corporate network resources where an integrated solution is not available. The thin-design software client can be preconfigured for mass deployments and easy initial logins. It is ideal for teleworkers who also need mobile connectivity, and it supports a variety of operating systems, including Microsoft Windows 98 and later; Apple MacOS versions 10, 9, and 8; Sun Solaris; and Intel Linux.

• **Cisco Easy VPN**—This configuration and deployment tool feature centralizes VPN management across all Cisco Mobile Office At Home VPN devices, including all the components mentioned above—reducing the complexity, cost, and time associated with VPN deployments for corporate IT departments. IT staff can push policies and updates to all remote security devices in a single upgrade effort.
IP Telephony

In addition to having access to corporate data, electronic mail, and other corporate applications from home, part of a full-service teleworking setup includes an extension to the corporate telephone system. As noted, many organizations are beginning to blend data and voice calls onto the corporate data network using IP telephony. Teleworkers, like employees moving about the corporation, can be available at their corporate IP Telephony extension, paring down the number of phone numbers that colleagues and customers must have on file for them.

The potential for savings in toll charges is substantial when remote workers use the corporate network to make phone calls. They are taking advantage of the telephony volume discounts negotiated by their organizations, rather than using their own phone services at higher per-minute usage rates. Using the corporate IP network for phone calls also eliminates the filing and processing of expense reports for off-net toll charges incurred by remote workers.

There are three scenarios for At Home voice deployments—best effort, best effort with QoS at either end, or full QoS in concert with a service provider. Cisco is currently working with leading service providers to enable end-to-end QoS, but the most common mode of deployment today is best effort with QoS. It generally provides voice quality between that of a cell phone and a normal IP phone.

Cisco At Home solutions to IP Telephony requirements include the following:

- **Cisco 7900 Series IP phones**—These phones extend the full capability of the Cisco enterprise telephony infrastructure into the home office. Integrated with existing IP phone systems or PBXs, the Cisco IP Phone provides the corporate dial plan and the message waiting light for voice mail. This is advantageous in situations where complete function transparency is required for the user. These phones are also useful in deployments that require full phone service when the PC is off.

- **Cisco ATA 18x Series IP Analog Gateways**—Cisco ATA devices support two basic analog telephone connections, allowing users to use analog phones and fax machines. This low-cost solution is ideal for teleworkers that require more than one phone line and have no need for the rich application environment provided by Cisco 7900 Series IP phones.

- **Cisco IP SoftPhone**—In Cisco Mobile Office At Home environments, IP Telephony can be deployed using the Cisco IP SoftPhone—a Windows-based PC application—as the worker’s corporate phone extension. Workers literally take their IP Telephony extensions with them (based on IP address), so they can make and receive calls as if they were in the office connected to the corporate network. Associated Cisco applications—Cisco Unified Communications and Cisco Personal Assistant—offer IP Telephony enhancements for message management by integrating with corporate directories.

- **V3PN**—The Voice, Video, and VPN (V3PN) feature combines the security and QoS required for voice traffic. Using V3PN, QoS markings that enable high-performance, real-time voice and video conversations are maintained across an encrypted session so that latency-sensitive packets can continue to receive top priority. This feature is supported in Cisco routers that run Cisco IOS Software.
Wireless LANs
While not a necessity in a teleworking environment, companies that have deployed wireless LAN (WLAN) technology in their corporate campuses need only to install an additional wireless access point in a worker’s home to enable the same mobility around the home that the user enjoys in a corporate campus environment.

Cisco Mobile Office At Home WLAN solutions include the Cisco Aironet® family of access points and client adapter cards. Together, these components enable workers to unplug their laptops and work wirelessly, while connected to the network, anywhere within 150 feet of the access point.

The WLAN investment can also extend the corporate network to other mobile users. Workers with wireless client adapters can use them when on the corporate campus (when in meeting rooms, for example). In addition, traveling employees can use them when in public WLAN service areas in airports, convention centers, hotels, and other locations to connect to the Internet and the corporate network.

Figure 2: The Cisco Mobile Office At Home Solution
VPNs provide tremendous cost savings by enabling remote workers to securely share the use of high-speed public networks using encrypted tunnels.
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
Shifting to a teleworking model can increase employee productivity and retention, use remote human resource pools, and decrease worker absenteeism. Decentralized, cross-functional teams require Cisco Mobile Office At Home teleworking solutions to connect, communicate, and coordinate their efforts worldwide—from home.

By focusing on customer satisfaction and technology innovation, Cisco has become the worldwide leader in networking for the Internet. In the teleworking market, Cisco stands out as the only provider offering an end-to-end solution that easily and securely extends the existing wired infrastructure. Working closely with service providers and systems integrators, businesses can build a teleworking solution that gives them a new competitive advantage in the way they conduct business.

For more information about the Cisco Mobile Office At Home teleworking solution, contact your Cisco representative or visit: http://www.cisco.com/go/athome