# Enterprise Telework Guide

**By Mark Goldstein**

**International Research Center**

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# Cox Business Services Enterprise Telework Guide

**Hy-Life** is a new approach to telework, a new hybrid lifestyle that lets employers and their employees achieve a healthy balance between work and personal time. Broadband connectivity has changed how, where, and when Americans work and play. With the help of broadband, Hy-Life moves the work to the workers and offers the technology to do it productively, easily and securely. Today, more enterprises are embracing the Hy-Life for their business and for their employees.

This **Enterprise Telework Guide** is intended to provide background and technical knowledge to aid the enterprise in evaluating and implementing telework programs. It can also aid the teleworker in equipping, connecting, and using the tools and applications necessary to support their remote work activity. The guide can also be found in its entirety on the web at the **Cox Business Services Hy-Life Site** (http://www.hy-life.com/) optimized for online use. A process of review, revision, and renewal will be undertaken to keep the material fresh and up-to-date. Please communicate your feedback, corrections, and suggestions to us at the address below.

## Written by:

## Mark Goldstein, International Research Center

PO Box 825, Tempe, AZ 85280-0825, Voice & Fax: (602) 470-0389,

E-mail: markg@researchedge.com, URL: http://www.researchedge.com/

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## Cox Business Services, LLC, An Affiliate of Cox Communications, Inc.

1400 Lake Hearn Drive, Atlanta, GA 30319

URL: http://www.coxbusiness.com/

## Contact:

## Bobby Amirshahi, Director of Media Relations, Cox Business Services

Voice: 404-843-7872, E-mail: bobby.amirshahi@cox.com

# Cox Business Services
# Enterprise Telework Guide

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# Telework Whys and Wherefores

## Executive Summary:

> In a country that has been moaning about low productivity and searching for new ways to increase it, the single most anti-productive thing we do is to ship millions of workers back and forth across the landscape every morning and evening.
>
> <p align="center">Alvin Toffler, Futurist and Author (http://www.toffler.com/)</p>

In the past several years, telecommuting and the broader concept of telework have become increasingly popular and more broadly adopted to enable knowledge workers to better serve within their modern enterprises. Advances in computer technology and telecommunications now enable employees to work part or full-time from home as well as from satellite offices, special telebusiness centers, or from the road. In doing so, telework resoundingly delivers as an important solution to cut down on air pollution by reducing the number of trips we need to take to and from our jobs and other work-related travel. It also yields numerous other benefits in improved employee productivity, satisfaction, and retention while contributing to more efficient and secure operations, reducing costs, and improving bottom-line results. These and other benefits serve the employee as well as employers, the community, and the environment alike. This guide will concentrate on the business strategy of telework including cost-benefit analysis, the enabling policies and procedures, planning for the Information Technology infrastructure to support working remotely, and getting the teleworker setup and going. It will detail the enterprise processes and support as well as the equipment and telecommunications connectivity necessary to support the teleworker operating from home and remote work locations connecting to the office, other people, and the world at large.

Certainly some types of jobs, such as where the individual largely works alone, can communicate electronically or hands off work products as electronic files are particularly suitable for telework Many of today's jobs readily lend themselves to performance from remote sites, as knowledge worker can communicate and collaborate with co-workers and customers independent of their location. This is due to advances in computer equipment, enterprise networking, and telecommunications services with increasing broadband availability. There are however a variety of issues that are of concern in this process. Employers may need changes in management philosophy to manage by objectives rather than observation, to manage projects and deliverables rather than by physical observation. There may be start-up and operating costs as well as legal and regulatory issues to consider. The enterprise's Information Technology (IT) service group will need to evaluate their current computer use and networks and possible enhance their external remote accessibility while augmenting security procedures. The implementing departments or finance staff may well want to perform a formal Return on Investment (ROI) analysis of any incremental costs for implementing and supporting remote work and access so as to build the business case supporting the necessary enterprise investments in telework.

This guide will serve as a starting point for management as well as Human Resources (HR) and Information Technology (IT) staff in planning for and implementing a successful telework program. It can also help the employee beginning to telework to get organizational buy-in and then get properly equipped, set up, and under way. There are sections for each group covering the necessary background, concerns, and solutions. Additionally, there are extensive references and pointers to additional resources, organizations, publications, and web sites that can help you further define your telework potential, goals, and needs aiding your success in reaching your objectives.

# Telework Benefits to Employees, Employers, and the Community

## Employees Benefit by:

- Reduced commuting time, expense, and travel risks

- Reduced stress and positive health impacts

- More flexible integration of work and family schedules

- Enabling them to work at their most creative and productive times

- Increased job satisfaction and longevity

- Improved work environment with reduced distractions and interruptions

- Decreased cost of food, clothing, and related expenses

## Employers Benefit by:

- Improved employee morale and job satisfaction

- Increased productivity with fewer distractions and interruptions

- Decreased employee absenteeism and improved retention

- Decreased real estate and overhead costs

- Aids as a recruitment tool, especially for knowledge workers

- Expanded labor pool for part-time, at home, and disabled workers

- Improved managerial techniques and job performance metrics

- Helps meet trip reduction goals and other government regulations

- Supports enterprise image as environmentally and employee-friendly

- Enterprise decentralization and diversification for business continuity planning

## The Community Benefits by:

- Decreased use of transportation infrastructure and overall transportation costs

- Decreased peak-hour traffic congestion and accidents

- Reduced pollution for cleaner air and other environmental and health benefits

- Reduced fuel consumption and dependence on foreign oil

- Increased neighborhood security and sense of community

# Top Benefits of Teleworking

| | |
|---|---|
| Improved productivity | 70% |
| More time with family | 61% |
| Increased loyalty to employer | 52% |
| Helping the environment | 50% |

0%　20%　40%　60%　80%　100%

**Percent of teleworkers agreeing or strongly agreeing with statement**
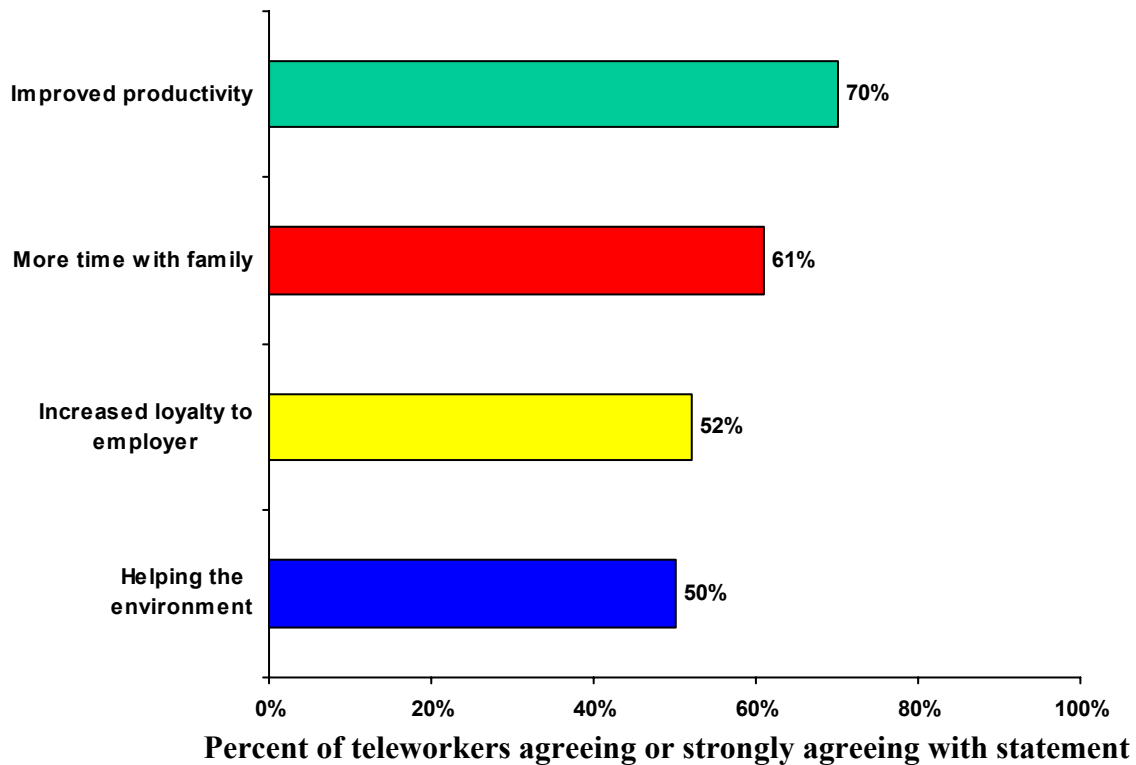
Source:  Opinion Research Corporation for Cox Business Services, April 2003

# Essential Requirements for an Ideal Teleworking Arrangement

| | |
|---|---|
| High-speed or broadband Internet connection | 51% |
| Dedicated work space | 40% |
| Wireless phone | 26% |
| Dedicated business phone line | 18% |
| Wireless Internet connection | 12% |
| Don't Know None of these | 12% |
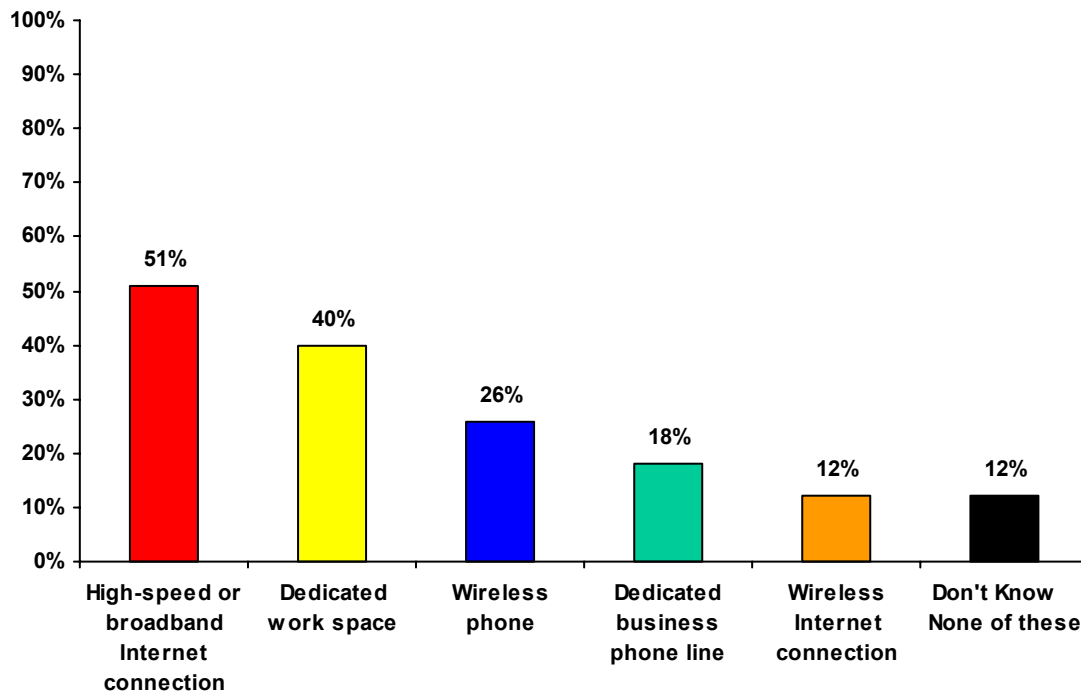
Source:  Opinion Research Corporation for Cox Business Services, April 2003

# Telework History and Trends:

For probably as long as business people have had paperwork to deal with, they have been bringing some of it home to work on at their leisure, perhaps sometimes at the expense of their leisure. But as technology has become increasingly essential to the workplace and our personal lives, it has become ever easier to work from home and remote sites, staying in touch with co-workers and others via advanced telephony services, computer networking, e-mail, and various collaborative tools. Jack Nilles of Jala International (http://www.jala.com/) is said to have invented both the terms "telecommuting" and "teleworking" back in the early seventies during an early pilot telecommuting project and today defines these terms as follows:

> **Telework:** Any form of substitution of information technologies (such as telecommunications and/or computers) for normal work-related travel; moving the work to the workers instead of moving the workers to work.

> **Telecommuting:** Periodic work out of the principal office, one or more days per week, either at home, a client's site, or in a telework center; the partial or total substitution of information technologies for the commute to work. The emphasis here is on *reduction or elimination of the daily commute* to and from the workplace. Telecommuting is a form of teleworking.

As telework comes to embrace not only part-time work from home but also full-time off-site officing as well as other varied forms such as use of satellite offices, reliance on field and mobile workers, and employees traveling on business, we continue to expand and evolve our definition accordingly. The International Telework Association and Council (ITAC- http://www.workingfromanywhere.org/) has found that the number of employees who telework in the United States had increased to 28.8 million or approximately one in five employees, for a jump of almost 17%, during the past year. Most work on the road (24.1%) or from home (21.7%), while a smaller percentage works at telework centers (7.5 %) or at satellite offices (4.2%). Most do multiple forms of teleworking, with more than 42.4% saying they combine working at home with some other form of teleworking. Broadband access demonstrably boosts teleworker productivity, saving employers more than $5,000 every year, with some 35% of broadband teleworkers have broadband paid for by their employers. Also, having broadband connectivity dramatically increases use of technologies like home networking and correlates to better information security practices. Further ITAC found that an overwhelming majority of these teleworkers are more satisfied with their jobs and feel more loyal to their employers.

Cox Business Services recently commissioned Opinion Research Corporation to conduct a major survey on Teleworking in America finding that over one quarter (27%) of the U.S. adult employed population are teleworkers. The majority of them (75%) are Remote Teleworkers who check their e-mail and do work outside the office under less structured teleworking arrangements while 25% of them are Dedicated Teleworkers working a dedicated work schedule from a home office with equipment provided by their employer. Just over half (51%) of all teleworkers cite a high-speed or broadband Internet connection as an essential requirement for an ideal teleworking environment. Seventy percent of teleworkers and 66% of their managers believe that teleworking improves employee productivity.

In-Stat/MDR (http://www.instat.com/), a major high-tech market research firm, reports there are now more than 87 million remote and mobile workers in the U.S., including frequent business travelers who spend 20% or more of the work year traveling, as well as telecommuters, day-extenders, multi-site workers, non-office workers, and mobile and remote office workers. Some 42 million of these remote and mobile workers are considered to be telecommuters in the classic sense, including day extenders. Providing workers with remote access to business applications and the Internet will thus become key priorities for U.S. businesses leading to a significant rise in demand for Internet and wireless-accessible hosted applications and services.

Information Technology (IT) has proven itself essential to the evolution of the modern enterprise and a great enabler of increased productivity as well as the ability to proactively engage and appropriately react to complex and demanding global markets. Today's knowledge workers, assisted by advanced computer applications and broadband connectivity, are increasingly mobile and regularly working from home and other remote locations. Recent events have lead to an increased focus on enterprise security and the ability to continue operations under varied circumstances, which telework serves well by diversifying the geographic spread and flexibility of the workforce and your sustaining capabilities. So plan well, implement smart, and go forth and telework, but don't forget to enjoy the ride.

## Telecommuters in U.S. Businesses 2001-2006 (in Millions)
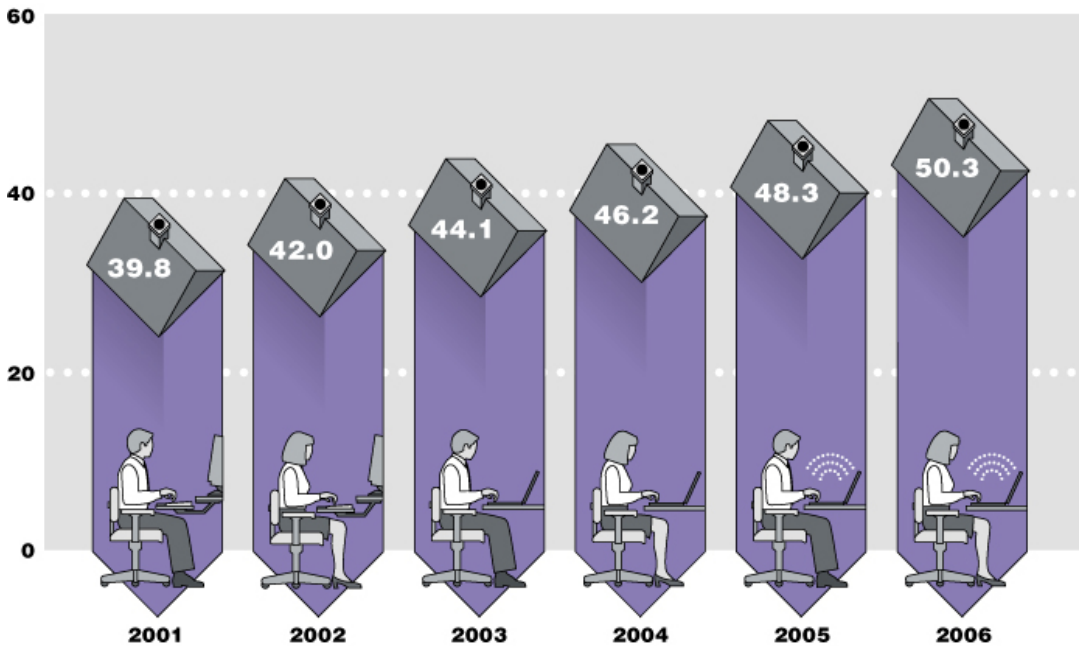


## Remote and Mobile Workers in U.S. Businesses 2001-2006 (in Millions)



(Source: In-Stat/MDR, http://www.instat.com/)
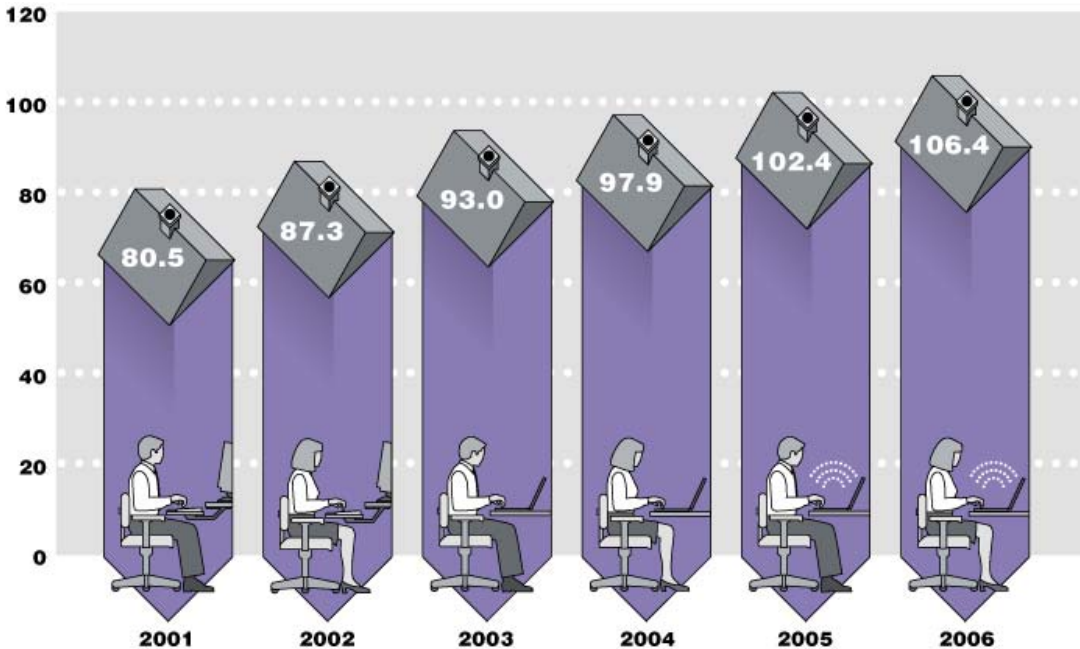
# Enterprise Responsibility within the Community:

There are a variety of federal, state, and possibly local regulations that all employers over certain sizes are usually bound to meet or that require the establishment of specific enterprise programs.  In particular, state and local government may mandate enterprise action to reduce the miles traveled by their employees commuting to work so as to reduce air pollution and the strain on transportation infrastructure.  These goals can best be met by integrating a strong telework component to augment other trip reduction initiatives, such as encouraging car-pooling and the use of public transportation.

Please check with your state, county and municipal governments for telework related regulations and available support programs.  In many instances government agencies will provide direct assistance in reviewing your telework prospects and recommending specific solutions and programs to participate in.  They can refer you to local service providers and may even have specific business incentives, grants or free consulting services available to help you get started.  Explore the resources and programs available in your area and make telework an important component within your organization to help reduce employee travel and meet government mandates while accruing a host of other benefits.

Enterprises adopting telework programs and promoting them to their workforce not only realize substantial benefits to themselves and their employees as detailed earlier, they also appear as good corporate citizens, acting in the best interests of the community they and their employees reside in.  Such initiatives lend to perceptions that the enterprise is forward thinking, concerned with the well-being of their employees, and proactive in dealing with environmental issues.  Strong enterprise telework programs are likely to be lauded by public agencies and reported on favorably in the press.

# Telework's Return on Information:

Implementing and supporting a telework program certainly will have specific costs associated with it and can utilize significant resources for capital equipment, software licensing, outside services, and internal support.  However, telework also delivers significant quantifiable benefits that usually provide a positive Return on Investment (ROI) and more often than not, a compelling business case.  Many of the enabling technologies and support mechanisms for teleworkers may already be in place in your organization, driven by other enterprise needs to evolve and maintain a modern IT environment and support customary work activity and processes.  Thus any incremental investments for telework may be quite modest considering your already substantial investments in enterprise computing and connectivity.  Depending on how your enterprise budgets and plans for its IT investments, formal calculations and business case justifications may need to accompany any internal funding proposals, so let's further explore the costs and benefits for establishing and maintaining a telework program.

The modern enterprise already commonly communicates and operates across an extensive internal network of desktop computers and other IT resources which are connected to the outside world by telecommunications services to support the work environment, document flow, and collaborative activity.  To the extent that these capabilities are already in place and integrated to an organization's operations, the accompanying major investment in capital, resources, and services will readily lend themselves to enabling your teleworkers for their home-based and mobile work.  And selectively outsourcing to address these issues is increasingly simplifying corporate IT support through the use of Application Service Providers (ASPs) and Managed Service Providers (MSPs), which we'll review in more detail in the section **Information Technology and Telework** later on.  All these costs can be rolled into a Total Cost of Ownership (TCO) for technology and services to support teleworkers.

# Go Figure:

First and foremost in considering your Return on Investment (ROI), there are significant benefits your organization will likely experience from implementing telework in reducing both employee absenteeism and turnover. Human Resources (HR) can certainly track specific metrics for these and relate improving trends to the availability and use of telework across your organization. Employee satisfaction surveys and other feedback should be used to both review and refine your telework program, but also to measure its impact on employee's attitudes and actions. Further, employee productivity has been shown to increase, sometimes dramatically, with the introduction of telework within an organization. As suggested in the next section, supervisors and their direct reports need to develop and agree upon productivity, deliverables, and metrics so that progress can be tracked and any issues identified and resolved. HR and financial staff probably already have well-developed ROI models in place that such factors as improved productivity and employee retention can be plugged into, so savings can be recognized and properly projected within any costs-benefit analysis.

Telework may help improve various business processes and aid operational efficiency. Also, you may find that your enterprise can deliver better customer service with attendant higher sales and customer retention as well as lower cost of sales or other quantifiable positives to your top-line and bottom-line revenue. Allowing your employees to work remotely can have a significant impact on your real estate costs, reducing the actual need for facilities and office space, as well as lowering various related costs for utilities, parking, furniture, consumables, and so on. Teleconferencing that supplants expensive travel can show an immediate ROI and improved IT security measures will aid risk management efforts thus yielding substantial quantifiable value. Government and other programs that supply tax credits, grants, and incentives may serve to further offset any incremental costs and make the justification of your telework program even more compelling. Also there may be fines or other negative financial impacts if your organization can't comply with various government mandates.

Much of the necessary Information Technology (IT) infrastructure for office computing and connectivity will already be in place to support customary on-site work activity and processes, along with the technical support for your knowledge workers. Additional expenses may include upgrades to hardware, software, networks, and connectivity at the organization's offices and the possible growth in IT support services. For example, servers and routers may have to be added to the network, new security measures put in place, and software licensed for additional seats or devices. To enable the home and remote worker, the enterprise may provide hardware for use outside their facilities such as mobile phones and data devices, home PCs and peripherals, associated software applications, as well as perhaps additional phone lines and broadband connectivity to best integrate the various work sites together. Employees may require additional training to operate equipment and software applications away from their primary office and may consume additional help desk and support resources. Such hard costs may be readily determined and used in your ROI model.

The specifics of how your organization plans for new initiatives, budgets for expenses, and justifies such investments will determine how formal a Return on Investment model you should use and what factors will be included. Additionally, soft ROI benefits or the more intangible positive results of telework may be recognized by your enterprise and thus utilized in your calculations and justification as appropriate. In **Appendix A - Where to Learn More about Telework** you'll find organizations such as the International Telework Association and Council (http://www.workingfromanywhere.org/) and American Telecommuting Association (ATA - http://www.knowledgetree.com/ata.html) who offer planning and analysis tools. You'll also find a bibliography and pointers to a wealth of other helpful resources there to help you further explore telework and find out all you need to get going.

# Telework Policies and Procedures: Enabling and Managing Telework

There are many reasons why telework is an idea whose time has come.  As we have shown, when done right there are numerous advantages to the employee, the organization, and the community.  However, successful telework programs require management support, implementation planning, enabling policies and procedures, commitment of some organizational resources, and ongoing support. Management need recognize and advocate the valuable role of telework in the enterprise, Information Technology (IT) then provides and supports the computing and communications environment, and Human Resources (HR) puts enabling policies and procedures in place, working with supervisors and employees alike to aid in the success of these initiatives.  In this section we'll review some of the basic issues and guidelines for developing and implementing good telework policies and procedures.

## Tasks and Jobs That Telework Well:

Today's knowledge workers are typically employing computers and telecommunications to do their job already and their customary work tasks are increasingly accomplished electronically or otherwise assisted by various technologies.  Their jobs are particularly well suited to a mix of on-site presence along with remote and telework activity.  And if they are mobile workers where their jobs involve some fair amount of business travel locally or away from home, the same enabling technologies and support mechanisms for home and remote facility telework will serve them well as they travel.

Review general job categories and functions analyze the tasks customarily performed, interaction with other workers and externally, the usual deliverables, as well as processes and workflow.  Some of the great varieties of jobs within the enterprise suitable for teleworking include:

| | | |
|---|---|---|
| Writers | Catalog Sales | Executives |
| Journalists | Telemarketers | Managers |
| Editors | Travel Agents | Salespeople |
| Copywriters | Medical Billing | Knowledge Workers |
| Translators | Insurance Agents | Contract Professionals |
| | Claims Processors | |
| Inventors | Customer Service | Accountants |
| Engineers | Representatives | Financial Analysts |
| Programmers | | Purchasing Agents |
| Systems Analysts | Help Desk | Stockbrokers |
| Help Desk Personnel | Call Center | |
| IT Support Personnel | Data Entry | Desktop Publishers |
| Field Service Representatives | Word Processing | Graphic Artists and Designers |
| | Telephone Operators | Architectural Design |
| Information Brokers | | Computer Aided Design (CAD) |
| Market Researchers | Trainers | Public Relations Practitioner |
| Investment Analysts | Training Development | |

These jobs and many others are primarily knowledge work and as such lend themselves to teleworking part-time or full-time.  Generally, telework should be able to be done on one's own or in collaboration as enabled by telecommunications and not require face-to-face interaction with customers and visitors

# Knowledge Workers and Their Tasks in the Modern Enterprise



(Source: International Research Center, http://www.researchedge.com/)

such as a receptionist or sales clerk or medical practitioner. And though paperwork can certainly be taken home to work on, one's work processes should not generally require too frequent hand-offs of such paperwork so as to be inconvenient to pick up and drop off or to affect the timely flow of enterprise documents. High-End knowledge workers have a high level of interdependence with other workers and strategic partners, thus benefit the most from collaborative tools and the enabling of remote work capabilities. In turn, they tend to contribute greatly to innovation and value creation within the enterprise. Investing in their productivity and effectiveness can reap significant benefits.

## Successful Teleworker Characteristics:

Just as there are characteristics of jobs that lend themselves to successful telework, there are individual characteristics that are helpful or even essential for an employee to likely succeed as a teleworker. First and foremost, the individual should be committed to teleworking, having come to view it as beneficial to both them and their employer, and convinced that they will enjoy some personal pluses in job satisfaction and in their home life as a result. Those allowed to telework should also be self-motivated and responsible, well organized, and able to work independently with minimal supervision to meet expectations and performance goals. They should certainly already be knowledgeable in the enterprise's procedures, organizational structure and dynamics, as well as their own job responsibilities and necessary resources. Then if they are also results oriented, able to operate effectively away from the social aspects and support structures of the office, and can communicate effectively with their supervisor and coworkers, they have the makings of a successful teleworker.

The teleworker should already be familiar with the kind of equipment on which their remote work will depend and perhaps already have a home workspace in place or at least in mind. Certainly they must carefully consider their home environment in terms of the placement and layout of where they will do their work, how the necessary equipment and connections will be integrated, and how papers and other work materials can be safely and conveniently accessed and effectively used. Though telework may well bring increased flexibility in regards to scheduling and time shifting of work activities, the teleworker must also consider the other members of their household and be willing and able to coordinate schedules and circumstances to allow them to work for sufficient periods of time with minimal distractions and interruptions.

## Supervisors and Employees Working Together:

Traditionally, supervisors have been more comfortable having their employees present in the office as much as their jobs allow, where they can monitor their physical presence and "see" that they're working. However, most jobs are best measured by actual performance. Does the job get done in a timely and appropriate manner? Is the employee sufficiently productive, responsive, and effective?

Assuming that an employee's general tasks and support needs lend themselves to telework, the key is to establish clear, measurable objectives and manage to them and the desired results. Surveys have shown that employee productivity often demonstrates marked improvement as they begin to telework and experience fewer distractions and interruptions while working at the times best for them. Supervisors can come to focus on the quality, quantity, and conformance to schedule of the employee's activities and work output. Special training is available on managing remote employees.

Employees must assume their fair share of the responsibility for insuring their telework experience is satisfactory not only to themselves and their family, but to their supervisor and employer as well. Successful telework is based on jointly agreeing on expectations, properly managing one's workflow and time, and providing deliverables on schedule. The teleworker needs to conscientiously undertake their tasks and accountabilities, while maintaining good communications with supervisors, coworkers, and customers as appropriate.

Any developing problems impacting the teleworkers ability to perform or of possible concern to the employer should be identified and discussed with one's supervisor as soon as practical. It is not usual for the new teleworker to have to make some adjustments to get things going smoothly depending on the amount of time spent teleworking, the importance of group interaction with coworkers, the work style of the individual, and the workflow and needs of their employer. If periodic face-to-face meetings with supervisors or coworkers are beneficial, department or company meetings are useful and customary, or one needs to handoff and pick up materials to get your job done, make sure work planning and scheduling place the teleworker in the office frequently and long enough to remain an integrated team member.

If the teleworker needs specific additional equipment or IT support, accommodations to work processes, review of previously agreed upon productivity and deliverables metrics, or other fine-tuning, make sure supervisors and their direct reports understand that such issues are customary and can be proactively discussed and resolved. When telework works, it works well, but it takes a team effort across the enterprise to lay the groundwork, keep things going, and insure success.

# Teleworking Increases Employee Productivity



**Two-thirds (66%) of those who manage employees who telework
believe the arrangement has increased their employees' productivity.**

Source:  Opinion Research Corporation for Cox Business Services, April 2003

## Policy and Procedure Issues and Solutions:

Human Resources (HR) already develops and administers a great variety of policies and procedures covering employee benefits, responsibilities, and appropriate behavior.  Many of these will already cover issues relevant to employees who telework, but additional formal written policies and procedures are necessary to lay out specific terms and conditions relating to the remote worker.  This groundwork should be put in place to help determine the appropriateness of certain employee classes and tasks being encouraged to telework and better enabling them to do so.  Some examples of policy and procedure issues and ideas follow and may be further explored through the resources listed in **Appendix A - Where to Learn More about Telework**.

Acceptable Use Policies (AUPs) can define the expectations in terms of shared use of equipment for business and personal needs, appropriate behavior for e-mail and browsing, and expected security and work-related procedures.   It may be difficult to fully separate personal use of enterprise resources at the office and when using equipment, software, and connectivity provided by the organization for remote work.  Just as occasional personal telephone calls may be customary and appropriate, so too may be a modest degree of personal web browsing and e-mail to support employees' ongoing busy careers inextricably intertwined with their private lives.  In any case, clear policies should be defined taking into account general expectations for employee, as well as enterprise Information Technology (IT) capabilities and limitations, special proprietary data and information security needs, and the ever-evolving body of legal precedence and best practices in the human resources arena regarding telework.

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Policies and procedures may serve to limit the use of e-mail to enterprise-related messages exclusively and may similarly limit employee web browsing utilizing enterprise resources to job-related activities. Or they may allow for a mix of business and personal use. In any case, employees should be encouraged to maintain separate personal e-mail and Internet access accounts for their own use to support their common communications with friends and families and for pursuing their personal interests, helping the enterprise protect itself from possible liabilities in cyberspace. Even where personal web browsing is allowed or perhaps encouraged utilizing enterprise resources, there may be strict policies prohibiting access to certain kinds of web sites or content such as stock trading, gambling, gaming, pornography, entertainment, and sports as deemed appropriate.

It may be necessary and appropriate to monitor employee activities, files, and messages with network monitoring applications and personnel for the purposes of measuring productive output, insuring compliance to policies, backing up and otherwise securing enterprise communications and information assets, and generally maintaining the integrity of the enterprise's Information Technology (IT) environment. However, the organization's expectations in these regards should be clearly defined in written policies and ongoing employee communication. While employee monitoring can raise various privacy concerns, it is in many ways a natural by-product of network management and associated activity logging, and should be proactively and consistently applied within the boundaries and guidelines as developed and set forth. Blocking or filtering of certain web sites and content types may be incorporated into firewalls or put in place as part of other security processes. Further, the enterprise should adequately define any issues and expectations related to the ownership of data and information collected and utilized by the teleworker. Such expectations, obligations, and associated definitions and terms may become part of the organization's standard employment or special teleworker agreements.

The organization should also have strategic plans and supporting policies in place regarding the ongoing role its Information Technology (IT) staff will play in setting technology and operational standards, procuring and supporting employee equipment, establishing and enforcing security procedures, as well as connecting and integrating remote workers to the enterprise environment. IT may well need to control and manage enterprise desktop environments for consistent operating systems and application installations, updates, and support. Thus they may proscribe what software should or may be installed on internal and remote equipment and what kinds or anti-virus, encryption, firewall, VPN, and other security mechanisms should be employed.

Increasingly, training can be provided as a distance learning teleconference or interactive e-learning experience allowing more flexibility and lower costs for ongoing employee education. Appropriate licensing and management of software applications should also be in place to preclude piracy and manage liability from software vendors by acting in accordance with individual and volume licensing agreements. Software selection and licensing should be professionally and persistently managed for site and enterprise-wide capabilities and agreements favorable to the organization, it's staffing, workflow, and IT needs, as well for the ability to scale to meet growing organizational needs and the interchange of data with enterprise customers, vendors, and partners.

## Enabling Workers in Their Home Office and on the Go:

When it comes to the employee's residence and how to configure and equip a home-based work environment, there will be a great variety of factors to consider, a range of options in equipment and support, often multiple appropriate solutions to choose from, and planning and budgeting to implement. If the enterprise provides equipment and software to employees at home, they will likely

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have more to say about the configuration and use of those resources.  If the employee already has one or more PCs in the home, IT should have general practices in place as to whether and how these can best be utilized and connected in a mixed-use environment.  In any case, assistance should be provided to help employees in choosing equipment and configuring their home work area to help insure work requirements and issues, ergonomic comfort, and safety concerns are considered and accommodated.

For employees who act as mobile workers or need to be on call, does the enterprise provider pagers, mobile phones, personal digital assistants (PDAs), laptop computers, or other information appliances?  If so, what specific equipment and services can be supported and integrated to the enterprises communication needs and IT environment?  Does IT automatically update applications and synchronize data for remote workers or are manual support processes necessary?  What protections need be in place and supported for data security, limiting liability, and protecting workers in cyberspace.  And when workers need remote connectivity, be it broadband to the home or connecting from the road, again the enterprise should have established expectations about how much bandwidth and of what types need be available to support specific classes of workers or tasks.  IT may well define minimal telecom services or capabilities to support remote work from home and on the road and help assure teleworker locations are good to go with the required services in place.

Human Resources are usually on the front lines helping the organization anticipate and proactively manage risk.  They need be concerned with the protection of privileged communications and proprietary information as it moves through the organization and beyond.  In today's world, as telework programs add significantly to the flexibility and geographic diversity of employees operating remotely but collaboratively, they become a strong component of business continuity planning as well as disaster response and recovery.  As connectivity is the lifeblood of the modern enterprise, HR should work closely with IT to define enterprise needs for remote workers and match to available technological capabilities and appropriate support mechanisms.

## Employee Considerations When Teleworking
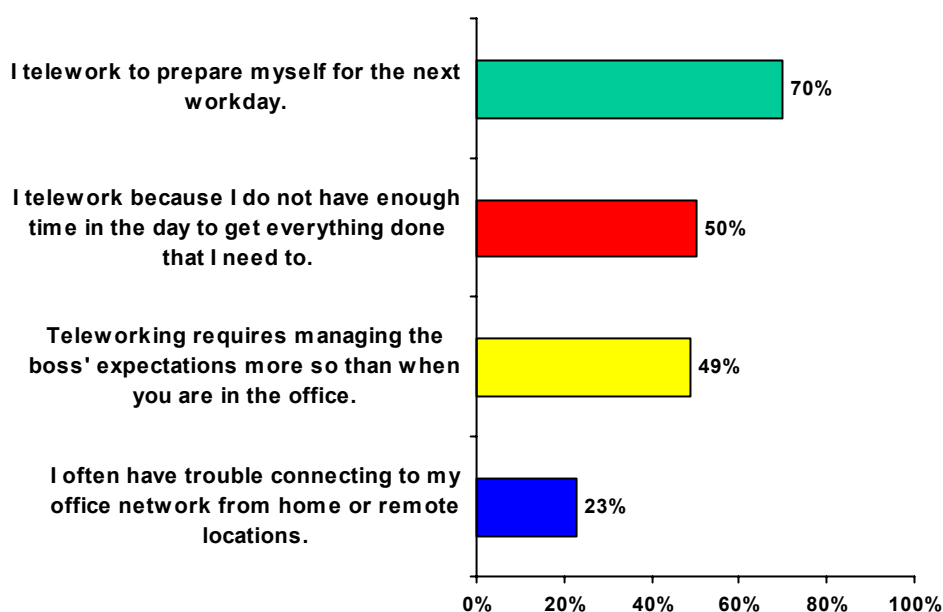


**Percent of teleworkers agreeing or strongly agreeing with statement**

Source:  Opinion Research Corporation for Cox Business Services, April 2003

# Telework Design and Development Checklist

## Telework Policies and Procedures:

- Evaluate job categories and functions and determine appropriate prospects for telework

- Review business process and enterprise data flows to integrate role and needs of remote worker

- Develop budgetary expectations and develop an ROI model on the telework business case

- Get buy in from senior management and their commitment for necessary funding and resources

- Develop a teleworker agreement and make available for supervisor and employee use

- Develop Acceptable Use Policy (AUP) for employee behavior guidelines and rules

- Define policies on enterprise provided versus employee owned equipment and software

- Institute supervisor training for managing teleworkers and publish collateral material

- Develop specific steps and support mechanisms for activating and assisting new teleworkers

- Review and adjust insurance coverages and emergency response and management procedures

- Identify any additional risk factors to employees and the enterprise, minimize and manage

- Review telework program costs, benefits, and results at least annually and adjust accordingly

## Information Technology (IT) Enablement:

- Review IT applications and systems supporting critical enterprise capabilities and data flows

- Review enterprise computing environment for security, resiliency, capacity, and connectivity

- Review data integration and software licensing issues impacted by remote and mobile workers

- Review data security requirements and processes integrating remote access and use needs

- Review availability of broadband connections to employees' homes and any integration issues

- Develop and deploy an appropriate IT support and help desk environment for remote workers

- Implement business continuity and disaster recovery planning, review, and test as needed

- Plan and budget for any necessary incremental IT capital, implementation, and support costs

# Information Technology and Telework: Supporting the Mobile Workforce

## Information Technology Drives the Modern Enterprise:

The personal computer (PC) has become nearly ubiquitous on the workplace desktop, wireless phones and information appliances take us mobile, and connectivity has truly become the lifeblood of the modern enterprise. Employees utilize computers and mobile data-enabled devices connected over local, regional, and wide-area networks to support their jobs, develop and deliver their work products, and communicate within and outside the organization. Even the smallest offices will usually have multiple computers and the need to connect them to each other as well as to the outside world via the Internet. Medium and large enterprises frequently involve multiple sites and the need to interconnect them over more sophisticated networks to share information and resources across the organization.

An Intranet, basically an internal private web site, is commonly used by employees of mid and large size organizations to access enterprise documents and news, licensed content sources, and other resources while keeping such information contained within departments or the organization as appropriate. Workers are also increasingly going online to the Internet to access essential external information as well as for collaborating with and messaging customers, partners, and vendors. Organizations often now provide a complementary Extranet as a semi-private enterprise web site accessible to a defined group of outside participants, usually customers or strategic partners. And to the general public, your enterprise's web site on the open Internet offers access to details about your products, services, news, and resources. The ability to support interactions and transactions with customers over the web has become key to many business models and processes. A strong internal and external web strategy can drive employees' collaborative efforts and productivity, enable higher sales and better customer and partner interaction, and generally contribute to both top line and bottom line revenue growth.

However, all these computers, mobile information appliances, various software applications and operating systems, servers for internal and external use, enterprise networks, and leased telecommunications capabilities increasingly form a complex and diverse environment. They are frequently used to support critical organizational functions and have become mission critical to most enterprises, requiring dedicated Information Technology (IT) personnel and departments for IT planning, implementation, and support. In this section we will review some of the fundamental issues and guidelines for IT in the modern enterprise and how they can readily support telework activities.

## No LAN is an Island:

Any workplace with more than a few computers will almost certainly have a Local Area Network (LAN) connecting them together with wiring and routing equipment to enable convenient communications among workers and shared equipment, such as printers and file servers. The design of the network can be quite simple supporting a few to a few dozen desktop computers on one or more hubs. As the networks get larger, they may become quite complicated, supporting hundred or even thousands of users at one or multiple sites. The network not only allows the transmission and storage of e-mail, but also lets users share a variety of resources such as software applications, data files, printers, and outside Internet access. The design, operation, and maintenance of the network is usually

# Key Information Technology Investments for U.S. Businesses in 2002



(Source: In-stat/MDR, http://www.instat.com/)
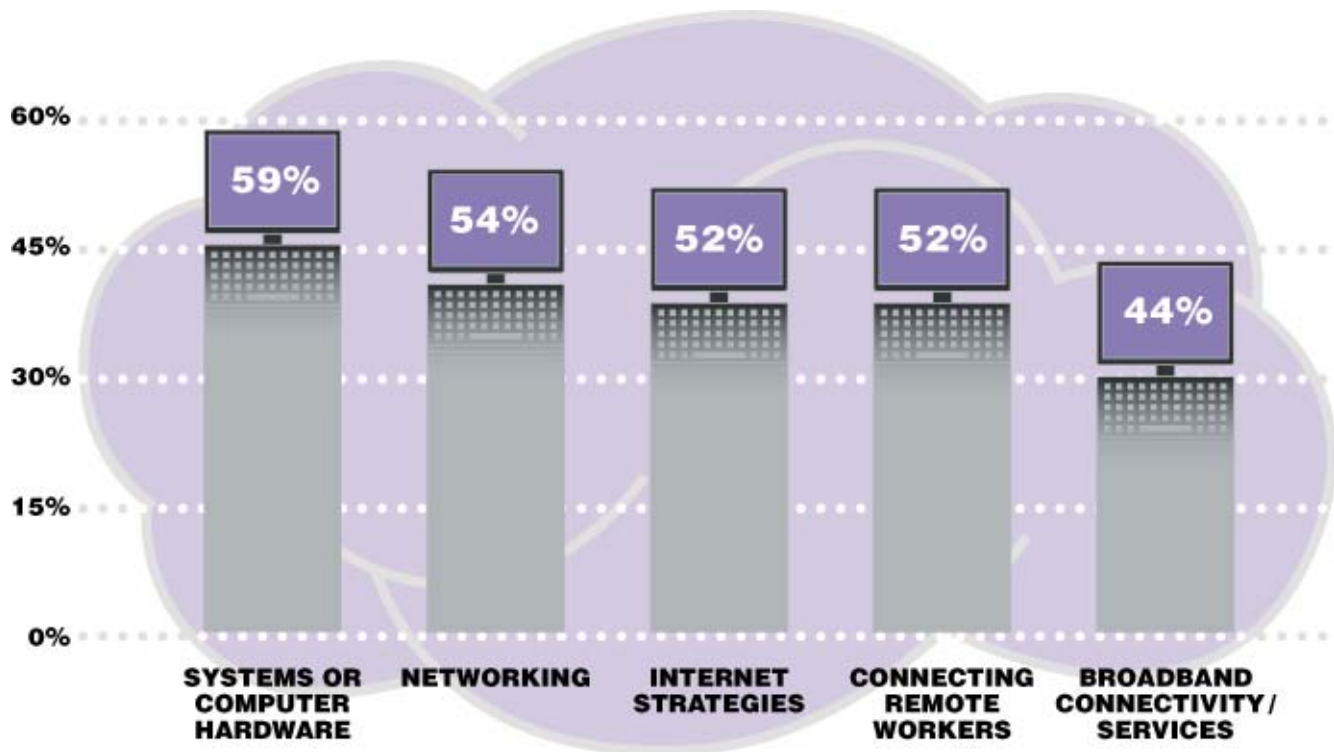
managed by Network Administrators who can be called upon to answer end users' questions and adjust or repair the equipment and its configuration to optimize utilization of it and constant availability.

Within a facility, the most common network protocol is Ethernet carrying data rates of 10 Mbps, 100 Mbps, 1 Gbps or soon as much as 10 Gbps. Desktop computers and laptops may have an embedded Ethernet port or use an accessory Network Interface Card (NIC) to add one. Local data is usually carried over Category-5 (Cat-5) copper wire or enhanced versions such as Cat-5e from each users' desktop or work area to strategically located hubs and routers, often organized by department level or physical areas of a facility. This may closely follow the enterprise's telephone wiring or be routed independently. Servers and peripherals such as shared printers may be placed at a variety of locations for convenient access by employees.

Wireless Local Area Networks (WLANs) may be added by placing one or more wireless hubs around the facility and thus enabling mobile workers or workstations to connect at high-speed from anywhere inside the buildings or even from a short distance away. Laptops or other portable devices may be readily fitted with appropriate short-haul wireless modems to free workers of the physical constraints of fixed locations. Also computer workstations around your facilities may readily emulate any individual user's configuration and desktop environment allowing them access to their applications and data, thus enabling their ready movement among various workstations and locations. But such mobility in turn requires special consideration for network topology as well as security and authentication considerations that we will further explore below.

Between an enterprise's facilities located in the same city or general geographic area, you may have your own fiber optic cables and telecom infrastructure, but more likely lease voice and data

telecommunication circuits from commercial providers to establish the necessary interconnections. If you have a far-flung enterprise with multiple remotely situated locations, you need a Wide Area Network (WAN) to implement a variety of connections simultaneously to carry private data traffic among company facilities and remote users. It can connect voice telephone equipment between facilities and in turn to the public telephone network, yielding some independence from the phone company and potentially substantial savings in long distance and other communications costs.

Your network also need provide high-speed Internet access to most or all of your facilities to allow employees to utilize the net and access the host organization's web site, applications, and data. However, your enterprise web presence may otherwise be hosted off-site by placing your equipment in commercial data centers or having it served up by web hosting service providers. Your strategy must also incorporate the capability to manage enterprise content and its distribution for your own on-site and remote employees as well as to tie in customers, partners, and vendors as appropriate. The design or topology of such sophisticated networks may be quite elaborate and is customarily supported by a team of information systems professionals.

Many telecommunication providers have their own extensive Metropolitan Area Networks (MANs) consisting of fiber optic rings terminating in their city-wide facilities and sites known as Central Offices (COs), Master Telecommunications Centers (MTCs) or Points of Presence (POPs) from which they provision services. Copper wire, wireless links and/or fiber optics connect your facility to these telecom provider networks where your voice and data services are enabled. And through these telecom circuits connecting you to the other locations within your enterprise and to the world at large.

For large, multi-site enterprises, the WAN will use a variety of leased telecom services to the various facilities, depending on enterprise needs, budgets, and availability of services. To the extent that such information technology is mission-critical to your employer's operations, a major investment may be made in redundancy for hardware and connections so as to remain up all the time or at least as much as practical. Availability of higher bandwidth as needed and specific guarantees of performance and Quality of Service (QoS) may be negotiated with providers and contained within a Service Level Agreement (SLA) specifying latency, packet loss, uptime, and other factors.

## Virtual Private Networks (VPNs):

Leased dedicated telecom circuits have been traditionally relied on to interconnect distant facilities, however it is becoming increasingly practical and advantageous to transport your data over the Internet using special equipment and techniques to protect and secure your information. And that leads us to a discussion of what is today known as a Virtual Private Network (VPN).

A VPN is a highly secure network created by a combination of your enterprise computing capabilities tightly integrated with commercial broadband telecommunications services. You augment the lower cost shared network of Internet broadband connections by carving out a secure channel between your facilities utilizing encryption, tunneling, and protective interface equipment. Such network connections are very cost effective compared with individual leased circuits and if properly designed and implemented, offer resilient and secure enterprise communications at substantially lower costs.

VPN solutions use a variety of available technologies and protocols to interoperate with existing networks and applications and thus create a truly reliable and resilient communications framework. Further, monitoring and control tools allow for the prioritization of various data traffic, optimization of

# Enterprise Wide Area Network (WAN) with VPN Connections



(Source: International Research Center, http://www.researchedge.com/)
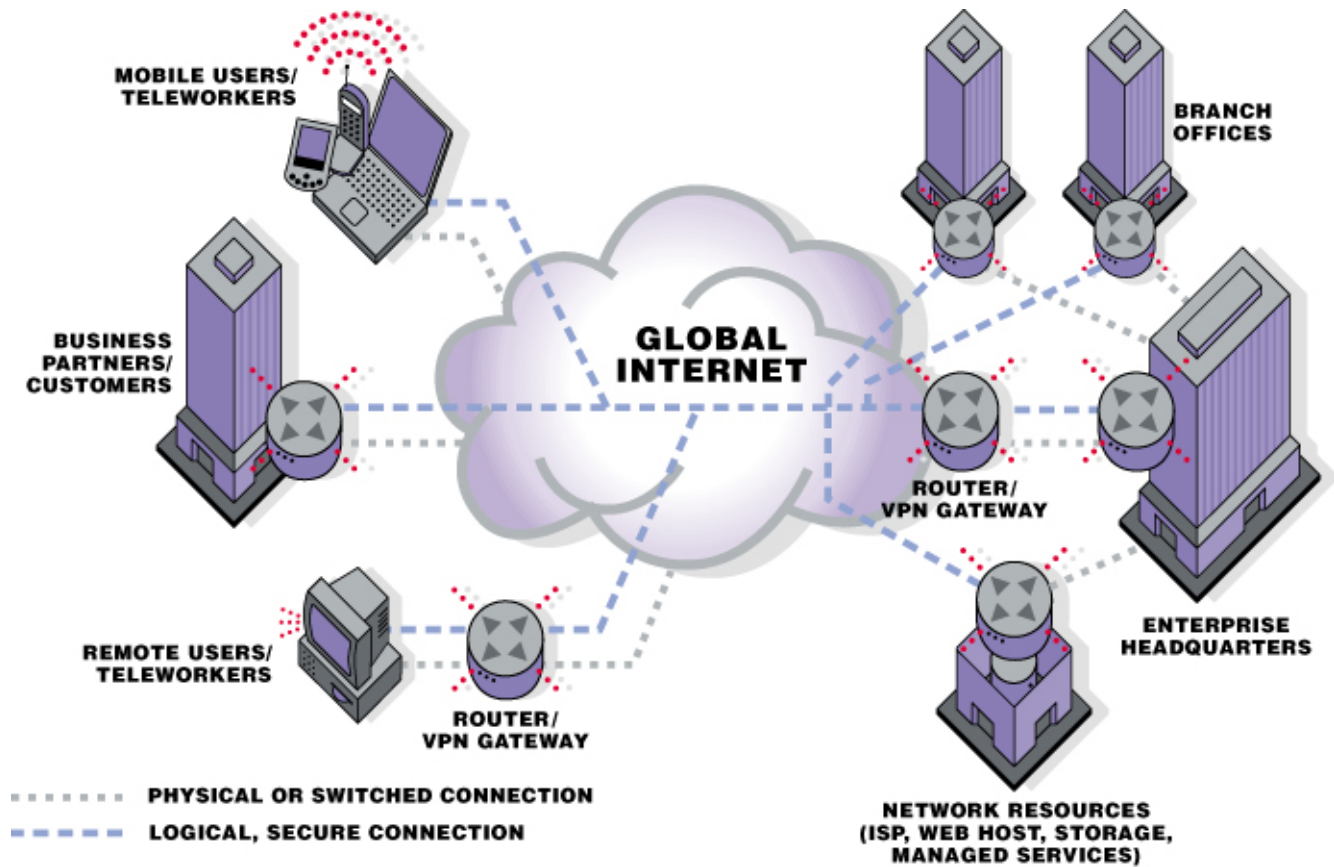
use and cost, and real-time information on the health of the network and your interconnected user base. Certain of these functions may best be met by outsourcing to Managed Service Providers (MSPs) who offer a range of value-added services going from web hosting to enterprise e-mail, data synchronization, remotely run applications, storage networks, content caching, security firewalls, traffic filtering, bandwidth management, transaction processing, customer relationship management, and more.

Tunneling serves to establish a defined pathway between two points on the enterprise WAN, encapsulating your data traffic with new packet headers while securing the endpoints.  Point-to-Point Protocol (PPP) and a variety of standards and protocols applied to tunneling enables user authentication, IP address management, IP and non-IP traffic carriage, compression, and a host of other protections and capabilities.  These end-to-end services are media independent and can incorporate encryption to better protect your data streams and Quality of Service (QoS) control to support rich media and applications.

VPN security is achieved with a combination of traffic isolation through tunneling, user authentication and authorization, data encryption where appropriate, and integration with firewalls and other enterprise security solutions such as content filtering, virus scanning, and protection against unauthorized access.  Additionally, telecom providers and managed service providers offer value-added capabilities to enhance security and reliability while aiding network management.  All this serves to help keep the bad guys out while facilitating convenient and reliable access to internal information resources from anywhere your employees need it.

# Cox Combines Local Access Architecture with Internet Access



(Source: International Research Center, http://www.researchedge.com/)
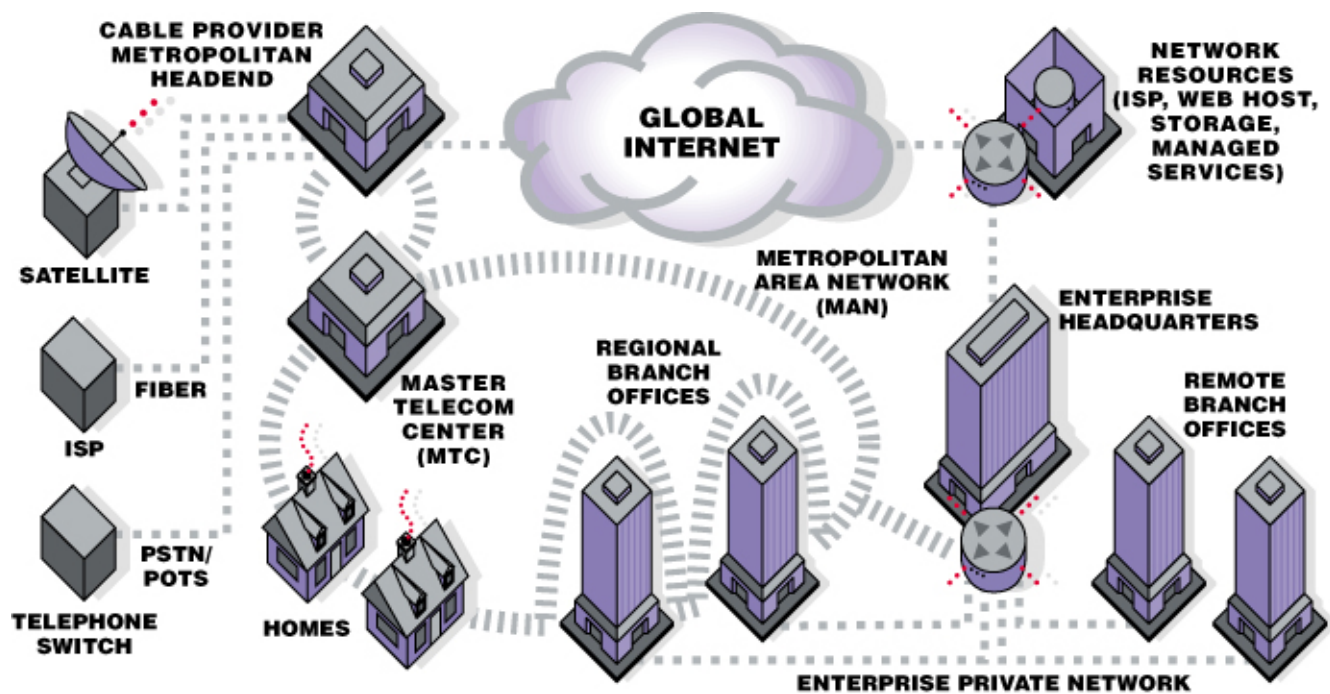
Additionally, those telecom providers with strong regional fiber infrastructure and last mile capabilities can connect teleworkers and your various local facilities in even more direct ways over their Local Access Architecture. Rather than your enterprise traffic going out onto the Internet where it can encounter delays and security risks, it can be carried fully contained on a single carrier's network for better and more predictable performance. Managed VPN and other value-added managed services can further secure your critical enterprise traffic and insure high quality uninterrupted connections.

## Collaborative Technologies and Trends:

Collaboration tools and capabilities have been steadily improving, becoming increasingly standardized and more widely adopted. Basic voice telephones in organizations connect to sophisticated PBXs and outside telecom services to enable advanced messaging, managed routing, and complex multi-party communications. Home telephone services also enjoy a broad range of advanced features enabling ready integration to the enterprise environment. Increasingly, the desktop computer has begun to replace or supplement the desk phone for voice communications and integrate full voice functionality with your local area and wide area networks.

Traditional room-to-room videoconferencing that has long enabled long distance meetings for groups is now being extended to support desktop-to-room and desktop-to-desktop applications. Desktop and laptop computers can add color video cameras allowing the transmission of images along with your voice, documents, and messages around the facility and around the world. And shifting from leased telecommunications circuits for dedicated voice service and data transport to more versatile Internet Protocol (IP) traffic carried over the Internet can dramatically decrease long distance and other communications costs, while adding flexibility and security.

More recently, Internet browsers and various stand-alone applications have been designed to aid the collaborative process by better managing the exchange of data between co-workers and other interested parties. We can conference, share documents and use tools like Instant Messaging (IM) to communicate instantly and conveniently with coworkers and others. Enterprise-grade Instant Messaging systems are evolving to interconnect with various external proprietary IM platforms while adding security and archiving capabilities. Additionally, a new generation of collaborative tools and Peer-to-Peer (P2P) networking allow enterprise content to be distributed across multiple systems and shared in an authorized and efficient manor. The remote worker at home or on the road can share all the immediacy and benefits of the enterprise's virtualized collaborative communications environment.

Of course, for all these basic and advanced uses you must have the right connections including a LAN to other nearby computers as well as an Internet connection of sufficient speed or a well designed WAN for remote communications among your facilities, remote workers, partners, and customers. And with the advent of high data rate mobile cellular and satellite networks, ubiquitous mobile devices will be increasingly useful as wireless broadband communicators for anytime, anywhere connections. A variety of Application Service Providers (ASPs) and Managed Service Providers (MSPs) can deliver advanced communications and security services, integrating to your enterprise environment, reducing costs, and simplifying your organizations IT support requirements.

## Collaborative Technologies for Enterprise Knowledge Work



(Source: International Research Center, http://www.researchedge.com/)

# Enabling the Mobile Knowledge Worker:

Your enterprise teleworkers will need equipment at their home, on their person, and perhaps at other remote locations to support their off-site work activity.  They also likely will need compatible desktop software applications and leased telecommunications services or broadband Internet access to connect to their workplace and enterprise environment.  The ownership, support, maintenance, and insurance of these resources and the liability and insurance for a remote worker are important considerations to plan and arrange for so as to best realize success for the teleworker and their employer.  Employees may utilize relatively low technology to adequately move work off site or may require medium and high technology applications and configurations, all of which are described in more in this section and the **Teleworker Toolkit** section that follows.

Organizational policy may require and pay for home and mobile equipment and connectivity or reimburse the employee in part or in full for the use of their own equipment and resources.  A well-organized and staffed Information Technology (IT) group can provide the help desk and support functions necessary to insure the success of the teleworker and the smooth integration of their activities both on-site and remotely.  The related start-up and operating costs can be significant and IT should anticipate, budget, and plan accordingly.  Initial capital costs as well as expenses for implementation and ongoing support all contribute to the Total Cost of Ownership (TCO) and should be included in any Return on Investment (ROI) calculations and considerations so as to build the business case for enabling telework with the necessary technology investments and enterprise commitments.

# Security in a Networked World:

There are significant security concerns across the enterprise ranging from your internal Intranet to the Internet at large and on to each employee's home office workplace and remote sites.  It takes planning and continual vigilance to protect the organization's proprietary information, customer and employee privacy and safety, and otherwise travel protected through cyberspace.  Tools such as dial-back modems, secured connections, passwords, encryption, and running regular backups can provide adequate security if well managed, while Virtual Private Networks (VPNs) and other measures can further protect your myriad telecommunications paths to remote sites and users.

Firewalls are either sophisticated software applications or special hardware installed on modems and network routers to guard the connection pathways originating outside a facility and control access to crucial enterprise information held on the internal enterprise LAN, PCs, and servers.  Firewalls should be utilized at all office locations to protect the internal networks from inappropriate outside access and use and may also be configured to preclude access to certain external sites and thus help enforce employee Internet use policies.  Modems, routers, and networks used at home can be similarly protected via security software, firewalls, VPN connections, and other technologies and procedures providing reasonable assurance of secure end-to-end communication.  As newer collaborative technologies and wireless connections create new avenues for exposure, improvements in security capabilities and practices follow along to extend and reinforce your organizations' protection.

The modern enterprise has come to depend on its internal network and external telecommunications access to support operations and collaborative work while enabling customer information access and relationship management.  To the extent that such information technology is deemed mission-critical to an organization's operations, a major investment may be made to provide redundancy of hardware and connections so as to remain up all the time or at least as much as practical.  Reliability and uptime may be further enhanced by the use of Uninterruptible Power Supplies (UPS) for network servers and

support equipment as well as possibly for individual end user workstations and even home office environments. Concentrations of critical data processing equipment may be housed in special rooms or facilities with hardened access, diverse electrical and telecom connections, and special environmental and fire suppression systems. Adequate backup policies and procedures need be developed and put in place to protect and make copies of enterprise data, be it on-site or remote to collect and store as off-site media and on storage appliances placed around the WAN.

Though perhaps counter intuitive, most security breaches originate inside companies rather than from outside sources and threats. Inappropriate access by employees of sensitive enterprise data such as payroll and personnel records can violate common privacy expectations and damage operational credibility and integrity. Disgruntled current or former employees are responsible for the majority of security and procedural breeches, though proper precautions and procedures will minimize your exposure and risks. However, outside parties develop and distribute viruses and other malicious code and destructive programs. Hack attacks represent direct attempts at penetrating your systems to access proprietary information, wreak destructive havoc or just for the challenge of it. IT must strike a balance between hardening enterprise computing resources and information from inappropriate access and use and enabling convenient and productive use of those same resources for legitimate activities.

It is important to compartmentalize data by department or job functions and implement enterprise systems that can be configured to control access to critical IT resources and share data among employees, partners, and customers only as necessary and appropriate. Passwords and other personal authentication are commonly used to confirm end users' identities as they are connected or launch specific software applications and processes. Correctly authenticated users are then authorized to proceed in a relatively transparent manner, but additional policies for not leaving logged in work stations unattended, managing passwords, and otherwise computing responsibly need to be clearly defined, well supported, and consistently enforced. Your organization's web site and electronic transactions with customers and partners may be essential to your regular operations and need special consideration to best manage web content integrity and updates while protecting sensitive customer data and financial information. Employee's appropriate use of e-mail and web browsing for legitimate job functions and possible personal use can reflect on the employer. Guidelines for such use and associated enterprise filtering and monitoring were discussed in some depth in the earlier section on **Telework Policies and Procedures**, but remain the purview of IT to enable and put into effect.

The enterprise's Information Technology (IT) service group is generally responsible for selecting enterprise operating system platforms and software applications to insure consistency, security, reliability, and interoperability across the organization. It is an ongoing task keeping up with software patches and revisions, keeping current with security threats and best practices, and proactively monitoring IT operations and performance to keep things running smoothly. IT staff needs to constantly evaluate enterprise computer use and networks and project and plan for future needs and growth while adapting security and protection to emerging threats and their evolving IT environment.

Business Continuity Planning (BCP) should be rigorously undertaken and applied to anticipate and plan for various contingencies including natural disasters and damage to critical infrastructure. Telework increases the geographic diversity and operational flexibility of your workforce and has proven effective in returning to normal operation in the face of major difficulties or disasters. Guidelines and procedures need to be in place to insure the safety of employees, allow for uninterrupted communications and operations, and assure continuity of business operations. Disaster response and recovery should not only be planned for but must be periodically exercised, reviewed, and tested to insure your enterprise is prepared to stay connected and on track.

# Teleworker Toolkit:
# The *New* Employee Manifesto

## Getting Started:

You may have thought about teleworking part of the time or full time from home.  You may know individuals who already telework in your organization or elsewhere.  You may already travel for work or spent some portion of your workday away from your desk or facilities.  But now you need to decide if telework is right for the job that you do and the tasks you customarily perform and if telework will be amenable and practical to your employer.  Also you need to consider if telework is right for you.  There are many personal benefits you may gain from teleworking such as more flexible work and family schedules that can reduce stress and the need for personal leave, while improving morale, motivation, and work satisfaction.

As we explored earlier, there are a great variety of tasks and jobs that telework well and certainly those that don't.  If you already typically employ computers and enterprise networks to do your job it is likely to be well suited to remote and telework activity.  If your job involves some fair amount of business travel locally or away from home, the same enabling technologies and support mechanisms for home and remote facility telework will serve you well as you travel.  Generally, telework should be able to be done on one's own or in collaboration as enabled by telecommunications and not require face-to-face interaction with customers and visitors or much physical handling of documents and products.  Further, telework may allow you to undertake a job you couldn't otherwise or bring greater focus with fewer distractions to the job you have, yielding improved personal productivity and effectiveness.  You'll certainly spend less wasted time spend commuting to and from work and should be able to decrease your outlay for common expenses such as gas, food, and clothing.

But for telework to be a viable solution it has to work for your employer as well.  Supervisors have been more comfortable having their employees present in the office where they can monitor their physical presence and "see" that they're working.  The new teleworker should help develop and commit to clear, measurable objectives and manage to them and the desired results.  You should be self-motivated and responsible, well organized, able to work independently with minimal supervision, and capable of communicating effectively with your supervisor and coworkers.  You'll need to consider the other members of your household and coordinate schedules and circumstances to allow for sufficient periods of time to work with minimal distractions and interruptions.

Employees must take responsibility for insuring their telework experience is satisfactory not only to themselves and their family, but to their supervisor and employer as well.  Successful telework is based on jointly agreeing on expectations, managing your workflow and time, communicating regularly, and delivering your work as committed.  The teleworker and supervisor can come to focus on the quality, quantity, and conformance to schedule of the employee's activities and work output, in other words to manage by performance.  Any developing problems should be identified and discussed with one's supervisor as soon as practical to make appropriate adjustments as needed.  Make sure your work planning and scheduling place you in the office frequently and long enough to remain an integrated team member joining department or company meetings as appropriate and coming in to handoff and pick up materials to get your job done.

# Teleworker Policy and Procedure Issues:

Many existing policies and procedures will already cover issues relevant to employees who telework, but additional policies and procedures have been implemented to cover special telework circumstances.  Acceptable Use Policies (AUPs) define any limits to shared use of enterprise resources for business and personal needs, appropriate behavior for e-mail and browsing, and expected security and work-related procedures.   Your employer may limit the use of e-mail to enterprise-related messages exclusively and may similarly limit employee web browsing utilizing enterprise resources to job-related activities or prohibit access to certain kinds of web sites or content.  Or they may allow for a mix of business and personal use.  In any case, you should maintain separate personal e-mail and Internet access accounts for your own use in communicating with friends and families and for pursuing personal interests.  This will serve to keep your personal activities separate and private as well as helping protect your employer from possible liabilities and risks.  Please see the earlier section on **Telework Policies and Procedures: Enabling and Managing Telework** for additional information.

Information Technology staff and systems may need to monitor workstation and network activities in real time, store and retrieve files and messages, and otherwise secure enterprise communications and information assets to support the organization's operations and generally the computing environment.  For your part, it is likely you handle a fair amount of privileged communications and proprietary information within your organization.  Apply common sense and your organization's guidelines and experience to manage information and communications appropriately and securely.  Your IT staff will likely have standards and guidelines to help control and manage enterprise desktop and mobile device environments for consistency, security, and reliability.  They may advise what software should or may be installed on internal and remote equipment and what kinds or anti-virus, encryption, firewall, VPN, and other security mechanisms should be employed.  You will also be expected to understand and respect your organization's software licensing agreements.  They in turn will assist you with system configuration, periodic updates, maintenance, help desk support, and other matters as needed.

# Getting in Gear:

At its simplest, telework may involve just bringing some of your paperwork home from the office with you.  You can take it with you!  There it can be reviewed and edited with just paper and pen or you can follow up where necessary with phone calls.  Thus the simplest of office supplies (pen, paper, stapler, paper clips, transparent tape, etc.) and an available telephone on a cleared work surface can support a variety of remote work activities.

However, the availability of a computer will allow you to edit documents, preparing them to be printed at work or at home or transmitted electronically to others in the various ways we will describe later.  You should already be familiar with the kind of equipment on which your remote work will depend and perhaps already have a home workspace in place or at least in mind.  Carefully consider your home environment in terms of the placement and layout of where you will do your work, how that will relate to the other members of your household, how equipment will be place and connections made, and how papers and other work materials can be safely and conveniently accessed and effectively used.  Opinion Research Corporation recently found that teleworkers believe that essential requirements for their ideal teleworking environment include a high-speed or broadband Internet connection (51%), dedicated work space (40%), wireless phone (26%), dedicated business phone line (18%), and wireless Internet connection (12%).

# Phone Basics:

Almost all residences have one or more telephone lines and multiple phone instruments and of course we find phones wherever we go available for our use. The ubiquitous telephone system gives individuals instant worldwide access to others, be they co-workers, clients, business service providers or friends and family with what is sometimes called Plain Old Telephone Service (POTS). Through the phone, much work can be remotely accomplished, though sometimes with Long Distance charges to remote locales.

You may need multiple phone lines at home to keep your regular line free and available for personal calls, as well as a dedicated line or two to serve business uses, including voice connections, document faxing, and modem access to your workplace or the Internet. Wireless phones can act as cordless extensions to let you roam about your house and nearby. An inexpensive answering machine can answer the phone and take messages while you're away or too busy to answer. Some may have multiple voice mailboxes to segregate messages for different family members and your business use. Most will also allow you to retrieve your messages and reprogram your outgoing message and functions remotely by entering individual access codes and commands from any touch-tone phone.

# Advanced Phone Features:

The various providers of local phone service or "dial tone," including traditional phone companies and competitive entrants such as cable operators and CLECs, can deliver a vast array of advanced features along with your regular voice phone service. This can help you to make more convenient and effective use of telephone voice communications for telework. One of the most common features is voice messaging, which serves as your answering machine and can take a message even if your line is in use, so there's never a busy signal. And as with the more advanced personal answering machines discussed above, you can remotely check your messages and reprogram your outgoing message.

Caller ID can work with your phone instruments to identify the originating phone number and sometimes the name of the calling party so that you are aware of who is calling before answering. An optional feature known as Call Waiting allows you to put the current call on hold to take another incoming call and then alternate between the two callers. Three-way or conference calling may be accomplished by using a telephone instrument that can bring two or more individual phone connections together or by features enabled by your phone service provider. Call Forwarding can redirect incoming calls to follow you around or be "forwarded" to another number of your choice, either all the time or only when certain conditions are met. Custom Ring capabilities allow the phone company to assign additional unique telephone numbers to you at low cost and have them ring on one of your regular lines. The ring pattern is unique so that you or your answering machine will know how to answer that line. These and other advance features are available from your local telephone providers and you should check with them for particulars and cost-effective bundles of common features.

Recent technological advances even let you handle an incoming call while using the phone line with a regular modem connected. Your Internet Service Provider (ISP) can receive forwarded voice calls from your busy line and send pop up alerts to your screen allowing you to put your modem on hold and take the incoming voice call or take messages as needed. The newest telephone modems may also have a call waiting function allowing you to view Caller ID displays on screen and put your modem on hold to take voice calls. But the odds are you'll be moving up to a broadband connection in your future if you haven't already, thus freeing up your phone line and accelerating your Internet access.

## Integrating to Enterprise Phone Networks:

You will likely have your own voice mailbox at work from which you can retrieve messages remotely. And you may have an extra home phone line dedicated to your outgoing business calls and to connecting you to your enterprise's telephone management and routing environment. Thus, your business calls can be directed as appropriate to home or remote phones and follow you as you roam. Your employer will usually pay for additional home phone lines and other special services as required.

Audio conferencing can be readily established among multiple phones and locations and can be augmented by shared electronic documents and various tele-collaboration tools to make virtual meetings efficient and effective. Increasingly, video streams are being used, even with home-based personnel to establish videoconferencing on demand and further aid real-time communications. These conferencing capabilities may be outsourced by IT to providers specializing in unified messaging or remote conferencing and can give even small firms a national or global reach. Additionally, Voice over Internet Protocol (VoIP) telephony is advancing rapidly and has significant potential to carry common voice traffic as data streams over Internet connections for lower cost and excellent enterprise integration. With VoIP, a headset connected directly to your PC's audio ports may well serve as an acceptable substitute to using a telephone instrument and traditional phone circuits.

## Mobile Voice and Data Services:

The availability and functions of mobile wireless services have exploded and geographic coverages have improved to the point where we can now "cut the cord" and connect not only from home, but also anytime from anywhere. Paging services can inexpensively alert you that you need to call a certain number or transmit a brief text message to display on your personal receiver. Mobile telephones can be conveniently carried along to let you converse from anywhere within their service area or wherever your provider has roaming agreements with other carriers. There had been enormous growth in consumer choice, the introduction of new service plans and options, as well as a sharp decrease in prices for airtime, sometimes bundling in Long Distance as well.

Mobile telephones may be analog or digital, with analog tending to have greater geographic coverage and digital having better voice quality where service is available. Mobile phones often have both analog and digital capabilities for maximum flexibility in connecting. They are increasingly data enabled allowing you to exchange e-mail, browse the web (or limited versions of it), and have in a single device not only your phone but also the functions of electronic organizers or Personal Digital Assistants (PDAs). As mobile wireless networks are upgraded to higher data rates and capabilities, sometimes known as 3G or third generation systems, we will be able to fully access digital messaging and browsing at reasonable data rates while untethered.

If you plan to travel much, you should certainly confirm coverage for the locales of interest to you and determine whether appropriate roaming arrangements are in place. There are a great variety of calling plans and costs that may have flat monthly rates including certain amounts of minutes, may include Long Distance charges, and possible roaming charges for use of your phone while traveling. Your employer may already have specific contracts in place with certain vendors which may offer a better value or that they would prefer you use for centralized management and billing or for other reasons. Some employers expect their workers to be reachable by pager or mobile telephone or making calls from the road may be essential to your job, so they may pay for all or part of your equipment and service fees.

# The Fax of Life:

Today's business relies on the documents we author, review, and route to others. Businesses commonly use the phone lines to transmit facsimiles (or faxes) of necessary documents instantaneously across town, the country or the world. Though most documents are now transmitted electronically as data files, your job and your telework may still require the ability to send and receive faxes.

As a teleworker, you have a variety of options for transmitting and receiving fax communications. First, you can rely on the equipment at your employer's office, receiving and holding incoming faxes for you and offering you outgoing fax transmission when you are next there. Secondarily, most commercial copy centers and mail service locations have fax machines where for a small charge you can send or receive your faxes. A neighbor, friend or community center may have fax capability they are willing to occasionally share with you. Beyond that, you can move your fax communications capability to your own home office in a variety of ways.

Dedicated fax machine can be quite inexpensive and connect simply to any phone jack. Depending on the volume of incoming faxes you will receive, you may want to consider the use of a dedicated phone line. You also will want to consider what kind of paper is used, what printer technology transfers the image to the paper, and what the estimated cost of printing each page is. Modern multi-function fax machines may offer additional features and convenience with full color capabilities and the ability to act as a low-volume copy machine. Such modern marvels can usually be hooked up to your computer as well, serving as a printer or document scanner, for example. Combining a variety of functions and capabilities can often be an effective solution in a crowded workspace.

Additionally, your home computer with its modem may be configured to work as your fax machine. When the computer is powered on and instructed to do so, its modem can answer your phone line to receive an incoming fax. You can also instruct it to send a document you've created with your word processor or another application to someone else's fax machine. However, if you need to use your computer to transmit documents that you only have in hard copy form, you will need a scanner to let your computer capture an image of each page to subsequently transmit. Some further options exist to use your computer and its Internet connection to get faxes to their destination at even lower cost.

# Desktop Computer Systems:

The frequency and complexity of the tasks you will be performing at home will help define the minimum performance level of your personal computer, the bandwidth and style of telecom connectivity that will suit you, and the software applications you will need to do your work remotely. You should review your enterprise's minimum requirements or standards for Personal Computer (PC) systems running common applications and any special needs for the work you need to perform with your Information Technology (IT) support group. You should also determine whether your workplace will provide equipment to be used at home by you and what policies are in place concerning shared business and personal use of equipment and resources.

Today's PC is a modern marvel of functionality and capabilities that continues to evolve at a rapid pace. Like most families, you probably already have one or more at home already. Here's a brief overview of some of the main considerations in understanding, selecting, and configuring a PC:

**Platform** - Your enterprise environment may best support or even require a certain operating system or type of PC. The choice of operating system, be it Microsoft Windows, Apple Operating System, or one of the variants of Unix, may affect the choice of hardware systems appropriate to your needs. Such systems are commonly built into modest size box-like chassis that can sit vertically or horizontally on or under your work area. However there are other form factors such as the computer

combined with the visual display that may be more desirable to best integrate to your home workspace. Your computer will undoubtedly be expandable and upgradeable in a variety of ways including internal card slots, memory slots, added or upgraded storage devices, attached peripherals, and so on.

**Computing Power** - The main brain of your PC is called the Central Processing Unit (CPU) or microcomputer chip. For decades Moore's Law has correctly anticipated the approximate doubling of computer power every 18 months we continue to experience. Today's fastest chips operate at several gigahertz (GHz) or several billion computer operations per second. Though the speed of your CPU is a fair indication of computing power and many applications specify certain minimums, a variety of other factors contribute to overall performance of your system and the applications you run.

**Computer Memory** - Your CPU needs a certain minimum of high-speed short-term memory for temporary use known as Random Access Memory (RAM) to run your operating environment and multiple open applications and tasks. Generally, the more memory you have installed, the better, for less memory swapping and better efficiency. Today's PCs will usually have at least 128 megabytes (MB) of Random Access Memory (RAM) and may have as much as a gigabyte (GB) or more.

**Hard Disk Storage** - Your operating system, a variety of sophisticated software applications, and all your data and messages are customarily stored on a hard disk drive buried inside your PC but with a visible activity light so you can see when it's in use. Today's PCs will usually have hard disk drives of at least 20 gigabytes (GB or billions of storage locations), but may be as much as 100 GB or more. Sometimes multiple hard drives may be installed or attached externally to expand storage capacity or add redundancy. As the primary repository of your work environment and working document storage, it is essential that you have regular backup procedures to copy critical information to secondary hard drives, removable media or over a network to be copied and stored from centralized locations either in your home or at your organization's facilities.

**Removable Storage** - The most common removable media is the Floppy Disk, long used for data storage and exchange, but somewhat limited at its usual 1.44 megabytes (MB) capacity for today's larger data files. Compact Discs or CD-ROMs can hold some 700 MB and will play music CDs as well as access large volumes of computer data. The drive and media may be writable (CD-R) or even rewritable (CD-RW) and thus quite practical for backing up your data. Digital Video Discs or DVDs are higher capacity optical disks that can hold entire movies or from 4.7GB to some 17 GB of data. Additional removable storage devices to consider are Zip Drives (commonly 100 MB, 250 MB or 750 MB capacity) and Tape Drives, which can hold tens of gigabytes. Storage devices may be added internal to your computer or as external devices connected to the main system. Backup procedures often call for making multiple copies of your data from a schedule or set of procedures and storing some copies away from the computer or at another location.

**Keyboard** - A typewriter style keyboard with a standard key layout (QWERTY) is included with almost every PC. It can be readily replaced with other styles or configurations, even with different key layouts or incorporating navigation or pointing devices, to best support your work style and comfort. Your keyboard will usually connect to a jack on your computer reserved for that function, probably a serial (PS/2) or Universal Serial Bus (USB) port.

**Navigation or Pointing Devices** - The most common navigation or pointing device is known as a mouse and is moved by hand across a flat surface to indicate motion commands to your computer acting along with your use of its pushbutton switches for control functions. Alternatives include trackballs and joysticks, again selected to best support your work style and comfort. Voice recognition, data gloves, eye tracking, and other special input devices may be applicable to you and are of special interest as they may enable those with disabilities or special needs to best utilize personal computer systems. Your primary navigation or pointing device will usually connect to a jack on your

computer reserved for that function, probably a serial (PS/2) or Universal Serial Bus (USB) port, but additional devices may be simultaneously connected for your convenience and comfort.

**Visual Display** - The most common visual display for the PC is a video monitor.  Monitor size is the measure of the diagonal of the picture tube or Cathode Ray Tube (CRT) with a suggested desktop minimum of 15 inches.  However, 17 inches is preferable and 19-21 inches even better.  The monitor should be able to synchronize with and set up to accommodate a variety of display resolutions and preferably have a small dot size specification for sharper imaging.  The actual useful display area is usually about 1" less than the picture tube.  Flat panel displays such as those found in laptop computers take up much less desk space and are much more energy efficient, but cost significantly more for desktop applications.  They are usually quite sharp visually and can fit quite well into the enterprise or home work area, especially where space is limited.

**Audio Input and Output** - Though your computer is likely to have a small internal speaker for status beeps and alerts, usually an external pair of stereo speakers is connected to a stereo mini-phone jack for projecting sound around your work area.  Alternately, a set of headphones may be used for privacy, noise isolation, and possibly better audio quality.  A microphone can be plugged into another mini-phone jack for audio input for applications such as computer telephony and voice recognition.  A headset combining the microphone with a speaker or two can be used for hands-free convenience.  Additionally, audio jacks can be used to bring external sound sources into the computer or alternately connect the computers sound output to other external amplifiers or devices.

**External Connectors for Other Stuff** - Every desktop computer has a plethora of ports to hook-up a variety of necessary and optional peripheral devices and accessories.  Usually you will find most ports on the back of the PC either directly mounted on the rear chassis or on the edge of add-in function cards.  Some ports may also be available on the front of your computer for convenience in accessing.  More recent PCs may actually have fewer external connections, favoring newer external link interfaces such as USB and FireWire over legacy ports.

> **Keyboard** - usually serial (PS/2) or Universal Serial Bus (USB) and clearly labeled on the PC
>
> **Mouse** - usually serial (PS/2) or Universal Serial Bus (USB) and clearly labeled on the PC
>
> **Video Graphics Adapter (VGA)** - connection to external video monitor or flat panel display
>
> **Composite or S-Video** - video connection to external NTSC television set or recording device
>
> **Serial** - common port for navigation devices and other peripherals in a DB-9 male jack
>
> **Parallel** - common port for printers and other peripherals in a DB-25 female jack
>
> **Infrared Port** - external lens and internal components transceiving data via infrared light
>
> **Universal Serial Bus (USB)** - newer common serial port readily shared by multiple peripherals
>
> **FireWire (IEEE-1394, i.Link ®)** - newer high-speed serial port for connecting to digital imaging devices as well as shared by multiple external peripherals
>
> **Audio** - usually several jacks including speaker/headphone out and microphone in, as well as possibly stereo mini-phone jacks for line in and line out functions.
>
> **Modem** - usually a telephone jack (RJ-11) for low-speed connections through the phone line but may include xDSL or cable modem functions internal to the PC rather than external
>
> **Ethernet or other network connection** - connect via Ethernet jack (RJ-45) or other network protocol to a home Local Area Network (LAN) and/or external broadband modem and services
>
> **Bluetooth** - possible antenna (or add-in function) for connecting interface devices and peripherals without wires up to 10 meters distance over a Personal Area Network (PAN)
>
> **Wireless Local Area Network (WLAN, 802.11x)** - possible antenna (or add-in function card) to support a short-haul wireless network connection within the workplace or home

# Computer Peripherals:

Even though today most of our communications and work documents start off electronically as computer data and files, we seem to still need plenty of hard copy, that is documents printed off to paper to read, markup, store or distribute.  Most home PCs are accompanied by one or more printers placed nearby to provide convenient hard copy on demand.

Laser printers transfer dry toner to the page at high speed and generally have a much lower cost per page for printing.  Monochrome (black and white only) laser printers are modestly priced, but color lasers can be relatively expensive.  Some of these printers allow for additional paper handling options including extra paper sources (i.e. - letterhead, legal size, envelopes) and possibly even duplexing for double sided printing which can save much paper and filing space.  If you do any significant volume of printing and monochrome output is sufficient, a laser printer may be your best choice.

Ink jet printers are available at very low cost and operate by shooting dots of ink in usually one or more of their four colors (black, red, blue, yellow) at your paper in a scanning fashion.  They can produce excellent color output at modest speeds.  However the necessary ink cartridges generally cost more per page printed than lasers.  If you do documents in color, produce digital photographs or work with other graphic images, an ink jet printer offers affordable color output.  As we discussed earlier, modern multi-function fax machines may offer additional features and convenience including a computer interface to allow the multi-mode device to act as a general purpose ink jet printer as well as a color scanner, copy machine, and of course a stand-alone fax machine.

Desktop scanners offer the ability to capture an image of paper documents as a graphic file that can then work in coordination with graphic packages, Optical Character Recognition (OCR), and document management applications to help enable and manage your work flow.  A digital still camera can be connected to your computer to download your photographic images for manipulation and storage.  You can also connect to various video cameras or sources to capture and download video clips.  Audio files may be captured or "ripped" directly from Compact Discs, acquired from a convenient microphone or audio line input as well as downloaded over networks or the Internet for playback and subsequent management.  Video content may be similarly handled.  All of these rich media applications generate substantial file sizes and driving mass storage capacity needs and bandwidth requirements ever higher.

# Mobile Computing on the Go:

There has been an explosion of mobile information appliances that people carry, often in addition to their mobile phone, ranging from simple electronic organizers to sophisticated Personal Digital Assistants (PDAs) that can help manage your affairs on the go.  Today's mobile phones and PDAs are converging yielding combined devices that are both voice and data enabled, allowing you to exchange e-mail, browse the web (or limited versions of it), and run a variety of organizer and other applications anytime from anyplace.  Third generation (3G) wireless services will provide convenient high-speed mobile broadband, making videoconferencing and rich media applications on the go quite practical.

Laptop computers are moderately portable and can provide all the power and capabilities of high-end desktop PCs.  Standard sized units generally run from 6 to 8 pounds with viewing screens up to 15" and will generally incorporate a floppy disk drive and CD-ROM drive as well as a hard disk drive.  You will need to carry an external power supply and various extra cables and support items usually in some special purpose carrying bag.  Smaller laptop units of from 3 to 5 pounds may still hold all the

features and capabilities that you'll need and be much easier to take along. You can take along additional external storage devices, peripherals, cables, and accessories as needed.

Your employer may well provide mobile computers to some of their workforce and have standards and programs already in place. By taking your laptop computer along with you, it can serve as your primary PC at home and on the road, but also perhaps dock and be used in your enterprise office as well. PDAs and other small mobile devices will usually dock at work and at home to transfer and synchronize files. Again, your IT services can help with selection, configuration, and support.

## Ergonomics for Your Comfort and Health:

Ergonomics is the science of designing and arranging things people use for efficient and safe interactions. Your work area, your particular equipment, your seating, and a number of other factors can have a significant effect on your productivity, comfort, and health. Let's take a closer look at some of these and start with some basic guidelines.
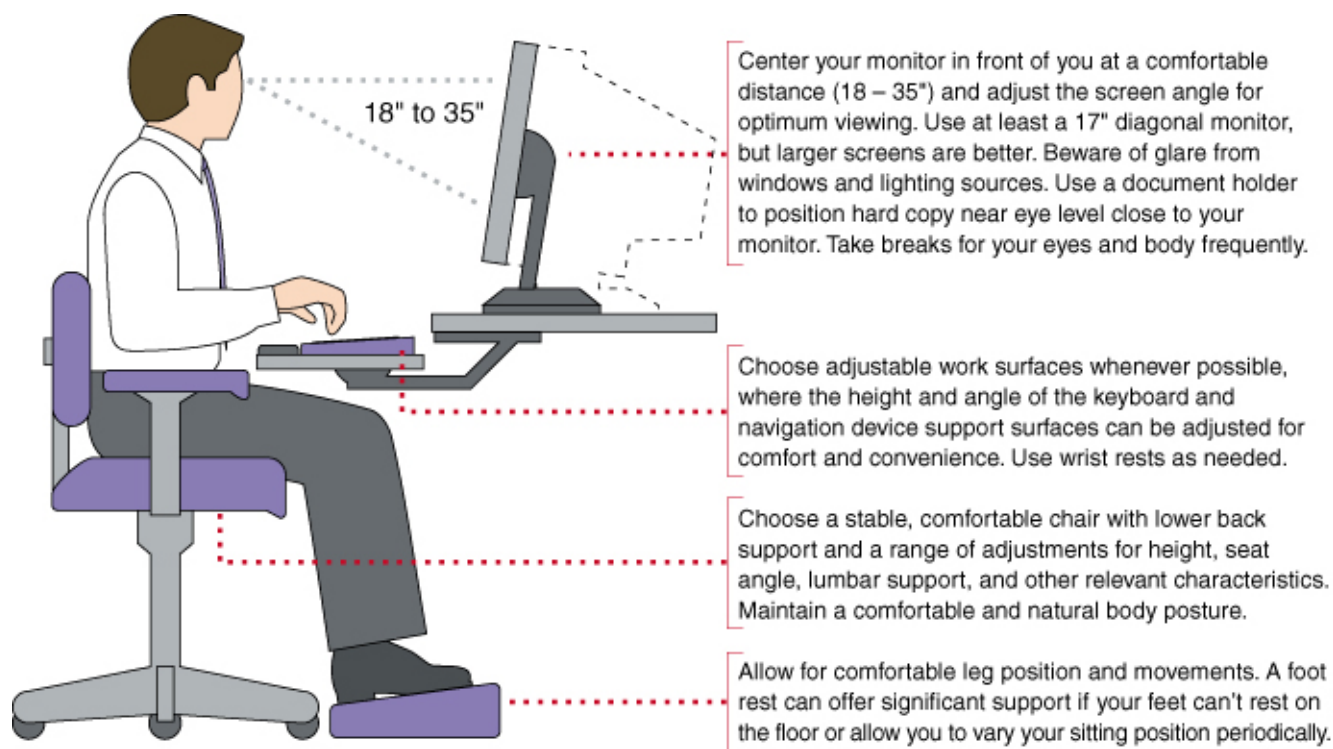
Your home work area may be a laptop set up temporarily on the kitchen table, a PC off to the side in the bedroom or preferably a work station set up with other furniture and office necessities in a separate room that can be used as a home office. The computer itself should be placed conveniently nearby to allow easy access to removable storage devices, to make cable connections, and to monitor status lights if needed. Make sure there is ready access to sufficient electrical outlets and capacity as well as to a phone jack and any necessary broadband or home network connections. Leave room for any peripherals such as printers, scanners, and external storage devices.

The video monitor or flat panel display should be placed at a comfortable height and distance in relation to your usual sitting position and titled and swiveled in place for optimum viewing. Generally laptop screens will range from 12-15 inches diagonally and video monitors and flat screen panels from 15-21 inches. The larger and sharper the screen you end up with, the better off you'll be. Ambient light can reflect visibly from the screen creating glare that makes images more difficult to see, so control its impact by placing light fixtures and carefully directing where they point, as well as possibly placing a shade or shroud around the computer's screen or adding a special viewing filter.

Long work sessions can strain your eyesight so plan to give your eyes a break periodically by doing other kinds of work, looking away, shutting them or exercising them. You might consider special computer glasses or contacts to use while you work at the computer. They can be made to your prescription for short to medium range vision correction appropriate to the variety of tasks you normally perform and can be of great help. Please consult your optometrist or ophthalmologist.

The selection and placement of your keyboard and navigation or pointing devices are critical to your comfort and ability to work on your computer for extended periods. The standard keyboard can be readily replaced with other styles or configurations, even with different key layouts or incorporating navigation devices, to best support your work style and comfort. While a desk surface or table may have a fixed height on which to set your gear, specially designed computer workstations often can be adjusted for optimum height and position, especially important for your use of your keyboard. You can also add a special keyboard drawer or mounting structure to place your keyboard at an optimum angle and position for your hands. A good alternative to using a mouse around is to substitute a trackball, which essentially flips it over so your hand remains stationary while your fingers roll a ball and push buttons. Voice recognition, eye tracking, and other special input devices are also available to personalize the control of your computer to optimum effect.

# Personal Computer Ergonomic Considerations

18" to 35"

Center your monitor in front of you at a comfortable distance (18 – 35") and adjust the screen angle for optimum viewing. Use at least a 17" diagonal monitor, but larger screens are better. Beware of glare from windows and lighting sources. Use a document holder to position hard copy near eye level close to your monitor. Take breaks for your eyes and body frequently.

Choose adjustable work surfaces whenever possible, where the height and angle of the keyboard and navigation device support surfaces can be adjusted for comfort and convenience. Use wrist rests as needed.

Choose a stable, comfortable chair with lower back support and a range of adjustments for height, seat angle, lumbar support, and other relevant characteristics. Maintain a comfortable and natural body posture.

Allow for comfortable leg position and movements. A foot rest can offer significant support if your feet can't rest on the floor or allow you to vary your sitting position periodically.

(Source: International Research Center, http://www.researchedge.com/)

For physical comfort you'll need a good chair that can be adjusted in a variety of ways to best support your posture and make you comfortable in your common sitting position.  Your posture is similarly important and you should try to maintain a natural "S" curve of your spine while seated.  You should use auxiliary supports for your limbs with well-adjusted arm rests on your chair or additional wrist or palm rests where necessary.  Experiment with the arrangement of your workstation, equipment, and chair to find the best configuration for you.  Make sure your work surfaces have sufficient lighting and that glare off your monitor screen and working documents is minimized.  There are a wide variety of alternative keyboard and navigation device designs as well as numerous accessories to help you customize your work area and computer configuration for maximum comfort and usability. Also, remember to take frequent and possibly scheduled short breaks to stretch, exercise or walk around.

We have discussed various aspects of ergonomics as they may affect your home working environment, comfort, and health.  A well organized and properly equipped home work area can make you more productive, help keep you healthy, and generally improve the quality of your telework experience.  In **Appendix A - Where to Learn More about Telework** you'll find pointers and links to additional ergonomic resources.  However, this guide does not intend to give medical opinions or advice.  If you experience any physical pain or discomfort, difficulty with your vision or other health symptoms you believe may be related to your home work processes, equipment or environment, please confer with your organization's support professionals for guidance and possible solutions and also seek the advice of a physician.

# Home Networking:

Most homes have at least one PC and many today have more than one to support the members of the household, young and old, in their work and personal pursuits.  Often these PCs and associated printers and peripherals are connected in a Local Area Network (LAN) right there at home, allowing for sharing data files, peripherals, and a high-speed broadband Internet connection.  Your home network may well rely on a hub and direct network wiring with Category-5 cable carrying Ethernet at data rates of 10 Mbps, 100 Mbps or even 1 Gbps to multiple locations about the house. However, adding such wiring to existing dwellings can be difficult and expensive so fortunately there are a number of other alternatives.

You can actually use your in-house telephone wiring to carry data around the home over Home Phone Network Adapters (HomePNA) while maintaining a standard voice circuit.  You can also go wireless by a variety of methods to avoid the need to install physical network wiring.  Though there is a specific HomeRF standard, Wireless Local Area Networks (WLANs) based on IEEE-802.11 standards also known as Wi-Fi (Wireless Fidelity) are most common and consistent with enterprise wireless networks, yielding data rates of 11 Mbps on up to 50 Mbps and beyond.  Another emerging wireless technology is Bluetooth that can be used over short distances (up to 10 meters) to establish Personal Area Networks (PANs) for interconnecting peripherals like keyboards, headsets, and printers to local PCs without wires.  Your IT department can likely assist in determining your home network requirements and optimum configuration and may well help you get it going.  See **Appendix A - Where to Learn More about Telework** for additional resources and links.

## Modern Home Network Example



(Source: International Research Center, http://www.researchedge.com/)
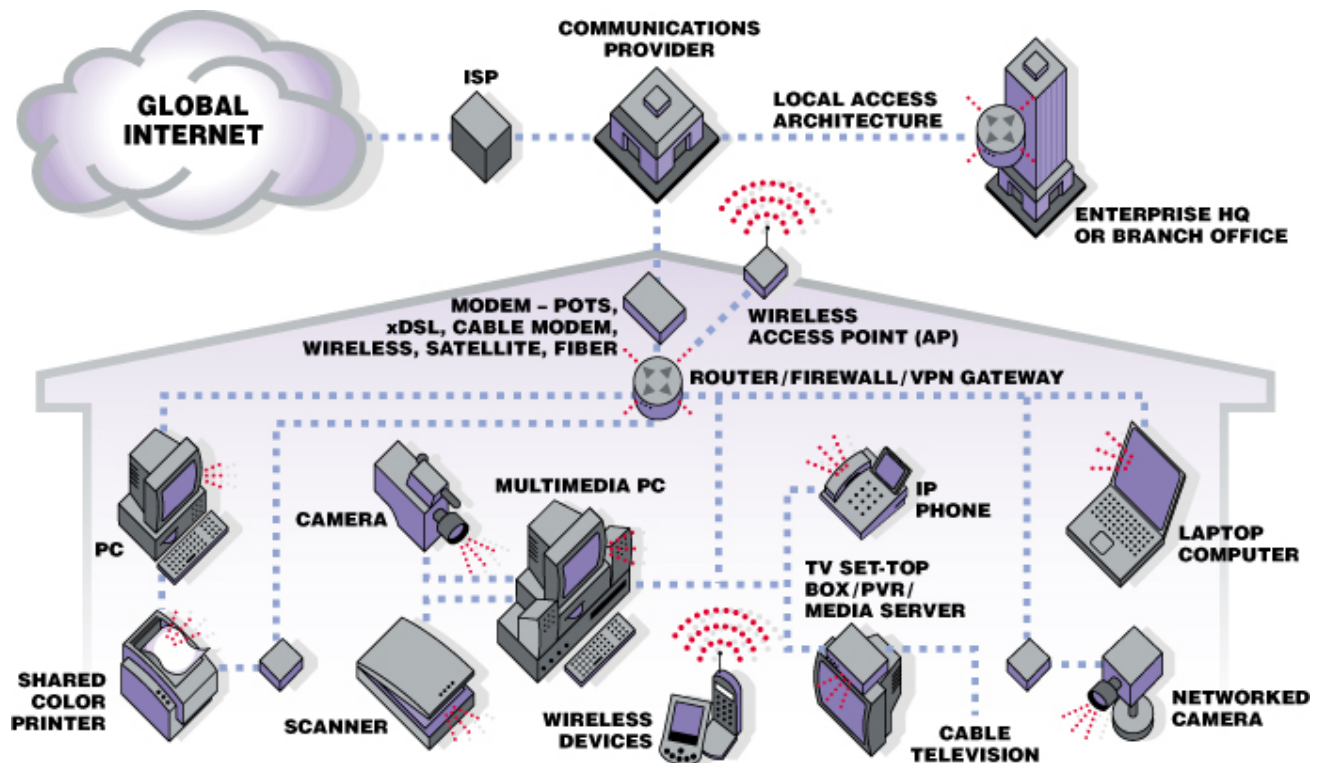
# Getting the Bandwidth You Need and Using the Bandwidth You Get:

Though you may dial in from home, connecting your PC or laptop through standard telephone modems to the Internet or directly to the enterprise, your data rates will be severely limited and may preclude running more advanced applications. Remember, broadband is better! Since your enterprise is already using sophisticated telecom equipment and commercial services to connect the LANs of separate facilities, they can readily integrate you and other remote workers as well into a Wide Area Network (WAN) covering your local region or spanning continents.

## U.S. Residential Dial-up and Broadband Forecasts (in Millions)

| CONNECTION TECHNOLOGY | 2000 ACTUALS | 2002 ESTIMATES | 2004 ESTIMATES |
|---|---|---|---|
| DIAL-UP (V.90 TO 56 Kbps) | (41.8) | (46.1) | (42.1) |
| WEB TV (PRIMARY CONNECTION) | 1.0 | 0.6 | 0.5 |
| INTERACTIVE TV (SET-TOP BOX) | - | 0.5 | 3.0 |
| CABLE MODEM | 3.7 | 9.9 | 16.6 |
| xDSL | 2.4 | 6.2 | 11.5 |
| OTHER BROADBAND | 0.1 | 1.0 | 3.6 |
| TOTAL BROADBAND | 6.21 | 17.60 | 34.70 |

Source: eMarketer, Inc., http://www.emarketer.com/. Notes: Year 2000 Actuals derived from U.S. DOC & OECD surveys. Other Broadband category includes wireless, satellite, and fiber to the home.)

Your communications traffic from remote locations such as your home be connected over dedicated circuits, but can best be routed virtually through the Internet to establish a private connection or Virtual Private Network (VPN) enhancing security and more closely linking remote end-users to the enterprise operations. Internet browsing, teleconferencing, and advanced applications are supportable and the network complexity and its uses can expand for future growth as needed. Concerns for privacy and security require firewall and other protective technology to protect the resources of the enterprise LAN from hackers and unauthorized external parties by managing user access privileges, monitoring network traffic, and detecting intrusions in real-time. Please see **Appendix B - Telecommunications Overview** for additional information and guidelines on getting and using broadband connections.

You may use a variety of telecom options to stay connected while traveling. Even if you are blessed with broadband at work and at home, you may have to revert to using slower telephone modems as a lowest common denominator from some remote locations. But increasingly hotel rooms and business settings are providing Ethernet connections linked to the Internet at high-speed for your convenience. Conferences and trade shows often set up Internet connected message centers or cyber cafes to support attendees. And public terminals and facilities are likely available for short-term use such as kiosks, rental workstations, and library facilities. Additionally, Wireless Local Area Networks (WLANs) are being deployed in hotels, restaurants, airports, and public spaces to enable laptops and other mobile devices to connect at high-speed whenever they are within range, usually up to a few hundred feet. Use of these wireless "hot spots" may be free and open or may require short-term charges or subscription to various roaming services. Such wireless connections always carry some additional security risks and should be used as appropriate and with additional layers of security when necessary.

# E-mail at Home and In the Enterprise:

Today's knowledge workers frequently need to communicate with co-workers and customers by exchanging e-mail messages. These messages are often less formal than business letters but can concisely get the point across and instantly reach the recipient across the globe. Such messages may go from one person to just one other individual or be broadcast to a defined group or list of people. E-mail may even be sent (or "posted") to an online discussion group for sharing with a large group of participants. These discussion groups may be public for anyone to join or see or private for a limited audience and access. The number of e-mails transmitted electronically has now surpassed the number of pieces of mail that are physically delivered, with e-mail becoming the most popular means of communications in the modern world and still growing strong.

At work, you may expect your e-mail to show up automatically on your computer screen or "desktop," as your enterprise's Local Area Network (LAN) administrator has likely configured it. When using your personal or portable computer from a remote location, it must be properly "configured" to access the Internet, your enterprise LAN, and your various e-mail accounts (it's not unusual to have several). Any of the forms of telecommunications connectivity that we will describe in detail below will "get you there" and your web browser should include basic e-mail capability to allow you to send, receive, and file your messages. Your work place LAN Administrator or Information Technology (IT) department should be able to help get you set up and going.

Though e-mail messages may (and often do) just contain text, data files generated by your desktop applications may be "attached" to your message for transmitting to your correspondents. Upon receipt, the files are saved to their hard disk drives and may be viewed and used by them, retaining the full "look and feel" of your original work and may be merged along with other team members output into even more complex documents and work products. Some examples of these attached files are your word processing documents, numeric spreadsheets, business presentations, databases, graphic designs, Computer Aided Design (CAD) drawings, as well as rich multi-media audio and video clips up to complete shows and productions.

More advanced e-mail applications will allow you to generate an automatic response to some or all incoming messages (such as a notice if you're away on vacation), automatically file incoming mail into folders for later review, and filter out or reject or redirect messages from certain users or sources. Your e-mail management application may allow you to maintain a contact directory of all your correspondents so that you can readily select individuals or groups to send your messages to without having to remember any of their e-mail addresses. You should, however, keep in mind that though e-mail is quick to draft and send and may seem relatively informal, anything you state or promise may well represent a binding legal commitment for your employer and your online behavior may reflect on them. If your message contains privileged or confidential information you may be expected to use encryption for increased security. Finally, a written acceptable use policy or some section of your employee manual may govern proprietary information and use of e-mail utilizing company resources.

Sending and receiving your electronic mail (or e-mail) from doesn't even necessarily require a personal computer. Some alternatives include dedicated web television devices and services (they still likely utilize your phone line) and advanced cable television set-top boxes, as well as new generation desktop and wireless telephones with information access capabilities. Converged devices with advanced voice and data functions are commonly known as "information appliances" along with advanced wireless network data capabilities will allow our e-mail to follow us everywhere!

# Browsing the World Wide Web:

One of the greatest advances in computer technology of our time is the introduction of a graphical user interface (GUI) for the Internet and the World Wide Web (WWW). Previously, use of the Internet was text-based and had required one to learn often arcane and difficult commands and techniques. Any relatively modern personal computer will support an Internet browser application that will manage your net connection and control your surfing experience with a high-quality visual presentation on the screen before you. This window opens onto a wide world of information and resources that may prove of tremendous value to you in your work and in your personal life as you learn your way around.

Your employer likely has a web site of their own, designed for general public access. It customarily starts with a home page that introduces the company and provides a table of contents or links to underlying content such as a history of the company, investor relations (especially for a public company), product information, press releases, contact information, links to other related resources, etc. You may want the company home page to come up as your personal home page whenever your browser is started (or launched) or you may prefer to select another default home page more suitable to your needs and interests.

In addition to their public Internet presence, your employer may provide an Intranet exclusively for its employees. Use is restricted to those physically onsite and remote users, usually employees, with a special password, authorized connection or other access security. On this Intranet one would find internal documents, perhaps departmental strategies, budgets, and projects; human resources policies and benefit assistance; employee news and management announcements; etc. It's both a private workspace for employees and a company communications and collaboration vehicle.

The most popular browser applications are Microsoft's Internet Explorer, Netscape's Communicator, and Apple's Safari. They all support plug-ins (small software add-ons and viewers for special types of files, media formats, and applets) and can manage your e-mail, access news groups, enable collaborative conferencing, and otherwise support the Internet experience. As with e-mail, certain personal browsing of the Internet while utilizing company equipment, connectivity, and resources may be governed by a written acceptable use policy or some section of your employee manual. Surf safely!

# Desktop Suites, Special Applications, Sharing Data and Files:

The modern office environment has come to depend on a variety of computer-generated documents for running the business. These documents and applications may include word processing, numerical spreadsheets, databases of critical information, and graphic presentations. Taken together they are commonly known as a desktop software suite. Additional applications frequently used include contact managers (a form of database for keeping track of other people), scheduling for meetings, project management for setting timelines and managing resources, and accounting among others.

Special software applications are used for a great variety of other purposes. You likely already manage a great variety of documents and media assets such as photos, drawings, sound, and video in your work and personal life. And your job may well rely on some specialized computer programs to perform specific functions and aid you in your work. For example, accounting is carried out with integrated accounting packages often linking to enterprise databases. Applications like Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Sales Force Automation (SFA) may serve various workgroups and departments. Computerized technical drawing or Computer-

Aided Design (CAD) has largely replaced the use of traditional drafting tables for product design and iteration. Process monitoring and production automation drive manufacturing excellence. Test and laboratory management software may collect data results and analyze it. Statistical analysis applications serve a wide variety of analytical investigations from weather prediction to manufacturing process control. The common thread for all these uses, though, is the interconnection of all these computers, their applications, and the resulting data and documents over local area and wide area networks. Files are stored on servers or transmitted across a network of computers to be shared by all authorized personnel for the efficient and effective operation of the company and productive use of human resources and work product.

As you may work with several different computers at a variety of locations, it becomes extremely important to learn how to remotely access your applications and data as well as how to synchronize files across your work environment and any computing devices you use. Your enterprise IT group should have specific recommendations, tools, and procedures to aid you in scheduling and executing regular backups. You may back up your files from the computers you use to local storage devices such as floppy disks, CD-ROMs, tape storage, and so on. Or you may utilize capabilities of the enterprise network to make regular automated backups of your important data to insure its safety and preservation. The data you handle and create is a valuable enterprise asset. Back it up regularly.

## Collaboration, Groupware, and Conferencing Applications:

More recently, browsers and stand-alone applications have been designed to aid the collaborative process by better managing the exchange of data between co-workers and other interested parties. They may not only distribute and track documents, but allow the real-time viewing and sharing of them combined with audio and/or videoconferencing and the ability to mark-up or alter these documents in plain view of your collaborators. These tools are proving quite valuable in increasing productivity and improving communications. They are shortening the time to market for new products and services, reducing errors and cycle time, and are often the best alternative to gathering the involved individuals for face-to-face meetings.

We can conference, share documents and use tools like Instant Messaging (IM) to communicate instantly and conveniently with coworkers and others. There are several Instant Messaging standards from ISPs or other service providers, so check with your IT group regarding your ability to use specific IM platforms and what security tools and procedures should be utilized. Additionally, a new generation of collaborative tools and Peer-to-Peer (P2P) networking allow enterprise content to be distributed across multiple systems and shared in an authorized, efficient, and safe manor. As a remote worker at home or on the road, you can share all the immediacy and benefits of the enterprise's virtualized collaborative communications environment.

Most desktop and laptop computers already have good audio capabilities allowing them to output via their speakers (or headphone jack) and use a built-in or easily added external microphone for speaking to and through the computer. In many enterprise environments, the computer is supplementing or even replacing the desk phone for voice communications, usually by using Voice over Internet Protocol (VoIP) technologies. Since leased telecommunications circuits are usually more limited and expensive, the Internet can carry data without much concern as to what it is, handling voice traffic alongside computer data, video, and other digital information allowing long distance and other costs to be managed and reduced.

The traditional room-to-room videoconferencing that has long enabled long distance meetings for groups is being extended to support desktop-to-room and desktop-to-desktop applications. It is relatively easy to add a color video camera to your computer and transmit images along with your voice and documents. Of course, for these advanced uses you must have the right connections, a LAN to other nearby computers and an Internet connection of sufficient speed or well designed WAN for remote communications. Again, your Network Administrator can assist in getting you configured and connected to help "make it all happen."

## Keeping Safe in Cyberspace:

No one "owns" the Internet and no single government, agency or entity is "responsible" for it. It is a shared responsibility of all its users and you must do your part to protect yourself, your friends and family, as well as your employer as we come to increasingly conduct our business and our lives online. Enterprise data that you access and work with may be private, sensitive, proprietary, or otherwise essential to keep control of and keep safe. And you are an important participant with a critical role in your enterprise's business continuity plans and disaster recovery efforts.

First you must protect your computers themselves and the storage devices and removable media that you use. A lost laptop can expose enterprise information to inappropriate eyes. Password protection, biometric authorization, encrypted transmissions and sessions, secured connections, and other techniques are commonly used to help protect systems and communications. The enterprise and most remote locations including individual residences should have firewalls, anti-virus and filtering applications as well as other protective measures in place. And in a constantly evolving world of technological complexity and cyber threats, it is essential to keep up with alerts, equipment and software updates, and best practices. Telework safe!

Please see the earlier section **Information Technology and Telework: Supporting the Mobile Workforce**, in particular the coverage of **Security in a Networked World** for more information. And use the computer security resources detailed in **Appendix A - Where to Learn More about Telework** to further your research and explorations.

## Top Ten Personal Cyber Security Tips

1. Use protection software such as "anti-virus software" and keep it up to date.
2. Don't open email from unknown sources.
3. Use hard-to-guess passwords.
4. Protect your computer from Internet intruders by using "firewalls".
5. Don't share access to your computers with strangers. Learn about file sharing risks.
6. Disconnect from the Internet when not in use.
7. Back up your computer data.
8. Regularly download security protection update "patches".
9. Check your security on a regular basis. When you change your clocks for daylight-savings time, reevaluate your computer security.
10. Make sure your family members and/or your employees know what to do if your computer becomes infected.

Source: Stay Safe Online (http://www.staysafeonline.info/sectips.adp)

# Time to Telework: Ready, Set, Go!

We've tried to provide a comprehensive, understandable guide to help you recognize the benefits of telework and be better aware of all the various issues involved.  We've included a wealth of resources to help you learn more and to keep up with the information technology that continues to permeate the enterprise and all of its operations as well as our personal lives.  As broadband accelerates our communications and collaborations, as high-speed mobile wireless enables anywhere, anytime connectedness, telework will become ever more a part of our work experience and our lives.

Whether you have your own home-based business or work from an office and as you travel from place to place, the tools and techniques outlined here should lay the groundwork for successful telework, both the human and technology sides of it.  If your enterprise already has a history of successful teleworking and the policies and technology in place, you're all set to go.  Just find out how your enterprise has enabled and supported telework so far and begin the process yourself with your supervisor and Human Relations department.  If there hasn't been much telework previously in your organization, you may have to help lead the way to achieve recognition of telework's valuable role and help set the stage for it.  In any case, it's time.  Let's get teleworking!

# Telework Success Stories:
# Enterprises That Are Living It

## Broadcom Supports Semiconductor Industry Knowledge Workers:

Orange County, CA - Broadcom Corporation (http://www.broadcom.com/), the leading provider of highly integrated silicon solutions that enable broadband communications and networking of voice, video and data services, chose to implement a "telework" architecture that would make their employees more productive by enabling the employees to securely log on to Broadcom's internal network from home.  Broadcom and Cox Business Services partnered to create a robust Virtual Private Network (VPN) solution for the Orange County, California corporate headquarters employees.

To minimize implementation risk and on going support issues, Broadcom chose to implement a hardware-based VPN network with thin clients or Network Connected Devices (NCDs) powered by Windows Terminal Services on top of the Cox@Work IP network.  VPN networks were "leading edge" concepts when Broadcom first implemented their network.  According to Broadcom CIO Kenneth Venner, Broadcom wanted the simplicity of working with just one provider to deliver the complete VPN solution, and Cox Business Services stepped up to that challenge.  "As we first considered this project, we saw that Cox Orange County was a very progressive technology provider," said Venner.  "After working with Cox, I'd say they deliver a one-stop-shop for all the infrastructure and services a business needs."

If user growth is any indication of success, then the Broadcom telework program is a winner. The program that started three years ago as a trial with 100 connections now boasts as many as 1,300 users of the Broadcom network.  The resulting increases in employee productivity have made Broadcom the industry leader in bringing products to market.

## Carolyn Sechler CPA Operates as a Virtual Small Business Enterprise:

Phoenix, Arizona - Carolyn Sechler, CPA PC (http://www.azcpa.com/) was founded in 1985 as a virtual office accounting firm by Carolyn Sechler after trying out telework with her previous employer following the birth of her daughter.  The firm has grown to more than ten employees and contractors all teleworking from their homes spread across six states and Canada, communicating continuously via the Internet.  Performance measurements clearly show that productivity is consistently high and creativity prevalent in job execution.  And the employees experience a closeness and availability to their families that many office workers don't.  Weekly staff meetings have the locals get together face-to-face while remote participants teleconference in.  This gives everyone a chance to meet and greet while working on any issues in real time conversation and lets the local staff pass along work related materials.  And full time broadband Internet connections, mostly over cable modems, allow the team to communicate and collaborate throughout the workday and beyond.  Sechler CPA saves many thousands of dollars each year in facilities and related costs while continuing to recruit and retain top talent attracted to the flexibility and lifestyle of their predominantly telework environment.

Over the years Carolyn has become an able technologist herself as well as a strong and vocal advocate of value of telework and the benefits of a virtual workforce.  Her experience has allowed her to build the firm and expand their service offerings well beyond accounting and financial reporting to now include strategic and technology integration planning and management consulting.  For three consecutive years, *Accounting Today* magazine has selected her as one of the "Top 100 Most Influential People in the Profession" as well as for their "Trailblazers of Technology."  She has been interviewed by *Fast Company*, *Fortune*, and *Business Week* and is a technology editorial advisor for *Journal of Accountancy* and *The Tax Advisor*.

## Cox Communications Uses CyberAgents for Customer Service:

San Diego and Orange County, CA - Cox Business Services (http://www.coxbusiness.com/) Customer Care Center has begun a telecommuting program for Customer Care Representatives that enables them to provide the company's legendary customer service from home. With input from employees, the CyberForce program was implemented to enhance the working environment and strengthen recruitment and retention.  With CyberForce, over 100 Customer Care Representatives are working from home through a Virtual Private Network (VPN) and high-speed cable modems.  The VPN connects an employee's home computer through a secure tunnel to the Customer Care Center's network so that he or she can handle customer calls from home.  Employees are also provided with office furniture, a computer, and other necessary equipment.

CyberForce is powered by Cox Business Services, a division of the company that oversees the development of VPN products to meet telework and business-to-business needs.  The sophisticated Cox VPN provides CyberForce participants with top-quality network security and call distribution so they can continue their high level of service to customers.  While telework has been credited with reducing stress and increasing employee productivity, CyberForce is also a solution for employees who are homebound, physically challenged or have transportation issues and another example of how Cox Business Services strives to create the best possible working environment for its employees.  "We are thrilled with the tremendous employee response to CyberForce," said Deborah Lawrence, Vice President of the Customer Care Center.  "We expect job applicants will also be excited about having a choice between working at our state-of-the-art call center or at home.  CyberForce is another indication of Cox Business Services' commitment to its employees and its commitment to recruiting the best candidates for our workforce."

# Valley Metro Supports Regional Telework Activities:

Phoenix, Arizona - Valley Metro (http://www.valleymetro.org/) has a long running initiative of providing employer services and resources to assist local companies in developing and promoting alternative commute options to the worksite and helping motivate employees to commute to work by ways other than driving alone. Telework (http://www.valleymetro.org/Rideshare/Telework/) has been a key component of the program since the State of Arizona passed a Trip Reduction Ordinance in 1988 to reduce traffic impacts on air pollution and emissions by requiring major employers and schools to develop, implement, and maintain a Trip Reduction Program.

Susan Tierney, Project Manager and Marketing Coordinator for the Valley Telework Project (VTP) notes, "Along with working to increase the number of teleworkers in the Valley, we also offer several promotional and outreach programs to give current companies with telework the assistance and recognition they deserve in helping to achieve work and life balance as well as trip reduction." The program has helped many local organizations of all sizes and industries start and expand telework for employees with free assistance to those with a sincere commitment to incorporate telework into their business objectives. The participating organizations receive solid telework assistance including developing policies and agreements, training, evaluation, technology assistance, and more. They have consistently discovered that the key to organizations achieving improved employee retention, increased productivity, and a reduced need for office space is to send their employees home and offer strong telework encouragement and support.

Valley Metro and its employer partners have experienced significant success in implementing and expanding regional companies' telework programs, achieving measurable results with substantial economic and community impact. Annual surveys demonstrate a 328% increase in telecommuting since 1993, resulting in an estimated 1.4 million passenger miles not driven per business day. This represents some 5% of the daily commute trips (eliminated) in Maricopa County, reducing Valley pollution by 38,200 pounds per day. This past year has shown a substantial increase in the percentage of employees from companies with over 50 employees telecommuting at least once a week from 7% to 11%. Telecommuters most often say they telecommute because their company is structured that way, allowing their employees to work at home (39%) and it is convenient or easier (24%).

Valley Metro has developed an employee kit specifically designed for employees looking to telework in their current job that puts together the essentials a potential teleworker needs to help sell their boss on the concept. Further, their Project ADOPT (Arizona Donates Office Products for Telework) provides a solution for one of the biggest potential barriers for employees who want to telecommute. Where the company cannot afford to provide computer equipment in the home as well as at the office, donated equipment is refurbished and distributed to allow employees to work from home on a full or part time basis.

Some of the organizations supported in their telework efforts by Valley Metro include Maricopa County, the Cities of Glendale, Mesa, and Scottsdale, as well as numerous commercial entities such as AAA Arizona, America West Vacations, American Express, Big Brothers Big Sisters of Central Arizona, Bull Worldwide Information Systems, Carollo Engineers, CIGNA Healthcare of Arizona, Community Church of Joy, Desert Schools Federal Credit Union, Information Network Corporation (INC), IBM, Mayo Clinic Scottsdale, Medtronic Micro-Rel, Mariscal Weeks McIntyre Friedlander P.A., Mountain Park Health Center, and Waste Management of Arizona. Many of these successes can be reviewed as case studies published on the Telework section of their Web site. Valley Metro remains an exemplary example of a public agency driving telework adoption, quantifying its impact, and supporting its growth across their region.

# Appendix A:
# Where to Learn More about Telework

We've looked at why telework is important and how you can bring it about successfully in your organization.  Now here are a variety of books and Internet resources to help you learn more.

## General Books on Telecommuting and Telework:

**An Organizational Guide to Telecommuting** by George M. Piskurich, 1998, American Society for Training & Development (ASTD), ISBN: 1562860860.

**Telecommuting** by Osman E. Eldib and Daniel Minoli, 1995, Artech House, ISBN: 0890067384.

**Telecommuting for Dummies** by Minda Zetlin, 2001, Hungry Minds Inc., ISBN: 0764553712.

**Telework: Present Situation and Future Development of a New Form of Work Organization** by Werner B. Korte, Simon Robinson and Wolfgang J. Steinle (Editors), 1988, Elsevier Science Ltd., ISBN: 0444703551.

**e-Work Guide: Recommended Telework Practices from the Experts,** project of the International Telework Association and Council (ITAC) and the Consumer Electronics Association (CEA), 2001, Order online at http://www.ce.org/eworkguide/default.asp

**Wired to the World, Chained to the Home: Telework in Daily Life** by Penny Gurstein, 2002, University of British Columbia, ISBN: 0774808470.

## Books on Managing Telework and Virtual Teams:

**Managing Telework: Strategies for Managing the Virtual Workforce** by Jack M. Nilles, 1998, John Wiley & Sons, ISBN: 0471293164.

**The Distance Manager: A Hands On Guide to Managing Off-Site Employees and Virtual Teams** by Kimball Fisher and Mareen Duncan Fisher, 2000, McGraw Hill Text, ISBN: 0071360654.

**Working Virtually: Managing the Human Element for Successful Virtual Teams and Organizations** by Trina Hoefling, 2001, Stylus Publications LLC, ISBN: 1579220320.

**The Virtual Workplace (Series in Information Technology Management)** by Magid Igbaria and Margaret Tan (Editors), 1998, Idea Group Publishing, ISBN: 1878289470.

**Virtual Teams: People Working Across Boundaries with Technology** by Jessica Lipnack and Jeffrey Stamps, 2nd edition, 2000, John Wiley & Sons, ISBN: 0471388254.

**Fifth Generation Management, Dynamic Teaming, Virtual Enterprising and Knowledge Networking** by Charles M. Savage, Revised edition. 1996, Butterworth-Heinemann, ISBN: 0750697016.

# Resource Books for Teleworkers:

**101 Tips for Telecommuters: Successfully Manage Your Work, Team, Technology and Family** by Debra A. Dinnocenzo, 1999, Berrett-Koehler Publisher, ISBN: 1576750698.

**Telecommuting Success: A Practical Guide for Staying in the Loop While Working Away from the Office** by Michael J. Dziak, Gil Gordon and Michael J. Dziak, 2001, Jist Works, ISBN: 1571121099.

**Turn It Off: How to Unplug from the Anytime-Anywhere Office Without Disconnecting Your Career** by Gil E. Gordon, 2001, Three Rivers Press, ISBN: 0609806971.

**The Telecommuter's Advisor: Real World Solutions for Remote Workers** by June Langhoff, 2nd edition, 1999, Aegis Publishing Group, ISBN: 1890154105.

**Work Naked: Eight Essential Principles for Peak Performance in the Virtual Workplace** by Cynthia C. Froggatt, 2001, John Wiley & Sons, ISBN: 0787953903.

**The Underground Guide to Telecommuting: Slightly Askew Advice on Leaving the Rat Race Behind** by Woody Leonhard, 1995, Addison-Wesley Longman, ISBN: 0201483432.

**Free Agent Nation: How America's New Independent Workers Are Transforming the Way We Live** by Daniel H. Pink, 2001, Warner Books, ISBN: 0446525235.

**A New Brand of Expertise: How Independent Consultants, Free Agents, and Interim Managers are Transforming the World of Work** by Marion McGovern and Dennis Russell, 2001, Butterworth-Heinemann, ISBN: 0750672927.

**Working from Home: Everything You Need to Know about Living & Working under the Same Roof** by Sarah A. Edwards and Paul Edwards, 1999, Putnam Publishing Group, ISBN: 0874779766.

**The Home Office & Small Business Answer Book** by Janet Attard, 2000, Saint Martin's Press, ISBN: 0805064508.

**Home Office Design: Everything You Need to Know about Planning, Organizing, & Furnishing Your Work Space** by Neal Zimmerman, 1996, John Wiley & Sons, ISBN: 0471134333.

# Teleconferencing and Remote Collaboration:

**Manager's Pocket Guide to eCommunication** by Laurie K. Benson, 2000, Human Resource Development Press, ISBN: 0874255899.

**Guide to Teleconferencing and Distance Learning** by Patrick Portway and Carla Lane, Third Edition, Advanstar Communications, ISBN: 0964327015.

**Desktop Conferencing: A Complete Guide to Its Applications and Technology** by Barry K. Aldred, 1996, McGraw Hill Text, ISBN: 0077076427.

**Computer-Mediated Communications: Multimedia Applications** by Rob Walters, 1995, Artech House, ISBN: 0890067570.

# Telework Resources on the Internet:

## Organizations that Encourage and Support Telework:

**International Telework Association and Council (ITAC)** - http://www.workingfromanywhere.org/

Telework America - http://www.workingfromanywhere.org/telework/index.htm

Telework America Survey: Teleworking Comes of Age with Broadband Executive Summary - http://www.workingfromanywhere.org/pdf/TWA2003_Executive_Summary.pdf

Telework Buyers Guide - http://www.workingfromanywhere.org/buyersguide/index.htm

Telework Links - http://www.workingfromanywhere.org/resources/links.htm

Telework Public Sector Resources - http://www.workingfromanywhere.org/publicsector/

Home Office Setup - http://www.workingfromanywhere.org/resources/homeoffice.htm

**American Telecommuting Association (ATA)** - http://www.knowledgetree.com/ata.html

Old Thinking vs. New Thinking - http://www.knowledgetree.com/atathink.html

What's So Good About Telecommuting? - http://www.knowledgetree.com/ata-adv.html

**Canadian Telework Association (CTA)** - http://www.ivc.ca/

Telework Links - http://www.ivc.ca/links.html

**European Telework Online** - http://www.eto.org.uk/

Telework and Telecommuting Pages - http://www.eto.org.uk/twork/

Key Resources - http://www.eto.org.uk/resource.htm

**National Environmental Policy Institute (NEPI) eCommute -** http://www.nepi.org/

## U.S. Government Telework Resources:

**U.S. Government's Interagency Telework/Telecommuting Site** - http://www.telework.gov/

OPM Telework Guide for Managers, Supervisors, and Telework Coordinators - http://www.telework.gov/documents/tw_man03/tw_man.asp

OPM - The Status of Telework in the Federal Government (1/03) - http://www.telework.gov/documents/tw_rpt03/status-toc.asp

**U.S. Dept. of Labor Telework Report & Resources** - http://www.dol.gov/asp/telework/

## General Telework Resource Sites:

**Cox Business Services (CBS) Hy-Life Site (Including this Telework Guide)** - http://www.hy-life.com/

**Telecommuting, Teleworking & Alternative Officing (Gil Gordon Associates)** - http://www.gilgordon.com/

**Telecommuting Safety & Health Benefits Institute (TSHBI)** - http://www.gilgordon.com/telecommutesafe/

**Jala International** - http://www.jala.com/

      Telework FAQ - http://www.jala.com/faq.php

      Telework Links - http://www.jala.com/twlinks.htm

      Telework Publications - http://www.jala.com/publicat.php

**Telecommuting Jobs Web Page** (Telecommuting Employment) - http://www.tjobs.com/

**University of California, Davis - Telecommunications and Travel Research Program**
http://www.its.ucdavis.edu/telecom/

      List of Publications (Extensive) - http://www.its.ucdavis.edu/telecom/publist.html

      Related Sites - http://www.its.ucdavis.edu/telecom/related.html

**Yahoo! Directory: Employment and Workplace Issues: Telecommuting** -
http://dir.yahoo.com/Society_and_Culture/Issues_and_Causes/Employment_and_Workplace_Issues/Telecommuting/

**AT&T Telework Web Guide** - http://www.att.com/telework/

      Getting Started - http://www.att.com/telework/get_started/

      Employee Telework Research (2002/2003) -
         http://www.att.com/telework/article_library/survey_results_2003.html

      Article Library - http://www.att.com/telework/article_library/

**June Langhoff's Telecommuting Resource Center** - http://www.langhoff.com/

      FAQs About Telecommuting - http://www.langhoff.com/faqs.html

      Links - http://www.langhoff.com/links.html

**Smart Valley Telecommuting Guide** (1998, Hosted at Cisco) -
http://www.cisco.com/warp/public/779/smbiz/netsolutions/find/telecommuting/

**About.com Telecommuting Starting Point** - http://telecommuting.about.com/

**MIRTI (European) Implementing Telework Handbook** -
http://www.telework-mirti.org/handbook/inglese/1_start!.htm

**Telework - Telecommuting SocioSite** - http://www2.fmg.uva.nl/sociosite/topics/telework.html

**State of Arizona Department of Administration (DOA) Telecommuting Zone** -
http://www.teleworkarizona.com/

      Valley Metro Telework Site - http://www.valleymetro.org/Rideshare/Telework/

**State of California Department of Personnel Administration (DPA) Telework Resources** -
http://www.dpa.ca.gov/telework/teleresource.shtm

**National Transportation Demand Management (TDM) and Telework Clearinghouse** -
http://www.nctr.usf.edu/clearinghouse/

**Telecommute Now** - http://www.telecommute-now.org/

      Resources - http://www.telecommute-now.org/html/resources.html

# Telework Return on Investment (ROI):

**Cisco Telework ROI Calculator** - http://www.cisco.com/warp/public/779/smbiz/ccho/roi-calculator.html

**Teletrips.com (Trip Reduction Impact Calculator)** - http://www.teletrips.com/

**Telework Return on Investment (JALA International)** - http://www.jala.com/TwROI.htm

# Telework Policies and Procedures:

**State of California Department of Personnel Administration (DPA) Telework Policy** -
http://www.dpa.ca.gov/telework/teleworkpolicy.shtm

**U. S. Office of Personnel Management - Successful Telework Policies: How to Get Started** -
http://www.opm.gov/wrkfam/telecomm/success.htm

**Acceptable Internet Use Policies (Rice University)** - http://www.rice.edu/armadillo/acceptable.html

# Information Technology (IT) and Networking:

**About.com - Computer Networking** - http://compnetworking.about.com/

**Information Technology Industry Council (ITIC)** - http://www.itic.org/

**National Institute of Standards and Technology (NIST)**
**Advanced Network Technologies Division (ANTD)** - http://w3.antd.nist.gov/

**Software & Information Industry Association** - http://www.siia.net/

**World Wide Web Virtual Library (WWW VL)** - http://vlib.org/

Communications - http://www.analysys.com/vlib/

Computing - http://vlib.org/Computing.html

# U.S. Government Computer Security Resources:

**National Institute of Standards and Technology (NIST)** - http://www.nist.gov/

Computer Security Resource Center (CSRC) - http://csrc.nist.gov/

**U.S. Critical Infrastructure Assurance Office (CIAO)** - http://www.ciao.gov/

White House Homeland Security Office - http://www.whitehouse.gov/homeland/

**Computer Incident Advisory Capability (CIAC) Website (U.S. DOE)** - http://www.ciac.org/ciac/

Hoax Busters - http://hoaxbusters.ciac.org/

**National Infrastructure Protection Center (NIPC)** - http://www.nipc.gov/

InfraGard (FBI & NIPC Information Sharing) - http://www.infragard.net/

**U.S. Department of Justice (DOJ) Cybercrime** - http://www.cybercrime.gov/

**Federal Emergency Management Agency (FEMA)** - http://www.fema.org/

Global Emergency Management System (GEMS) DB/Links - http://www.app1.fema.gov/gems/

# Other Computer Security Resources:

**About.com - Security in IT** - http://internet.about.com/cs/security1/

**Computer Emergency Response Team (CERT) Coordination Center** - http://www.cert.org/

      All Research Papers - http://www.cert.org/research/papers.html

      Other Sources of Security Information - http://www.cert.org/other_sources/

**How Stuff Works - Security** - http://www.howstuffworks.com/category.htm?cat=Secur

**Information Systems Security Association (ISSA)** - http://www.issa.org/

      Community Outreach Links - http://www.issa.org/comm-outreach.html

**System Administration, Networking & Security (SAN) Institute** - http://www.sans.org/

      Information Security Reading Room - http://rr.sans.org/index.php

      Top 20 Critical Information Security Vulnerabilities - http://www.sans.org/top20.htm

**Center for Internet Security** - http://www.cisecurity.org/

**Stay Safe Online** - http://www.staysafeonline.info/

      Security Tips - http://www.staysafeonline.info/sectips.adp

# Personal Computer Resources:

**About.com - Computing & Technology** - http://about.com/compute/

**How Stuff Works** - http://www.howstuffworks.com/

      Computers - http://www.howstuffworks.com/category.htm?cat=Comp

      Electronics - http://www.howstuffworks.com/category.htm?cat=Elec

      Telecommunications - http://www.howstuffworks.com/category.htm?cat=Tele

# Setting Up the Home Office:

**About.com - Home Office Space Planning** - http://interiordec.about.com/cs/officespaceplans/

**About.com - Home Networking** - http://compnetworking.about.com/cs/homenetworking/

**Home Office Association of America (HOAA)** - http://www.hoaa.com/

**International Telework Association and Council (ITAC)** - http://www.workingfromanywhere.org/

      Home Office Setup - http://www.workingfromanywhere.org/resources/homeoffice.htm

**Paul & Sarah Edwards - Working from Home Site** - http://www.workingfromhome.com/

# Conferencing and Collaboration Resources:

**About.com - Internet Conferencing** - http://netconference.about.com/

**International Multimedia & Collaborative Communications Alliance (IMCCA)** -
      http://www.imcca.org/

# Mobile Worker Resources:

**About.com - Mobile & Wireless** - http://internet.about.com/cs/wirelessmobile/

**MobileInfo.com (Mobile Computing & Wireless Information)** - http://www.mobileinfo.com/

**Portable Computer and Communications Association (PCCA)** - http://www.pcca.org/

# Distance Learning and e-Learning Resources:

**American Society for Training & Development (ASTD)** - http://www.astd.org/

E-Learning - http://www.astd.org/virtual_community/Comm_elrng_rdmap/e_lrng_comm.html

E-Learning Glossary - http://www.learningcircuits.org/glossary.html

**International Society for Technology in Education (ISTE)** - http://www.iste.org/

**Instructions Systems Association (ISA)** - http://www.isaconnection.org/

**Learning & Training Innovations (LTI) Magazine** - http://www.ltimagazine.com/ltimagazine/

**United States Distance Learning Association (USDLA)** - http://www.usdla.org/

Distance Learning Glossary - http://www.usdla.org/html/resources/dictionary.htm

# Ergonomics Resources:

**U.S. Dept. of Labor Occupational Safety and Health Administration (OSHA) Ergonomics Page** - http://www.osha-slc.gov/SLTC/ergonomics/index.html

Ergonomic Solutions: Computer Workstations - http://www.osha-slc.gov/SLTC/computerworkstations_ecat/index.html

Workstation Checklist - http://www.osha-slc.gov/SLTC/computerworkstations_ecat/checklist.html

Additional References - http://www.osha-slc.gov/SLTC/ergonomics/additional_references.html

**National Institute for Occupational Safety and Health (NIOSH) Ergonomics Page** - http://www.cdc.gov/niosh/topics/ergonomics/

**About.com - Ergonomics** - http://stress.about.com/cs/ergonomics/

**Human Factors and Ergonomics Society** - http://hfes.org/

**National Coalition of Ergonomics** - http://www.ncergo.org/

**Telecommuting Safety & Health Benefits Institute (TSHBI)** - http://www.gilgordon.com/telecommutesafe/

**Ergonomics & Telework from Models of Industrial Relations in Telework Innovation (MIRTI)**

**European Study & Guide** - http://www.telework-mirti.org/handbook/inglese/ergo.htm

**Checklists & Audits: Safety - Ergonomics** - http://www.rmlibrary.com/db/checksafergo.htm

## U.S. Government Telework Resources for Those with Disabilities:

**The Access Board (Federal Agency for Accessible Design)** - http://www.access-board.gov/

**U.S. Department of Justice Americans with Disabilities Act (ADA) Home Page** - http://www.usdoj.gov/crt/ada/adahom1.htm

Business Connection - http://www.usdoj.gov/crt/ada/business.htm

**U.S. Department of Labor (DOL) Office of Disability Employment Policy (ODEP)** - http://www.dol.gov/odep/welcome.html

**U.S. Government Service Administration (GSA) Center for IT Accommodation (CITA)** - http://www.gsa.gov/Portal/content/offerings_content.jsp?contentOID=22804&contentType=1004&PMKC=1&S=1

**Federal Communications Commission (FCC) Consumer Information Bureau (CIB) -**

**Disabilities Issues** - http://www.fcc.gov/cgb/dro/

**National Council on Disability (NCD)** - http://www.ncd.gov/

**National Institute on Disability and Rehabilitation Research (NIDRR)** - http://www.ed.gov/offices/OSERS/NIDRR/

**Section 508 (Rehabilitation Act): The Road to Accessibility** - http://www.section508.gov/

## Other Telework Resources for Those with Disabilities:

**Alliance for Technology Access (ATA)** - http://www.ataccess.org/

**American Association of People with Disabilities (AAPD)** - http://www.aapd-dc.org/

Assistive Technology Links - http://www.aapd-dc.org/docs/linkassistivetech.html

**Center for Applied Special Technology (CAST) Bobby Site Analyzer** - http://www.cast.org/bobby/

**Equal Access to Software and Information (EASI)** - http://www.rit.edu/~easi/

**International Commission on Technology and Accessibility (ICTA)** - http://www.ictaglobal.org/

**National Organization on Disability (NOD)** - http://www.nod.org/

Information and Resources - http://www.nod.org/info/

**Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)** - http://www.resna.org/

**Trace Research & Development Center (University of Wisconsin-Madison)** - http://trace.wisc.edu/

Information Resources - http://trace.wisc.edu/resources/

**Usable Web - Accessibility** - http://usableweb.com/topics/000262-0-0.html

**World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI)** - http://www.w3.org/WAI/

Web Accessibility Initiative (WAI) Resources - http://www.w3.org/WAI/Resources/

# Appendix B:
# Telecommunications Overview and Resources

> Electric circuitry has overthrown the regime of "time" and "space" and pours upon us
> instantly and continuously the concerns of all other men.  We now live in a global village.

Marshall McLuhan, 1967 (http://www.mcluhan.ca/)

Indeed our world and the ways in which we relate to it in both our business and personal lives have been absolutely transformed by the advances in computers and telecommunications this past decade. There is no going back and much more yet to come in the exciting times ahead.  In this guide we've looked at the enterprise rationale for and integration of telework, as well as the tasks the teleworker must accomplish and the kinds of equipment, software, and support necessary to accomplish their responsibilities.  Now let's explore in more detail the kinds of connections and telecommunications services that are available and how to get the speed you need.  It's a broadband world after all.

Legacy telephone networks cover the entire country delivering voice telephony services from both Incumbent Local Exchange Carriers (ILECs) and Competitive Local Exchange Carriers (CLECs). This expansive Public Switched Telephone Network (PSTN) delivers not only basic phone service, the lowest common denominator for personal communications services, but may be accompanied by advanced features as we discussed earlier as well as low to high speed data communications capabilities.  However, additional options for voice and high-speed data services are now available, maturing in the marketplace, and should prove much more versatile and cost effective in the long run.

## The Rise of the Internet and the Great Convergence:

Today's Internet dates back to at least 1973 when the U.S. Defense Advanced Research Projects Agency (DARPA) initiated research to interlink packet networks resulting in the development of two initial protocols, Transmission Control Protocol (TCP) and Internet Protocol (IP) which has become more commonly known as TCP/IP.  The early national network was primarily used to connect researchers within military and higher education communities and to support e-mail communication as well as the sharing of high-power computer resources from remote locations.  In 1986, the U.S. National Science Foundation (NSF) developed NSFNET, a 45 Mbps backbone that formed the basis, along with other domestic and international efforts, of a global Internet.  Commercial carriers joined in, helping extend the reach, functionality, and robustness of these early efforts.  The number of users remained modest, however, until the mid-1990s when the advent of graphical browsing and hyperlinked content lead to a virtual explosion in the popularity and use of the Internet.

Consumer, business, and government use of the Internet has grown enormously, along with the graphical and media rich character of the available content.  Streaming audio and video, teleconferencing, groupware applications, graphic images, downloads of large files, electronic commerce, and other delivery of rich content sources and real time data streams all drive the need for backbone and "last mile" data capacity.  Further, the Internet enabling of voice telephony (Voice over Internet Protocol - VoIP) and trends in Computer Telephony Integration (CTI) will drive the convergence of the traditional Public Switched Telephone Network (PSTN) increasingly with the Internet to form Next Generation Networks (NGNs) or a New Public Network (NPN).  Dispersed

# U.S. Internet Traffic Over Time
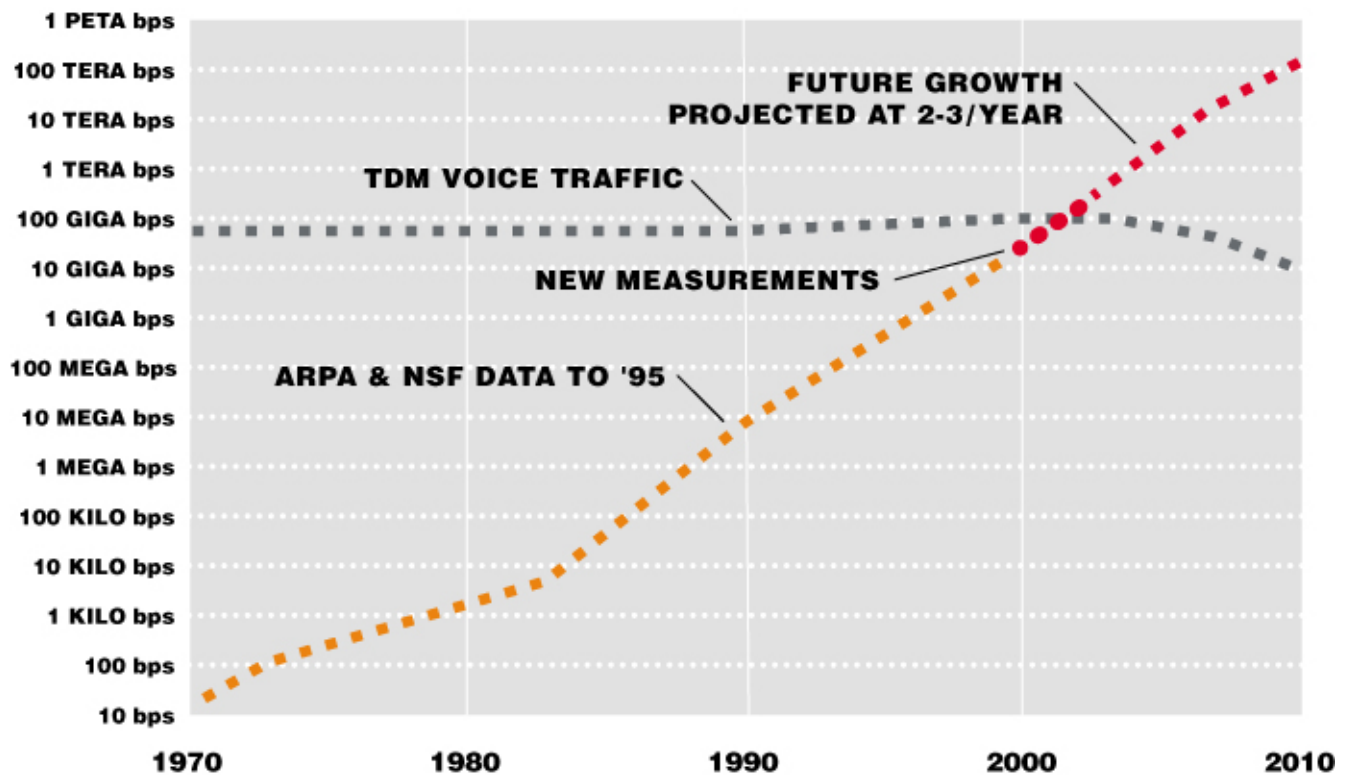


(Source: Dr. Lawrence G. Roberts et al., Caspian Networks, http://www.caspiannetworks.com/)

enterprises are increasingly moving their Wide Area Network (WAN) applications from leased telecommunications services to Virtual Private Networks (VPNs) operated over the Internet. Additionally, many new types of devices, Personal Digital Assistants (PDAs), information appliances, next generation set-top television boxes, Internet-enabled fixed and wireless telephone instruments, will drive our use of and reliance on this burgeoning communications media.

The "need for speed" and the performance or mission critical nature of many of these new applications will further drive the large-scale deployment of fiber backbones and evolution of Internet protocols. An Internet2 project, or Next Generation Internet (NGI), is being funded by the U.S. government and led by over 150 research universities to enable new, advanced network applications to meet emerging needs in research and education. The Abilene Project, the key subnetwork making up the Internet2 backbone, will consist of some 13,000 mile of fiber optic cabling operating at least 2.4 Gbps. Like the original Internet, this project will serve as a test bed from which significant innovation will occur. Technology transfer to the government and commercial vendors will enhance the generally available Internet and further drive the evolution of its capabilities and capacity.

Voice, data, and video will increasingly be merged into combined data streams and carried over the most cost-effective communications transport services. Enterprises will move forward with carrying their converged voice and data traffic together for simplicity, efficiency and cost reasons. Further, the variety of messages that individuals now receive, live voice interaction, voice messaging, paging, faxes, e-mail, media file attachments, shared documents, and more will be collected and managed from unified message mailboxes for personal convenience and effectiveness.

# The Basics of Telecom Connectivity:

All of us have grown up with basic phone service, sometimes known as Plain Old Telephone Service (POTS). You pick up the receiver, listen for the dial tone, and call your number. The true complexity of the telephone network is largely hidden from us, but a lot of cable and facilities go into supporting what seems a simple task. Many homes now have multiple phone lines to support personal and business voice use as well as modems and faxes. Long distance service allows us to connect around the country and the world at every decreasing cost. Fax machines and computers that can send faxes use special protocols but still operate over standard phone lines. They can send or receive several pages a minute, but tie up a phone line when doing so. Subscriptions to special services can allow the home PC to transmit and receive faxes over the Internet bypassing standard phone use, defaulting to however you connect to the net. Please see the earlier section **Teleworker Toolkit: The *New Employee Manifesto*** for more information on phone features and services.

These same phone lines support connecting computers with modems at low speed for transferring data and running remote applications. Today's most common analog modems run at a maximum of 33.6 Kbps upstream (data you send) and 56 Kbps downstream (for data you receive). They meet specifications known as the V.34 and V.90 standards, support fax functions and may have special voice functions as well. Emerging V.94 standard modems can allow slightly higher downstream speeds, as high as 80 Kbps. However, the actual data speeds you achieve will be dependent on the quality of your phone lines as well as the capabilities of the system you're connecting to. Phone modems provide the most common connection at the lowest cost, but also at the lowest speed.

# Basic Telecom Resources:

## Federal Communications Commission (FCC) - http://www.fcc.gov/

**Wireline Competition Bureau (WCB)** - http://www.fcc.gov/wcb/

Broadband - http://www.fcc.gov/broadband/

Consumer Alerts and Fact Sheets - http://www.fcc.gov/cgb/information_directory.html

Local Competition - http://www.fcc.gov/ccb/local_competition/

FCC-State Link (Industry Analysis Division Reports) - http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/fcc-link.html

## Telephone Service Trade Organizations:

**Association for Local Telecommunications Services (ALTS)** - http://www.alts.org/

**Competitive Telecommunications Association (CompTel)** - http://www.comptel.org/

**National Cable & Telecommunications Association (NCTA - Cable System Operators)** - http://www.ncta.com/

**National Telephone Cooperative Association (NTCA - Small & Rural Independent LECs)** - http://www.ntca.org/

**United States Telephone Association (USTA - ILECs+)** - http://www.usta.org/

# Broadband Connectivity Options:

For today's modern computing applications and both personal and enterprise needs, a simple dial-up phone modem connection may be too painfully slow or otherwise unsuitable for your primary home connectivity or even when operating remotely.  Fortunately, a variety of higher speed connection methods have been developed and deployed in recent years.  The availability, suitability, and costs for each of these types of connections from various telecom providers may vary greatly.  Your Information Technology (IT) department can likely assist in determining your remote connectivity requirements and available options, as well as help you get it all up and going and optimize your configuration and connection.  IT will likely have standards and guidelines in place to help control and manage enterprise desktop and mobile device environments for consistency, security, and reliability, while helping insure the success of the teleworker and the smooth integration of their activities both on-site and remotely.

The rest of this section will discuss technologies and techniques for achieving you own high-speed connection to the Internet and World Wide Web (WWW).  You must always confirm the availability of these services directly with the appropriate telecom service providers, but you will find these options increasingly available and quite suitable for supporting an effective telework environment.  Cable modems are and will remain the dominant residential high-speed data delivery method (see earlier table **U.S. Residential Dial-up and Broadband Forecasts**), followed by xDSL and to a lesser extend by satellite and terrestrial wireless.  The table later in this chapter, **Residential Data Services Comparison** will summarize and hopefully help clarify and simplify the choices you will make.

# Connect and Communicate



(Source: International Research Center, http://www.researchedge.com/)
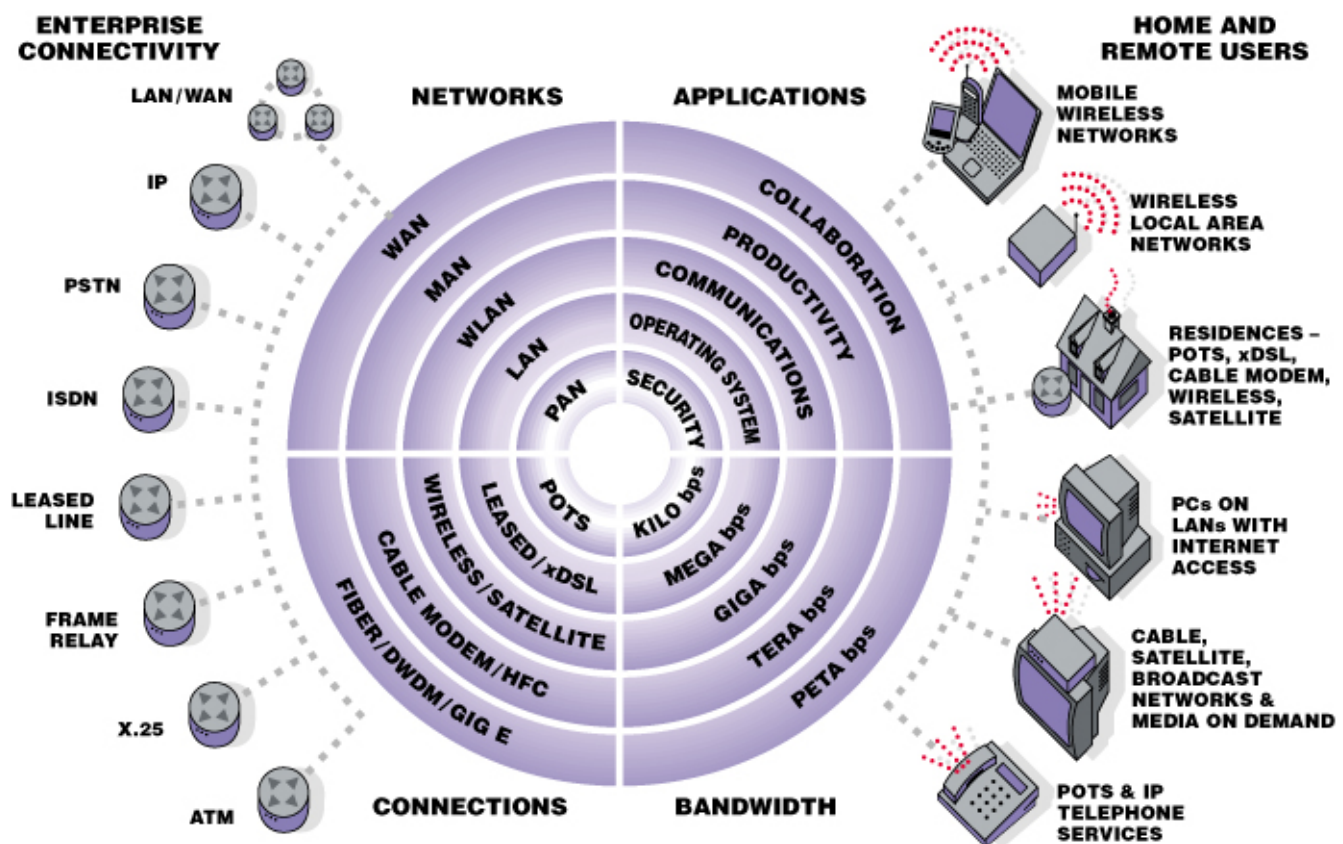
## Integrated Services Digital Network (ISDN), Frame Relay, T1-T3, etc.:

Existing copper unshielded twisted pair (UTP) in the local phone loop may be used to carry a variety of digital data services. Frame relay provides 56 or 64 Kbps and more, but is mostly used for business locations where multiple channels may be bonded for higher aggregate data connection rates. Also, T-1 (1.5 Mbps) and T-3 (45 Mbps) rates can be provided over special circuits and are commonly used by enterprises to get their connectivity to other facilities and high-speed connection to the Internet.

Integrated Services Digital Network (ISDN) was the first attempt at a popular high data rate service that could serve residences and can deliver data at 128 Kbps, but its limited availability, high cost of service, and difficulty to install restricted its growth. Though it is still used for some business and residential applications and able to achieve medium speeds, it is being largely superceded on the phone network by high-speed Digital Subscriber Line, cable modem, and other alternative services.

### Related Resources:

**Frame Relay Forum** - http://www.frforum.com/

**National ISDN Council (NIC)** - http://www.nationalisdncouncil.com/

**North American ISDN Users' Forum (NIUF at NIST)** - http://www.niuf.nist.gov/

**ISDN Zone** - http://www.isdnzone.com/

**Committee T-1 (Standards and Resources)** - http://www.t1.org/

## Digital Subscriber Line (xDSL):

Digital Subscriber Line (DSL) technology allows for even higher speed connections between a residence or workplace and the telephone company central office. From there the data traffic can be routed directly to another location or to through an Internet Service Provider (ISP) to the Internet for worldwide net access. There are many flavors of DSL such as Asynchronous Digital Subscriber Line (ADSL), Rate Adaptive Digital Subscriber Line (RADSL), and Very high-speed or Video Digital Subscriber Line (VDSL) which is why the general abbreviation is usually given as xDSL, with the x representing the many types available.

Data rates go from 256 Kbps each way all the way up to 1 Mbps upstream and 7 Mbps downstream at various price points. This service is not available in all areas due to distance from telephone facilities and other factors. You need to check with your phone company and other competitive local exchange carriers CLECs) to determine if you are in an active service area. A new DSL standard known as G.lite may allow simpler and cheaper DSL connections, operating up to 1 Mbps. The end user will treat it more like a phone modem of today that can be self-installed or it will come already built into modern computers. In general, DSL service shares a single phone circuit with regular POTS voice service and makes quite efficient use of existing telephone lines and resources.

### Digital Subscriber Line Resources:

**DSL (Digital Subscriber Line) Forum** - http://www.dslforum.org/

**DSL Reports** - http://www.dslreports.com/
      Search for DSL service by location - http://www.dslreports.com/?nav=1

# Cable Modem:

Cable companies, sometimes known as Multiple System Operators (MSO), have the only other complete network of fiber optics and copper wire in the ground reaching residences and most business locations. Their Hybrid Fiber Coax (HFC) network reaches your home or small business through a metropolitan headend facility connected by redundant fiber optic rings to a number of Master Telecom Centers (MTC) and again by fiber rings to neighborhood nodes. From there, shielded coaxial cable that traditionally only delivered entertainment television programming now reaches your home with high-speed data and voice telephony services as well. With their enormous investments in upgrading these networks, the cable companies can now deliver high-speed Internet access over cable modems, with each neighborhood sharing one or more 10 Mbps (and soon to be 27 Mbps) connections. Since everyone isn't accessing the Internet at once, effective performance is usually well above 1 Mbps download speed for each user. Upload speeds may have a specific cap such as 256 Kbps, but upgraded business class capabilities can be provided to implement VPNs or otherwise improve security as well as to guarantee specific minimum performance and quality levels as needed for remote enterprise applications. Furthermore, your cable company can frequently deliver voice telephony service over one or more telephone circuits provisioned on the same high-speed HFC network delivering video and data services. Larger enterprises receive high-speed data services with direct fiber connections.

As with any high-speed service, you must check with your provider, in this case your cable company, to determine if you can currently get high-speed data services at your locations or what the availability is scheduled to be. Along with the new data services, the cable company is also delivering enhanced digital television and competitive local and long distance telephone service, often at attractive bundled rates. In most areas, the use of cable modems employing the Data Over Cable Service Interface Specification (DOCSIS) standard allow you to purchase your own unit from any of a number of manufacturers "off-the-shelf" from your cable company, at local retail stores or through other channels. Then you can usually connect and configure it at home on your own with telephone support as needed, however field technicians will also come out to install it and get it working if you prefer. Cable modem service is broadly available and by far the most popular means of high-speed connection to the Internet from homes today.

## Cox's Neighborhood Fiber Delivers High-Speed Data along with Video and Voice



(Source: International Research Center, http://www.researchedge.com/)
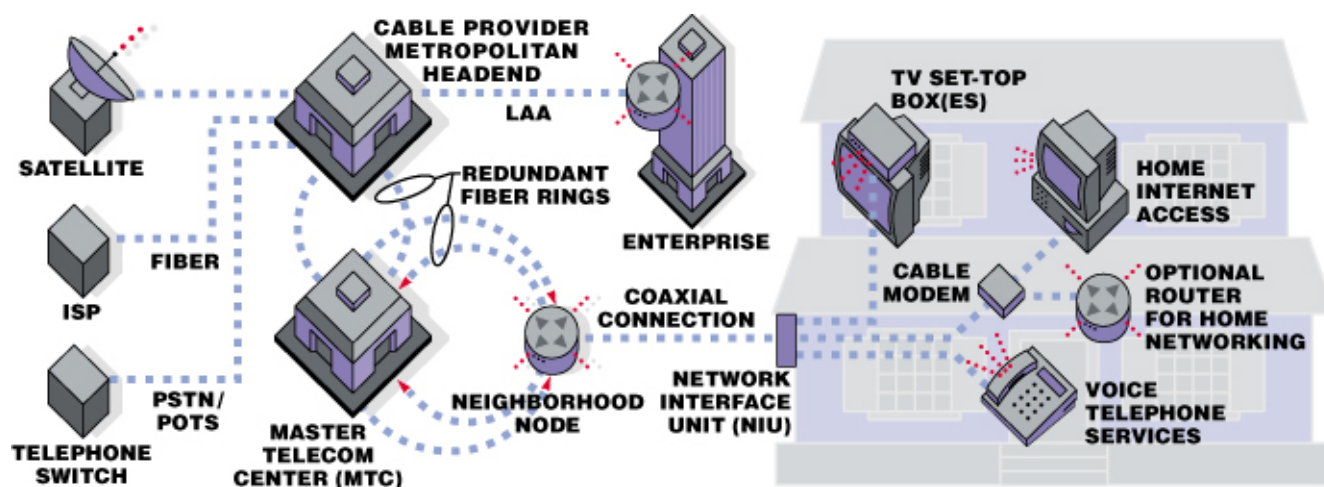
**Cable Modem Resources:**

**National Cable & Telecommunications Association (NCTA)** - http://www.ncta.com/

   High-speed Internet Access - http://www.ncta.com/broadband/broadband.cfm?broadID=4

**Cable Television Laboratories (CableLabs)** - http://www.cablelabs.com/

   Go2Broadband Service Locator - http://cpss.go2broadband.com/

   Certified Cable Modem Project - http://www.cablemodem.com/

   OpenCable Initiative (Next generation of set-top boxes) - http://www.opencable.com/

   PacketCable (Internet-based voice & video products over cable) - http://www.packetcable.com/

**CATV CyberLab (Broadband Bob Report & Cable Carrier News)** - http://www.catv.org/

**Cable in the Classroom (CIC)** - http://www.ciconline.org/

# Fixed Wireless Access:

Local fixed wireless transmission can deliver wireless cable television content as well as high-speed Internet services.  Strategically placed transmitting towers may allow consumers can access the Internet with download speeds of 1 Mbps using a small eight-inch dish mounted on their homes and businesses.  The return path for communicating navigation commands and uploading files may be through your phone line (thus limited to 33.6 Kbps) or via bi-directional radio transmission freeing up a phone line but at a somewhat higher subscription cost.  With this technology, all areas within line-of-sight of one of the local towers can receive this services.  Again, check with the provider regarding your location and they will perform a site survey if necessary to confirm availability.

Similar radio technologies known as Wireless Local Loop (WLL) can provide telephone and data services to residents in rural and remote areas.  Additionally, point-to-point microwave links from telecom providers and contractors may be used to bridge gaps in wireline networks to deliver broadband capabilities and a variety of services to volume business customers.

# Mobile Wireless Access:

Today, tens of millions of Americans enjoy the mobile connectivity of a cellular and Personal Communications System (PCS) wireless handset for voice telephony.  These services rely on an extensive network of cellular radio antennas placed throughout urban areas and along highway routes.  Their geographic coverage may vary by provider and should be considered along with rate plans and options when selecting a service.  In general, these networks can be used for low-speed data connectivity for mobile devices such as handheld and laptop computers, but the data interface and connections may take special hardware or configuration.

Over the next few years these wireless networks will evolve their data access to higher speed Third Generation (3G) performance levels.  Other mobile wireless solutions include micro-cellular systems that may implement wireless local area networks (WLANs) over short distances within buildings, across enterprise campuses, or in facilities such as airports, shops, and public spaces.  In general, wireless systems are the easiest to introduce into existing markets because cables don't have to be buried everywhere.  Look for an explosion of wireless options and competition in the years to come.

## Locate Mobile Wireless Voice Providers by Geography:

**Point.com** (mobile phone plans) - http://www.point.com/

**WirelessAdvisor.com** (mobile phone plans) - http://www.wirelessadvisor.com/

**WiFinder.com (**hot spots locator**)** - http://www.wifinder.com/

**Wireless Broadband ISPs (WISPs) Directory** - http://www.bbwexchange.com/wisps/

## Other Wireless Resources:

**FCC Wireless Telecommunications Bureau (WTB)** - http://www.fcc.gov/wtb/
>    3G Third Generation Wireless - http://www.fcc.gov/3G/
>    Cellular Services - http://wireless.fcc.gov/services/cellular/
>    Paging - http://wireless.fcc.gov/services/paging/
>    Personal Communications Service (PCS) - http://wireless.fcc.gov/services/narrowbandpcs/
>    Auction Topics - http://www.fcc.gov/wtb/auctions/
>    Wireless Facilities Siting Issues - http://www.fcc.gov/wtb/siting/

**Cellular Telecommunications Industry Association (CTIA)** - http://www.wow-com.com/
>    Consumer Issues & Information - http://www.wow-com.com/consumer/
>    Industry Issues & Answers - http://www.wow-com.com/industry/issues/
>    Wireless Solutions Center - http://www.wow-com.com/solutions/

**Personal Communications Industry Association (PCIA)** - http://www.pcia.com/

**Wireless Communications Association International (WCAI)** - http://www.wcai.com/

**Wireless Ethernet Compatibility Alliance** - http://www.wi-fi.org/

# Satellite Access:

The modern era of communications was truly begun with the launch of Sputnik in 1959. Today, thousands of satellites orbit the earth and many thousands more will be added in the next few years. Geostationary satellites sit in a fixed location above the equator and can be used by pointing a fixed antenna with appropriate support equipment at the "bird" in the sky. Services such as Hughes DirecPC and StarBand offer medium-speed Internet downlink (up to 600 Kbps) across the country, even in rural areas, and can be combined with video entertainment services or Direct Broadcast Satellite (DBS). The return data uplink may be by phone modem at a much lower connect speed (up to 33 Kbps) or transmitted directly back to the satellite at 100-200 Kbps with a bi-directional dish and transceiver.

Other constellations of satellites, such as Motorola's Iridium project, circle the globe in polar or other orbits with one or more satellites always overhead. They support mobile voice communications and low-speed data from anywhere on the planet but at a high cost for the special phone and service costs. Additional satellite constellations will launch soon with higher data performance capabilities and costs will begin to drop. Additionally, special stratospheric planes and aerial platforms are being designed to offer advanced wireless services in urban areas with IP services from the sky.

## Satellite Resources:

**FCC International Bureau (IB** including satellite communications) - http://www.fcc.gov/ib/

   **Satellite Division** - http://www.fcc.gov/ib/sd/

**European Telecommunications Satellite Organisation** - http://www.eutelsat.org/

**Mobile Satellite Users Association (MSUA)** - http://www.msua.org/mobile.htm

**Satellite Broadcasting & Communications Association (SBCA)** - http://www.sbca.com/

**Center for Satellite and Hybrid Communication Networks (CSHCN)** -
   http://www.isr.umd.edu/CSHCN/

**All About Satellite Communications (SatCom)** - http://www.allaboutsatcom.com/

**Robert's Satellite WWW Page (C-Band)** - http://www.nmia.com/~roberts/robert.html

# Residential Data Services Comparisons

|  | DIAL-UP MODEM | ISDN | xDSL | CABLE MODEM | TERRESTRIAL WIRELESS | SATELLITE WIRELESS |
|---|---|---|---|---|---|---|
| **Downstream Data Rate** | <=56 Kbps (V.90) | 128 Kbps | 256 Kbps to 7 Mbps | 400 Kbps to 3 Mbps | 9.6 Kbps to 1 Mbps and up | 33.6 Kbps to 600 Kbps |
| **Upstream Data Rate** | <=33.6 Kbps (V.90) | 128 Kbps | 256 Kbps to 1 Mbps | 256 Kbps to 3 Mbps | 33.6 Kbps via dial-up to 1 Mbps wireless | 33.6 Kbps via dial-up to 300 Kbps wireless |
| **Initial Cost** | Bundled to $50 | $150 to $300 | $100 to $200 | $50 to $200 | $150 to $400 | $200 to $600 |
| **Monthly Cost** | Free to $30 | $40 to $120 | $40 to $150 | $30 to $50 | $45 to $80 | $60 to $130 |
| **Pros** | Easy & cheap; Widely available | First dedicated digital service; Reasonably broad availability; Useful for Point of Sales applications and video conferencing | Low cost potential; Shares phone line with voice; Switched circuit dedicates connection; Developing G.Lite standard to accelerate 1 Mbps rate availability | Low cost potential; Broad urban deployment/ availability; DOCSIS standard in place; Cable modems in retail distribution | Single antenna for large area; Quick to deploy with great regional coverage; Multi-path and multi-hop may help reach | Works anywhere; Additional systems to be launched; Higher data rates pending; Stratospheric platforms may fill the gap |
| **Cons** | Rates limited by phone quality; Ties up a phone line; Very slow by today's speeds | Setup can be problematic; Availability limited by distance from telco office; Relatively slow and expensive | Standardization still pending; Availability limited by network upgrades and distance from telco office | Limited availability to business; HFC upgrades still in progress | Limited upstream data rates with telco return; Only available in some markets; Line of sight only | Expensive interface hardware and service costs; No broadband until 2002 or later |

Note:  Kbps is a thousand bits or about 100 characters of text (a little over 1 line of text) per second while a Mbps is a million bits or about 100,000 characters of text (about 30 pages of text) per second.

# Direct Fiber Connectivity:

Fiber optic cables carry extraordinary quantities of information organized into data packets and traveling as photons of light at 186,000 miles per second, doing all the heavy lifting for the Public Switched Telephone Network (PSTN) and Internet backbones alike as they crisscross the country and the world. In each major marketplace, telecom providers develop their own Metropolitan Area Networks (MANs) with redundant fiber ring topologies to carry their own data traffic, sometimes that of other telecom providers, and to connect directly to their enterprise clients as well. Telephone companies, also known as Incumbent Local Exchange Carriers (ILECs), operate from a number of local Central Offices (COs) and may invest in additional fiber to extend xDSL service through remote Digital Subscriber Line Access Multiplexer (DSLAM). Cable Providers have the only redundant telecommunications connections to most all residences and build Master Telecommunications Centers (MTCs) from which they deploy fiber MANs and Fiber To The Neighborhood (FTTN) to support high-speed data, video, and voice service provisioning and delivery to residences as well as enterprises. Other Competitive Local Exchange Carriers (CLECs) may operate from leased facilities and network elements or build their own fiber MANs and Points of Presence (POPs).

Direct fiber optic links to individual homes via Fiber To The Home (FTTH) are only occasionally incorporated into new developments and rarely retrofit to existing neighborhoods or multi tenant units. Fiber remains a solution primarily for telecom providers and medium to large enterprise that need and can afford faster and more sophisticated bandwidth products. Optical Carrier (OC) fiber optic network connections are usually delivered over SONET (synchronous optical network) rings at common rates such as OC-3 (155 Mbps), OC-12 (622 Mbps), OC-48 (2.488 Gbps), OC-192 (9.953 Gbps) and OC-768 (39.812 Gbps). Dense Wave Division Multiplexing (DWDM) allows many colors or lambdas (λ) of light to simultaneously travel down a single strand of dark fiber for vastly improved capacities.

## Fiber and Optical Networking Resources:

**Fiber Optics Association (FOA)** - http://www.thefoa.org/

**Fiber Optics Online** - http://www.fiberopticsonline.com/

**Network and Services Interoperability Forum (NSIF SONET)** - http://www.atis.org/atis/sif/sifhom.htm

**Optical Internetworking Forum (OIF)** - http://www.oiforum.com/

**Optical Ethernet Resource Center** - http://www.optical-ethernet.com/

**10 Gigabit Ethernet Alliance (Open Industry Forum)** - http://www.10gea.org/

**Free-Space Optical (FSO) Alliance** - http://www.fsoalliance.com/

# Outlook for Our Connected Future:

Broadband enabled applications will be increasingly at the core of our personal and enterprise computer use and messaging. Persistent and pervasive connections will keep us linked at work, at home, while mobile, and at remote locations. Home networking will converge with media gateways and serve up a wealth of rich applications and content, while acting as a communications hub for our activities and lives. Cable modems will continue to deliver broadband to the most homes while an explosion of wireless devices and solutions will continue to transform our messaging styles. We hope we've shown you how to get the speed you need and how to telework and otherwise benefit from it.

## Telecom Research and Tutorials:

**Alcatel Library & Resources** - http://www.ind.alcatel.com/library/index.cfm?cnt=index

**Benton Foundation** - http://www.benton.org/
> Digital Divide Network - http://www.digitaldividenetwork.org/

**Bitpipe IT Research Access** - http://www.bitpipe.com/

**Communication News Buyers Guides** - http://www.comnews.com/cgi-bin/bg/default.asp

**CommWeb Tutorial Channel (CMP Media)** - http://www.commweb.com/tutorials

**Computer and Communication Entry Page** - http://www.cmpcmm.com/cc/

**ComputerWorld Browse Topics** - http://www.computerworld.com/topics

**International Engineering Consortium (IEC) Web ProForum Tutorials** - http://www.iec.org/online/tutorials/

**International Telecommunications Union (ITU)** - http://www.itu.int/

**Network Computing Technology Center** - http://www.networkcomputing.com/core/core.html

**Network World Fusion Technologies Research** - http://www.nwfusion.com/research/

**Slashdot (News for Nerds, Stuff that Matters)** - http://slashdot.org/

**TechGuide.com (IT Technology Guides)** - http://www.techguide.com/

**TechTarget (Enterprise IT Web Resources)** - http://www.techtarget.com/
> **SearchNetworking.com** - http://searchnetworking.techtarget.com/
> **What Is (IT-specific encyclopedia)** - http://whatis.techtarget.com/

**Telecom Information Resources on the Internet (U of MI)** - http://china.si.umich.edu/telecom/telecom-info.html

**WWW Virtual Library** - http://vlib.org/
> **Communication and Telecommunications** - http://www.analysys.com/vlib/

**Yahoo! Telecommunications News** - http://biz.yahoo.com/news/telecom.html

**ZDNet (Ziff-Davis) AnchorDesk Briefing Center** - http://www.zdnet.com/anchordesk/
> **Extreme Tech** - http://www.extremetech.com/

## Find Internet Service Provider (ISPs) or High-Speed Telecom Providers:

**ISPworld Product Marketplace** - http://www.ispproductmarketplace.com/

**CNET Internet & Telecom Services Search** - http://home.cnet.com/internet/0-3762.html

**DigiTerra High-Speed Internet Access Locator (DSL & Cable Modem)** - http://www.broadbandcompass.com/

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# Internet Related Resources:

**Internet Society (ISOC - Internet Standards & Evolution)** - http://www.isoc.org/

    **Internet Engineering Task Force (IETF)** - http://www.ietf.org/

    **Internet Architecture Board (IAB)** - http://www.iab.org/iab/

**The World Wide Web Consortium (W3C)** - http://www.w3.org/

    HyperText Markup Language (HTML) - http://www.w3.org/MarkUp/

    Platform for Privacy Preferences Project (P3P) - http://www.w3.org/P3P/

    Web Accessibility Initiative (WAI) - http://www.w3.org/WAI/

**Internet Corporation for Assigned Names and Numbers (ICANN)** - http://www.icann.org/

**InterNIC (Network Solutions - Domain Name Registration)** - http://www.internic.net/
(For .com, .net, .org, and .edu extensions)

**Internet Assigned Numbers Authority (IANA)** - http://www.iana.org/

    **American Registry for Internet Numbers (ARIN)** - http://www.arin.net/

**Internet 2 Project (Next Generation Internet)** - http://www.internet2.edu/

    **University Corporation for Advanced Internet Development (UCAID)** - http://www.ucaid.org/

        **Abilene** (advanced network) - http://www.ucaid.edu/abilene/

# Internet Background and Metrics:

**Complete Guide to Internet Statistics and Research** - http://internet-statistics-guide.netfirms.com/

**Computer Almanac (Brad Myers)** -
http://www.cs.cmu.edu/afs/cs.cmu.edu/user/bam/www/numbers.html

**Comscore Media Metrix ($)** - http://www.comscore.com/

**Cyber Atlas** (Internet.com - Internet Statistics & Market Research) - http://cyberatlas.internet.com/

**eMarketer** (eBusiness statistics) - http://www.emarketer.com/

    **eStats Database ($)** - http://www.emarketer.com/products/database.php

**Hobbes' Internet Timeline** - http://www.isoc.org/zakon/Internet/History/HIT.html

**Internet Indicators** - http://www.internetindicators.com/

**Internet Surveys and Statistics** - http://www.tbchad.com/stats1.html

**Nielsen//NetRatings** - http://www.nielsen-netratings.com/

**NUA Internet Surveys** (Online Demographics) - http://www.nua.ie/surveys/

**Pew Internet & American Life Project** - http://www.pewinternet.org/

**Yahoo! Internet Statistics and Demographics** -
http://dir.yahoo.com/Computers_and_Internet/Internet/Statistics_and_Demographics/

# Appendix C: Telecom and Telework Glossary

## Online Telecom Glossaries and Dictionaries:

**American National Standard for Telecommunications Glossary 2000** - http://www.atis.org/tg2k/

**Federal Communications Commission (FCC) Consumer Glossary** - http://www.fcc.gov/glossary.html

**Free On-line Dictionary of Computing (FOLDOC)** - http://foldoc.doc.ic.ac.uk/foldoc/

**Tech Word Spy** - http://www.wordspy.com/TechWordSpy/

**TECHtionary** (Animated Technology Dictionary by Subscription) - http://www.techtionary.com/

**TechTarget What Is** (IT-specific encyclopedia) - http://whatis.techtarget.com/

**TechWeb TechEncyclopedia** - http://www.techweb.com/encyclopedia/

**Telecom Dictionary & Acronym Lists** (at TelecomCareers.Net) - http://www.telecomcareers.net/Resources/Dictionary/index.htm

**Telecommunications Terminology Glossary** (from Connect Indiana) - http://www.connectindiana.org/learning_center/default.htm

**Webopedia Online Dictionary for Computer and Internet Terms** - http://webopedia.internet.com/

## Definitions of Selected Terms:

**Acceptable Use Policy (AUP)** - An organization's policy for employees and computer networks which defines and possibly restricts the nature of their use or the basis on which access privileges are granted.

**Application Service Provider (ASP)** - A company that provides computer applications and software from a central location to other organizations for leased remote access, much as an Internet Service Provider (ISP) allows access to the Internet.

**Assistive Technology -** Any device or system used to increase, maintain, or improve functional capabilities of individuals with disabilities.

**Automatic Call Distribution (ACD)** - Telephone equipment or service that receives incoming calls, managing and routing them based on a set of instructions and rules.

**Authorization -** Allowing a user access to various computing resources, applications, and data based on the user's identity and privileges, usually after the user is authenticated.

**Authentication -** Verification that a user is who he or she claims to be by the entering of a password or other means or that a message (i.e., an email message) really comes from the stated source.

**Backbone -** The main interconnection pathways for any communications network, often connecting various local area and regional networks to each other and carrying the heaviest traffic.

**Bandwidth** - Refers to the speed of transmission of information over a communications pathway, often measured in frequency (Hertz) or bits per second (bps). The lower the bandwidth, the slower the access to remote data or downloading of rich media.

**Bluetooth** - A standard for short-range (up to 10 meters) wireless communications between a wide array of devices and peripherals to a mobile or desktop computer in a Personal Area Network (PAN).

**Bookmark** - A direct link to an often-visited site that you've saved in your Browser for easy access.

**Broadband** - A high bandwidth transmission pathway or service capable of supporting a wide range of frequencies (Hertz) or high-speed data as measured in bits per second (bps).

**Browser** (Web Browser) - A software application that allows the user to interact with the World Wide Web. Examples include Microsoft Explorer and Netscape Navigator.

**Business Continuity Planning (BCP)** - A rigorously developed and tested plan to anticipate and recover from various contingencies including equipment failure, targeted attacks, and damage to critical infrastructure.

**Cable Modem** - Refers to modems that use the cable television provider's coaxial cable link to the home or business to provide "always-on" high-speed, broadband connection to the Internet.

**Call Forwarding** - A voice telecommunications feature that allows the customer to program their telephone to route an incoming call to another phone number.

**Call Waiting** - A voice telecommunications feature that signals the customer a second caller is trying to reach you while still on the first call, allowing you to switch between the two calls or have it sent to voice mail.

**Caller ID** - A voice telecommunications feature that displays the name and phone number of an incoming caller on a phone handset display or computer screen, alerting the recipient to the identity of the caller.

**Category-5 (Cat-5)** - An American National Standards Institute (ANSI) standard for cables commonly used for Local Area Network (LAN) wiring inside buildings and interconnecting network equipment.

**Cathode Ray Tube (CRT)** - A vacuum tube of glass where the front surface is coated with phosphorescent material and electrically excited for television set and computer terminal displays. Increasingly being replaced by flat panel displays which are smaller, consume less power, and emit less radiation.

**Cellular Phone** - The common name for a voice mobile telephone instrument supported by a network of transmitting towers spread across a geographic region.

**Central Office (CO)** - The place where telephone companies terminate customer lines and locate switching equipment to interconnect those lines with other facilities and networks.

**Central Processing Unit (CPU)** - The main brain of a computer, usually implemented as a single chip (integrated circuit) microprocessor with various support chips in Personal Computers (PCs). May operate at up to several gigahertz (GHz) or several billion computer operations per second.

**Client Server** - A common form of distributed system in which software is split between server tasks and client tasks. A client sends requests to a server, according to some protocol, asking for information or action, and the server responds.

**Coaxial Connection** - A type of cable with a solid central conductor surrounded by insulator, in turn surrounded by a cylindrical shield woven from fine wires and electrically grounded. It is used to carry high frequency signals and is commonly employed by cable companies to reach your house and distribute signals throughout.

**Collaborative Technologies** - May include capabilities of advanced telephony services, computer networking, e-mail, and group applications to enable distributed and remote worker to share all the immediacy and benefits of the enterprise's virtualized collaborative communications environment

**Collocation Facility** - A central site operated by a company that houses telecommunications and/or computer equipment in a leased space, often with a technician to care for the equipment and real-time monitoring, so as not to have to have equipment at a company's premises.

**Compact Disc (CD)** - A small optical disk used to store data digitally.  Includes CD-ROM (CD-Read Only Memory), CD-R (CD-Read), CD-RW (CD-Read/Write), DVD (Digital Video Disc) variants.

**Competitive Local Exchange Carrier (CLEC)** - A telecom provider that competes for customers with the established Incumbent Local Exchange Carrier (ILEC) within certain markets utilizing a combination of built and owned infrastructure, leased Unbundled Network Elements (UNEs), and resale of services.

**Computer Aided Design (CAD)** - A computer and its related software and peripherals used to design and engineer components and products with complex graphical representations and design rules.

**Computer Telephony Integration (CTI)** – Integrating telephony functions with computer applications such as connecting a headset or handset to a computer through a local area network to a telephone switch (a PBX or an ACD) and services.

**Custom Ring** - The ring of a telephone differing from the normal ringing sound to indicate that a different line is being used or that a certain person is calling, often triggering special call handling procedures.

**Customer Premises Equipment (CPE)** - Telecommunications equipment located at the enterprise premises and connected to the telephone network such as telephones, modems, PBXs, and videoconferencing.

**Customer Relationship Management (CRM)** - Enterprise-wide software applications which allow businesses to manage and track all aspects of their customer relationships.

**Cryptography** - The process or practice of encoding and decoding data to secure it from unauthorized access.

**Dark Fiber** - Dark fiber is optical fiber cabling or individual fiber strands that are installed but not currently being used or "lit," thus remaining available for future provisioning and use.

**Data Center** - A specially prepared location within an enterprise or dedicated standalone facility for housing computer and telecommunications equipment in a highly controlled and secure environment.

**Data Over Cable Service Interface Specification (DOCSIS)** - A CableLabs standard for cable modems and associated equipment to carry high-speed bi-directional digital data and other advanced services between customer premises and the cable provider's network.

**Database** - The storage of structured data by computer systems organized in any of a number of ways to facilitate ready access to information of interest.

**Dense Wave Division Multiplexing (DWDM)** - Multiplexing several Optical Carrier signals onto a single optical fiber by using different wavelengths (colors) of laser light to carry different signals, greatly multiplying the fiber's data carrying capacity. See also: Lambda (λ).

**Desktop Applications** - Common computer software applications such as word processing, spreadsheets, presentations, database access, calendar, and contact manager used to support the productivity and connectivity of workers.

**Desktop Scanner** - A peripheral optical scanning device used to capture an image of paper documents as a graphic file to input to a computer for use with graphic packages, Optical Character Recognition (OCR), and document management applications to help enable and manage your work flow.

**Desktop Suite** - An integrated set of desktop software applications commonly used by an employee and including such standard functions as word processing, spreadsheet, presentation, database management, calendar, and contact manager.

**Digital Subscriber Line (DSL, xDSL)** - A technology that uses ordinary copper telephone lines to deliver high-speed information over modest distances between customer premises and a telecom provider's facilities while still carrying regular voice traffic.

**Digital Subscriber Line Access Multiplexer (DSLAM)** - Equipment placed at telephone company Central Offices (COs) or in the field closer to customers to terminate and multiplex multiple xDSL lines and make their connection to the telephone network.

**Direct Broadcast Satellite (DBS)** - A broadcasting system that utilizes geo-stationary satellites to transmit data and video services directly to a small antenna or dish, usually at a residence.

**Domain Name** - A unique name that identifies a World Wide Web site and becomes part of the address of a series of individual related Web pages.  See also: Universal Resource Locator (URL).

**Download** - To go online to an enterprise server or sites on the World Wide Web and pull down or retrieve a file from the remote location into your own computer.  The opposite of "Upload."

**e-Commerce or Ecommerce** - Electronic commerce, utilizing the Internet to conduct business and execute transactions such as online shopping and Business-to-Business (B2B) procurement.

**e-Learning** - Electronic learning; utilizing the Internet to learn something or take classes from a distance.

**E-mail or Email** - Electronic Mail carrying everything from simple text to rich multimedia messages over a Local Area Networks (LANs) within an enterprise to messages traversing the world on the Internet

**Encryption** - The transformation of data into a form unreadable by anyone without a secret decryption key for the purposes of privacy and security.

**Enterprise Resource Planning (ERP)** - Any software system designed to support and automate the business processes of medium and large businesses. This may include manufacturing, distribution, personnel, project management, payroll, and financials.

**Ergonomics** - The study of the design and arrangement of equipment to optimize the end user experience in comfort, health, and efficiency. As related to computer equipment, ergonomics is concerned with such factors as the physical design of the keyboard, navigation devices, display screens, and related hardware, and the manner in which people interact with these hardware devices.

**Ethernet** - A standard Local Area Network (LAN) connection in which data is broken into packets and transmitted to a destination without error in the presence of other data packets and traffic. Includes 10Base-T (10 Mbps), 100Base-T (100 Mbps), and 1000Base-T/GigE (1 Gbps) also known as Gigabit Ethernet.

**Extranet** - A semi-private enterprise computer network accessible to a defined group of outside participants, usually customers or strategic partners.

**Facsimile Equipment (or Fax)** - Equipment that allows images of hard copy documents or from computer files to be sent through the switched telephone system and printed out at a remote location.

**Federal Communications Commission (FCC)** - An independent U.S. federal regulatory agencies created by Congress in 1934 to regulate interstate and international communications by telephone and other means.

**Fiber Optic Cable** - A bundle of optical fibers that each uses the transmission of light to carry high volumes of data through flexible glass or plastic fibers, or wires.

**Fiber To The Home (FTTH)** - Fiber connections carried directly to customers' homes allowing for extremely high-speed connectivity, but at a significantly higher cost than the much more common copper connections.

**Fiber To The Neighborhood (FTTN)** - Fiber connections from a carrier's network to an equipment cabinet placed near a group of homes, allowing advanced services to be delivered over modest distances utilizing regular telephony wiring or cable operator coaxial connections.

**File Transfer** - Transmission of data files between computers over direct cable connection, a Local Area Network (LAN) or between remote computers utilizing the Internet or other connections.

**Firewall** - A combination of hardware and software that sits between network elements to prevent unauthorized access, enforces security policies, and limits the exposure of a computer or a network to outside attack.

**FireWire** - A high-performance serial bus interface standard that allows high-speed communications with peripherals and asynchronous real-time data services. Synonymous with IEEE-1394 or i.Link[®].

**Fixed Wireless Access (FWA)** - Establishing a radio data communications path from one fixed location to another without the use of interconnecting wires transmitted over licensed or unlicensed wireless spectrum.

**Flat Panel Display** - A thin, lightweight, backlit video display used in laptop and notebook computers as well as in desktop configurations in place of cathode-ray tubes. They are smaller, consume less power, and emit less radiation, though generally cost more than equivalent size conventional displays.

**Floppy Disk Drive** - A common data storage device that reads and writes on portable "floppy" magnetic disks, usually in 3.5" or 5.25" formats.

**Frame Relay** - A packet switching protocol in the form of frames, used to connect devices on a Wide Area Network (WAN) at speeds from 56 Kbps to T-1 (1.544 Mbps) and T-3 (45 Mbps).

**Free Space Optics (FSO)** - Laser-based transceivers placed in pairs for wireless connections from roof tops or through windows at high-speed over distances up to several miles.

**Graphical User Interface (GUI)** - A visual interface which allows users to control programs and manipulate commands in those programs by using a pointing device, such as a mouse to navigate a graphical screen image.

**Groupware** - Software applications that allow multiple people to simultaneously participate in joint projects, managing document review and revision, workflow, and conferencing by sharing files and resources.

**Hacker** - Originally, a person who enjoys and is skilled at exploring the details of computer systems and able to stretch their capabilities. Now may connote a computer cracker or cybercriminal who uses their programming skills to gain illegal access to computers, release damaging programs, or engage in computer crime.

**Hard Disk Drive** - A high capacity data storage device that reads and writes onto hard magnetic disks rotating at high speed and communicating over bus protocols such as CF, FireWire, IDE, MFM, SCSI, and USB.

**Headend** - The primary sourcing location for a cable network's program distribution in any metropolitan area or locale supported by satellite download facilities and local program feeds.

**Home Phone Network Adapter (HPNA)** - A home network protocol and technology for connecting computers and peripherals over the AC power line, eliminating the need for dedicated Local Area Network (LAN) wiring.

**Hot Spot or Hotspot** - A geographic location supported by a Wi-Fi wireless access point and allowing access to an 802.11 wireless LAN (WLAN) to the general public or a selected group of end users.

**Hub** - A central device at the core of a Local Area Network (LAN) connecting computers and peripherals to each other and external resources.

**Hyper Text Markup Language (HTML)** - The programming language used to build most web pages and understood by all browser applications.

**Hyper Text Transfer Protocol (HTTP)** - The underlying protocol for transmitting hypertext documents and rich media around the Internet.

**Hyperlink** - Alternately known as a "link" or "hot key." Usually appears different (in size, color, or will initiate a transfer to another Web page.

**Incumbent Local Exchange Carrier (ILEC)** - The largest (or default) telecom provider within a local market, usually one of the Regional Bell Operating Companies (RBOCs).

**Information Appliance** - An electronic consumer device that performs a few specific tasks such as web browsing, e-mail, and remote control, usually simpler and cheaper than a more capable personal computer (PC).

**Information Technology (IT)** - A synonym for data processing or management information systems (MIS).

**Infrared Port** - a computer port for controlling printers and peripherals using an external lens and internal components to transceive data via infrared light up to 4 Mbps under Infrared Data Association (IrDA) standards

**Inkjet Printer** - A printer that utilizes nozzles to electrostatically spray ink to form images on paper.

**Instant Messaging (IM)** - The ability for computer users to communicate text messages with each other instantly and conveniently. May depend on proprietary standards which can be bridged by enterprise-grade Instant Messaging systems.

**Integrated Services Digital Network (ISDN)** - An early digital data protocol used over the telephone system to achieve up to 128 Kbps of bi-directional data transmission.

**Interactive Voice Response (IVR)** - A telecommunications protocol that allows a pre-recorded database of voice messages present options to users, typically over telephone lines in order to do something (i.e., retrieve voice mail).

**Internet** - Refers to a publicly accessible worldwide network that uses standard protocols or communication rules and methods to connect individual networks operated by government, industry, academia, and individuals. See also: Internet Protocol (IP).

**Internet Protocol (IP)** - The method (or protocol) used to route information sent from one computer to another on the Internet or other data networks (such as corporate Intranets or industry Extranets). The predominant IPv4 is being augmented by the newer IPv6 with a full transition over time.

**Internet Service Provider (ISP)** - A company which charges monthly fees for providing Internet access, user account support, and perhaps specialized content. ISPs often lease their telecommunications connection from other service providers.

**Intranet** - A private computer network limited to one department, company or organization.

**Intrusion Detection System (IDS)** - A computer security application constantly monitoring enterprise network activity for possible security attacks or policy violations, logging them, and alerting IT personnel as needed.

**Joystick** - A peripheral device for on screen navigation, resembling the control stick of an aircraft and used to interface with computers, especially for use with games.

**Keyboard** - A peripheral device resembling a typewriter's keys used to enter data into and interface with computers. Available in a variety of layouts and ergonomic configurations for user comfort and preferences.

**Lambda (λ)** - Greek symbol signifying a single color wavelength of light carrying data down an optical fiber. May be accompanied by other colors or Lambdas (λ) on the same optical fiber to accomplish Dense Wave Division Multiplexing (DWDM), greatly increasing the fiber's bandwidth capacity and capabilities.

**Laptop** - A portable computer that can be used on one's lap or on any flat surface, usually containing an internal battery and having most or all of the capabilities of a Personal Computer (PC).  Synonymous with Notebook.

**Laser Printer** - A color or monochrome printer that utilizes a laser or Light Emitting Diode (LED) array to form images on a rotating drum before electrostatically transferring the images onto paper.

**Last Mile** - Last-mile technology is any telecommunications protocols and infrastructure that carry voice and data signals a relatively short distance (more or less than an actual mile) to and from the home or enterprise, such as wireline twisted pair copper, coaxial cable or wireless connections.

**Leased Line** - A leased line is a telephone line or circuit that has been leased for private and exclusive use.

**Local Access Architecture (LAA)** - The capability of telecom providers with strong regional fiber infrastructure and last mile capabilities to connect teleworkers and various local facilities in a direct fashion staying on the provider's network, bypassing the public Internet for performance and security considerations.

**Local Area Network (LAN)** - A short-distance data communications network used to link computers and peripheral devices under some form of standard control and protocol such as Ethernet.

**Local Exchange Carriers (LEC)** - The incumbent telephone companies (ILEC, often the Regional Bell Operating Company or RBOC) or competitive (CLEC) providers that offer voice and data services within a specific geographic region.

**Local Multipoint Distribution System (LMDS)/Microwave Multipoint Distribution System (MMDS)** - A method of distributing TV signals to households in a local community, using broadcast microwave or FM signals, more recently expanded to support high-speed wireless Internet access as well.

**Long Distance** - A telephone call outside the local operating area of a telecommunications provider, usually within a different area code. Also known as a toll call.

**Managed Service Provider (MSP)** - A company providing delivery and management of network-based services and applications to enterprises, residences, or other service providers such as storage and security.

**Master Telecommunications Centers (MTCs)** - Cable provider facilities placed in a service area to deploy fiber MANs and Fiber To The Neighborhood (FTTN) supporting high-speed data, video, and voice service provisioning and delivery to residences as well as enterprises.

**Metropolitan Area Network (MAN)** - A MAN is a network that interconnects telecom provider facilities or users with computer resources in a geographic area or region larger than that covered by a local area network (LAN), but smaller than the area covered by a wide area network (WAN) often spanning cities or countries.

**Mobile Wireless Access** - The ability to roam with Personal Computers (PCs) and Personal Digital Assistants (PDAs) around the enterprise or in a Wide Area Network (WAN) via data transmission over radio frequencies.

**Modem** - Acronym for MOdular/DEModulator, comprising equipment that converts digital signals to analog signals and vice versa and transmits information over the Public Switched Telephone Network (PSTN), cable networks, or wireless pathways.  Current telephone modem technologies are commonly known by their ITU technical standards, V.34 for 33.3 Kbps upstream/downstream, V.90 for 33.3 Kbps upstream and as much as 56 Kbps downstream, and V.92 extending upstream rates to as much as 48 Kbps.

**Mouse** - The most common navigation or pointing device, moved by hand across a flat surface to indicate motion commands to your computer, acting along with pushbutton switches for control functions.

**Navigation or Pointing Device** - Used to move a cursor or objects around on screen and activate various control functions selected to best support your work style and comfort. Common devices include mice, trackballs, and joysticks. Alternatives include voice recognition, data gloves, and eye tracking devices.

**Network** - A system for connecting various, usually computer-related, devices such as desktop computers, servers, hubs, routers, and peripherals.

**Network Administrator** - An employee whose main responsibility is the configuration, maintenance, security, and evolution of enterprise network systems, as well as possibly providing assistance directly to end-users.

**Network Interface Card (NIC)** - A NIC is a printed circuit card placed inside a Personal Computer (PC) system to support connection to other devices in a network. Today, many PCs, laptops, and other devices have embedded Ethernet capabilities, thus not requiring a separate NIC.

**Network Interface Unit (NIU)** - A network interface unit (NIU), sometimes called a network interface device, is a piece of equipment that serves as a common interface for various other devices within a Local Area Network (LAN), or as an interface to allow networked computers to connect to an outside network.

**Open Systems Interconnection (OSI)** - OSI (Open Systems Interconnection) is a standard description or "reference model" that defines seven layers of communications protocols of increasing sophistication and service levels for the operation of data transmission across a telecommunication network and applications.

**Operating System (OS)** - An operating system (sometimes abbreviated as "OS") is the program that, after being initially loaded into the computer by a boot program, manages all the other programs in a computer. Such as Microsoft Windows, Mac OS, Linux/Unix, etc.

**Optical Carrier** - Provisioned Optical Carrier (OC) fiber optic network connections provide high-speed enterprise bandwidth and are usually delivered over SONET (synchronous optical network) rings. Common OC-x rates are OC-3 (155 Mbps), OC-12 (622 Mbps), OC-48 (2.488 Gbps), OC-192 (9.953 Gbps) and OC-768 (39.812 Gbps).

**Optical Character Recognition (OCR)** - A software application designed to identify written words and convert them into text via an optical scanner or from existing graphic images of documents.

**Paging** - To send a number or brief text message to display on the beeper or personal receiver of someone.

**Parallel Port** - A computer connector for sending low-speed to a printer or attaching various input or mass storage devices. The connector is sometimes called a Centronics Parallel Port and may have EPP (Enhanced Parallel Port) or ECP (Extended Capabilities Port) functionality.

**Password** - A sequence of characters kept secret and changed periodically that users need to gain authorized access to files, data or generally to use a specific computer or application.

**Peer-to-Peer (P2P)** - Peer-to-peer is a communications model in which each party has the same capabilities and either party can initiate a communication session.

**Personal Area Network (PAN)** - The wireless interconnection of information technology devices and peripherals within the range of an individual person, typically within a range of 10 meters utilizing Bluetooth technology.

**Personal Communication Services (PCS)** - A newer form of cellular telephony at different radio frequencies licensed to increase competition for mobile voice and data services.

**Personal Computer (PC)** - A computer for one person's use, as opposed to mainframes and mini-computers, usually in a desktop or laptop form factor.

**Personal Digital Assistant (PDA)** - A small portable computer usually held in the hand and used to keep track of notes, phone numbers, addresses, appointments, etc. Often used with a stylus and handwriting recognition and synchronized by docking in a cradle attached to a PC. May also have a miniature keyboard, wireless connectivity, slots for expansion cards, an embedded camera, and various other functions and ports..

**Plain Old Telephone Service (POTS)** - No-frills, voice-grade access to the Public Switched Telephone Network (PSTN), including the ability to place and receive calls and access to directory assistance, emergency services, and long-distance services. Can support low-speed data access by the use of phone line modems.

**Point of Presence (POP)** - A facility or site which houses a telecommunications carrier's equipment for network access and transmission to end users and interconnection with other carriers and facilities.

**Point-to-Point Protocol (PPP)** - A standard Internet protocol for interconnecting computers and remote equipment and allowing the transport of IP packets over a simple link.

**Private Branch Exchange (PBX)** - A PBX (private branch exchange) is a telephone system within an enterprise that switches calls between enterprise users on local lines while allowing all users to share a certain number of external phone lines.

**Public Switched Telephone Network (PSTN)** - PSTN (public switched telephone network) is the worldwide collection of interconnected voice-oriented public telephone networks, both commercial and government-owned, and generally accessible to all with appropriate phone instruments and access privileges.

**Public Utility Commission (PUC)** - Each state has a regulatory body with oversight of various aspects of the regional utility industry including many aspects of telecommunications deployment, management, and pricing.

**Quality of Service (QoS)** - The performance properties of a network service such as speed, latency, jitter, packet loss, reliability and uptime that may be monitored and reviewed by telecom providers and/or customers.

**Random Access Memory (RAM)** - The primary memory and temporary data storage area in a computer in which data can be accessed in any order or "at random." RAM may be static (SRAM) or dynamic (DRAM) and have varying bus and speed characteristics that will affect both applications and performance.

**Return on Investment (ROI)** - The internal accounting calculation about the long-term payback or value of making any specific investment in capital equipment, facilities, or human resources.

**Rich Media** - Rich media is an Internet advertising term for a Web page ad that uses advanced technology such as streaming video, downloaded applets (programs) that interact instantly with the user, and ads that change when the user's mouse passes over it.

**Roaming** - Roaming is the ability to use your cellular phone when away from your home area, usually as some additional charge, depending on your service contract and your provider's relationship with other providers.

**Router** - A device that directs or routes data traffic and messages between computers. May incorporate firewalls, address and content filtering, and other administrative and security functionality.

**Sales Force Automation (SFA)** - Sales automation software is a type of program that automates business tasks such as inventory control, sales processing, and tracking of customer interactions, as well as analyzing sales forecasts and performance.

**Satellite Transmission** - A form of transmission that sends signals to an orbiting satellite, which receives them, amplifies them and returns the signals back to a receiver, such as a mobile phone, television receiver or computer back on Earth.

**Serial Port** - A computer connector to which peripherals (i.e., PS2 keyboard, mouse, trackball, etc.) can be attached via a serial cable and receive information as a stream of single bits at a time.

**Server** - A shared computer on a Local Area Network (LAN) serving any of a variety of special functions such as managing and distributing software applications and data, running specific applications as a shared service, powering an enterprise Web site or connecting peripherals and various resources to end users.

**Service Level Agreement (SLA)** - An agreement that delineates telecom services and service levels that customers should expect, including Quality of Service (QoS), providers' responsibilities in addressing problems, and detailed problem resolution paths and commitments.

**Small Office Home Office (SOHO)** - SOHO is a term for a small business office based in commercial space or a residence as well as a home office environment from which a teleworker may operate.

**Spam** - Unwanted e-mail advertisements or solicitations, often sent without the recipient's request.

**Spectrum** - The range of electromagnetic radio frequencies used in the transmission of sound, data and television. May be unlicensed or licensed and regulated by national and international government agencies.

**Spreadsheet** - The most common financial and calculating application with numbers and formulas contained in tabular rows and columns.

**Synchronize** - To align data and files between servers, PCs, PDAs, and other devices

**Tape Drive** - A peripheral data storage device for computers that reads and writes on magnetic tape. Frequently used as backup for primary applications and data and may be stored offsite for business continuity purposes.

**Telecommunications (or Telecom) Provider** - A company providing telecommunications services such as voice telephony, high-speed data, and video to enterprises and residential customers.

**Telecommuting** - Periodic work out of the principal office, one or more days per week, either at home, a client's site, or in a telework center; the partial or total substitution of information technologies for the commute to work. The emphasis here is on *reduction or elimination of the daily commute* to and from the workplace. Telecommuting is a form of teleworking. (Source: Jack Nilles of Jala International - http://www.jala.com/)

**Teleconferencing** - A term for a conference of more than two people linked by telecommunications through a conference bridge, including audio, video and computer-based conferencing. See also: Videoconferencing.

**Telephony** - The technology and process of transmitting voice over a telecommunications network.

**Telework** - Any form of substitution of information technologies (such as telecommunications and/or computers) for normal work-related travel; moving the work to the workers instead of moving the workers to work. (Source: Jack Nilles of Jala International - http://www.jala.com/)

**Total Cost of Ownership (TCO)** - The internal accounting calculation about the total cost of not only purchasing a piece of equipment, but supporting it and its user over its entire useful service life.

**Trackball** - A ball mounted in a stationary housing manipulated by rotation to indicate motion commands to your computer, acting along with pushbutton switches for control functions.

**Trunk Level 1-4 (T-1, T-2, T-3, T-4)** - A digital transmission link with a total signaling speed of 1.5 Mbps (T-1) to 45 Mbps (T-3) and beyond. Commonly used to provide medium to high-speed data access or voice services for an entire enterprise network. T-1 circuits are frequently used to carry multiple voice circuits as well as data for business needs.

**Tunneling** - Tunneling serves to establish a defined pathway between two points on the enterprise WAN to form a Virtual Private Networks (VPNs), encapsulating data traffic with new packet headers while securing the endpoints as associated with it.

**Unified Messaging** - A synonym for integrated messaging, which allows voice, faxes, data, images, and video to be managed from a universal message in-box.

**Uninterruptible Power Supply (UPS)** - A power supply with battery backup that continues to provide power to a computer in the event of interruptions and failure of the incoming electrical power.

**Universal Resource Locator (URL)** - The Internet address that is typed into the browser window. Most begin with "http://www." and end with ".com" (commercial sites), ".net" (networks), ".gov" (government sites), ".org" (organizations), ".edu" (schools), or two-letter country codes. Newer address extensions such as .biz, .info, .name, and others have more recently been added.

**Universal Serial Bus (USB)** - A peripheral interface standard for communication between a computer and multiple external peripherals designed to be Plug and Play and operate up to 12 Mbps for Version 1.1 and 480 Mbps for Version 2.0.

**Unshielded Twisted Pair (UTP)** - Simple copper wire pairs used for most telephone and LAN connections. Category 3 (CAT-3) can support phones and Category 5 (CAT-5) is used for most networks up to 100 Mbps and beyond.

**Upload** - To go online to an enterprise server or sites on the World Wide Web and send a file there from your own computer. The opposite of "Download."

**V.xx** - International Telecommunications Union (ITU) standards for dial-up telephone modem applications such as V.34bis (33.6 Kbps downstream/upstream), V.90 (56 Kbps d, 33 Kbps u), and V.92 (80 Kbps d, 48 Kbps u).

**Videoconferencing** – Real-time bi-directional exchange of audio and video content between remote locations over high-speed broadband connections utilizing dedicated equipment or PCs. See also: Teleconferencing.

**Video Graphics Array (VGA)** - Originally a display standard for IBM PCs featuring 640 x 480 pixels. Term may be generically applied to the video connector and output on a computer even at higher resolutions.

**Video Monitor** - The most common visual display for a PC, utilizing a Cathode Ray Tube (CRT) of some 15 to 21 inches diagonal. The monitor should be able to synchronize with and set up to accommodate a variety of display resolutions and preferably have a small dot size specification for sharper imaging.

**Virus** - A program, usually hidden in a file or email, which can infect a computer by altering or deleting files. Servers and PCs should run applications to detect and protect against viruses, updating their definition files frequently.

**Virtual Private Network (VPN)** - A highly secure network created utilizing public networks with a combination of telecommunications equipment, computer hardware, software, and the Internet.

**Voice over Internet Protocol (VoIP)** - A protocol for the transmission of voice telephony over data networks bypassing the Public Switched Telephone Network (PSTN).

**Voice Recognition** - A program designed to identify spoken words and digitize them into text for control of computer equipment or input to application programs. Synonymous with Speech Recognition.

**Web Server** - A dedicated computer that stores and serves up the files that form Web pages to Web users over intranets and the Internet utilizing Hypertext Transfer Protocol (HTTP).

**Wi-Fi** - Wi-Fi or Wireless Fidelity (or Wireless Ethernet) are the popular terms for a high-frequency wireless local area network (WLAN) operating under 802.11x protocols. Wi-Fi technology is rapidly gaining acceptance in many enterprises and homes as an alternative to a wired Local Area Network (LAN).

**Wide Area Network (WAN)** - A data network typically extending a Local Area Network (LAN) outside a facility over telephone common carrier lines to link to other LANs in remote locations.

**Wired Equivalent Privacy (WEP)** - A security protocol, specified in the IEEE Wireless Fidelity (Wi-Fi) standard for 802.11b, that is designed to provide a wireless local area network (WLAN) with a level of security and privacy comparable to that of a wired LAN, with up to a 128 bit key for data encryption.

**Wireless Access Point (AP)** - A wireless local area network (WLAN) node for connecting various PCs, information appliances, and peripherals over short-haul wireless networks. May be integrated into a router.

**Wireless Local Area Network (WLAN)** - A Local Area Network (LAN) using high-frequency radio waves rather than wires to communicate between devices and nodes. May be configured quickly and cheaply, but is often not as fast as wired LANs and may pose additional security concerns.

**Word Processor** - A computer program (i.e., Microsoft Word, WordPerfect, WordStar, etc.) that is designed to create, manage, and print mostly text-based documents with sophisticated formatting and graphics inclusion.

**Workflow** - The pathways and procedures used to manage and route work as it moves around an enterprise including the automation of standard procedures with defined rules and tasks.

**World Wide Web (WWW)** - The graphical and multimedia portion of the Internet where the user can visit millions of Web sites anywhere in the world accessing information, purchasing, and entertainment resources.

**ZIP Drive** - A ZIP drive is a removable media, high-capacity storage device for computers that is operated similarly to a floppy drive with capacities of 100 MB, 250 MB, and/or 750 MB.
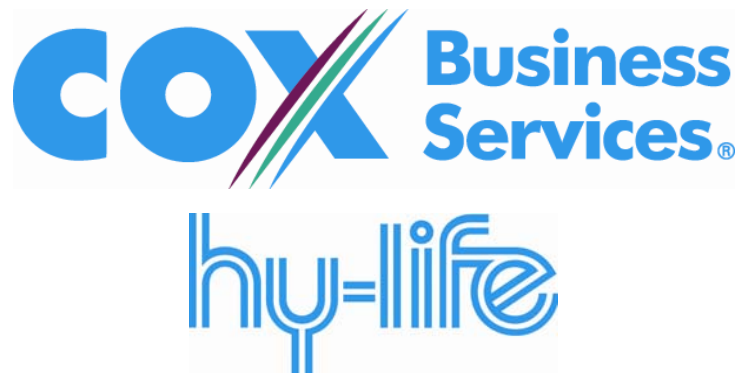
# Is Your Company Right for the New Telework Solutions?

1) **Can your enterprise operate with some of its staff offsite some or all of the time?** Tasks that telework well should be able to be done on one's own or in collaboration with coworkers as enabled by telecommunications, and not require face-to-face interaction with customers and visitors.

2) **Can you move the work to the worker?** Today's knowledge workers are typically employing computers and telecommunications to do their job already and their customary work tasks are increasingly accomplished electronically or otherwise assisted by various technologies.

3) **Are you looking to improve employee recruitment, retention, productivity, and job satisfaction?** Telework has been consistently shown to deliver all of these benefits and more to the delight of the employer and employee alike.

4) **Are enterprises of your size required by your state to implement trip reduction strategies or do you otherwise view it in your best interests to do so?** Telework can and should be a strong component of reducing employee commuting and positively impacting the environment.

5) **Do you have or can you create an office environment that is accepting of off-site work?** Good supervision and communications, performance metrics, onsite meetings, and collaborative tools all help keep teleworkers fully engaged, productive, and part of the team.

6) **Does your Human Resources (HR) department have policies and procedures in place to cover issues relevant to employees who telework?** Likely, existing policies and procedures deal with most aspects and unique circumstances of telework, but some specific extensions and additions may be needed.

7) **Does your Information Technology (IT) environment and resources adequately support the workflow inside the enterprise and can it be readily extended to remote locations and teleworkers?** Usually most or all of the key elements are already in place, but teleworkers may require some additional equipment, assistance, and support.

8) **Can your employees get broadband access to most or all of their residences?** Broadband connectivity has changed how, where, and when we work and play, enabling telework to be accomplished productively, easily, and securely.

9) **Does management recognize the valuable role that telework can play and are they willing to support its development and growth within the organization?** Telework often begins as a grass roots or ad hoc activity, but to really flourish and extend across the enterprise, good management support is critical.

10) **For all these reasons and more, can you afford not to give it a try?** Telework benefits employers, employees, and communities in so many ways. Check out Cox Business Services' Enterprise Telework Guide online at http://www.hy-life.com/ to learn more about why and how.
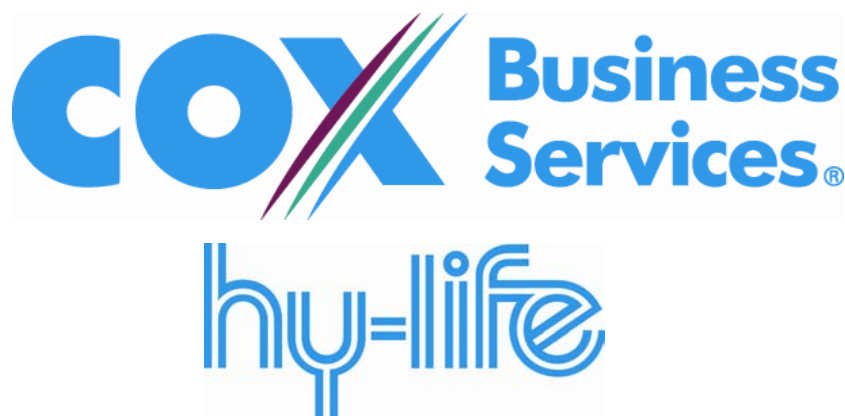
# Enterprise Telework Guide

Hy-Life is a new approach to telework, a new hybrid lifestyle that lets employers and their employees achieve a healthy balance between work and personal time. Broadband connectivity has changed how, where, and when Americans work and play. With the help of broadband, Hy-Life moves the work to the workers and offers the technology to do it productively, easily and securely. Today, more enterprises are embracing the Hy-Life for their business and for their employees.  Cox Business Services is pleased to bring you this Enterprise Telework Guide, intended to provide background and technical knowledge to aid you and your enterprise in evaluating and implementing telework programs. It can also aid the teleworker in equipping, connecting, and using the tools and applications necessary to support their remote work activity.  The guide can also be found in its entirety on the web at http://www.hy-life.com/.

## Written by Mark Goldstein, International Research Center

Mark Goldstein is President of International Research Center (http://www.researchedge.com/), a noted consulting and contract research provider.  IRC provides custom research and strategic support for business, legal, and public policy clients in a variety of high-technology disciplines and arenas, concentrating on telecommunications, information technology, eContent, Internet, and biotechnology by harnessing global information resources for informed decision making.

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