Reader Notes

- The "tethered" remote access (the connected model) market segment is the dominant market segment of remote access. It will drive the market for improvement in remote work technologies and lower communications costs.

- No single remote access technology will completely support the transition from office work to remote office work. Users in tethered remote access scenarios will use a mixture of remote control, remote node and store-and-forward applications. Online access requirements will grow rather than diminish, fueling an ongoing need for "remote control" work.

- New messaging architectures being developed to improve the productivity of untethered mobile workers will be adopted by the larger population of tethered remote workers, where greater benefits will be realized.

- Organizations are beginning to develop realistic cost/benefit models for large numbers of remote workers.

Reader Notes

1. What are the market forces for connected remote access?

2. Which communications standards and technologies will be important to future connected remote access users? How will the creation of standards progress, and when will they be adopted?

3. Which vendors will be the leading suppliers of technology for connected remote access?

4. How will users select appropriate combinations of connected remote access technology?

5. How will users manage the costs associated with remote communications and work?

What are the market forces for connected remote access?

Market Forces for Remote Access

Employer
- Increased morale and productivity
- Recruitment tool
- Reduced office cost (e.g., real estate, energy)
- Federal compliance
- Less interruption of routine work on short trips

Government Mandate

- Clean Air Act (in the United States)
- Family and Medical Leave Act (in the United States)
- European Community proposals on "flexible work" (in the European Community)
- Metropolitan-based proposals for traffic regulation (worldwide)

Employee
- More time for family and child care
- Savings on commuting and clothing expenses
- Flexibility to work at peak personal times with less stress and more continuous work time
- Ability to work at home during evenings and for full days on an ad-hoc basis
- Ability to carry out routine work on short trips.

Source: Gartner Group

Organizations that respond only to external pressures will fail to implement successful remote access programs.

More than 80 percent of all organizations will have at least 50 percent of their staff involved in some form of remote access by 1999 (0.8 probability).

Social issues at the macroeconomic and government level, as well as environmental issues, are the key drivers that force companies to consider investment into connected remote access scenarios. The potential benefits for user satisfaction and productivity have been taken for granted in most cases and, therefore, early experiments with telecommuting, for example, have generated mixed levels of satisfaction.
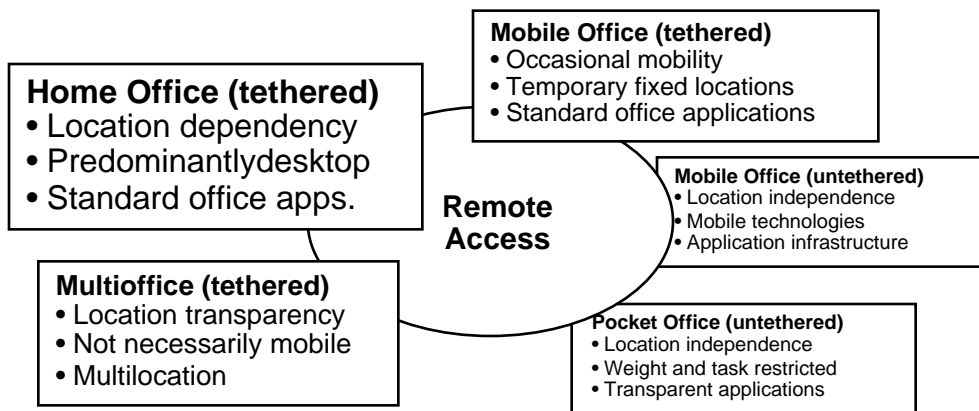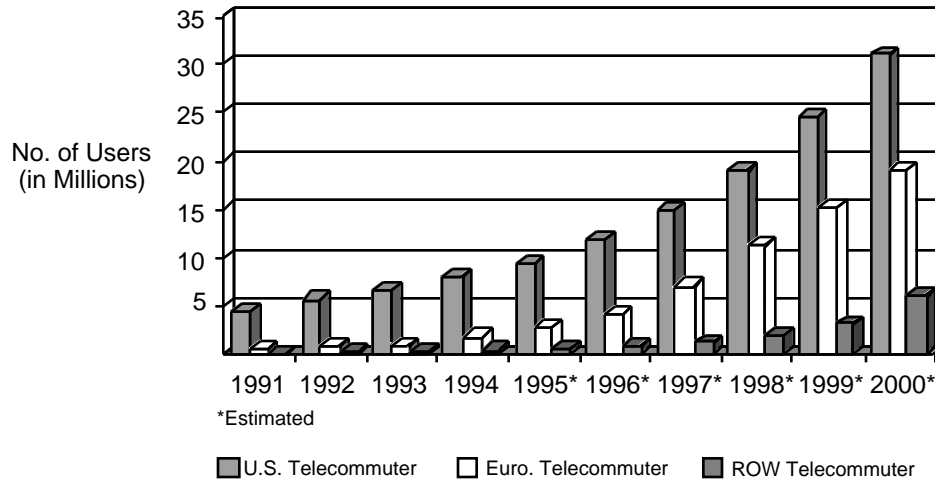
Organizations must concentrate on formulating the three different levels of benefits prior to developing a plan for implementation. Only through a centrally formulated strategy will users be able to reap the benefits of remote access. We believe most users will be driven by a subset of the three issues above, which will not ensure full project success.

By 2000, more than 55 million worldwide users will be regular telecommuters (0.7 probability).

Telecommuting User Growth

No. of Users
(in Millions)

1991 1992 1993 1994 1995* 1996* 1997* 1998* 1999* 2000*

*Estimated

■ U.S. Telecommuter   □ Euro. Telecommuter   ■ ROW Telecommuter

Mobile Office (tethered)
• Occasional mobility
• Temporary fixed locations
• Standard office applications

Home Office (tethered)
• Location dependency
• Predominantlydesktop
• Standard office apps.

Mobile Office (untethered)
• Location independence
• Mobile technologies
• Application infrastructure

Remote Access

Multioffice (tethered)
• Location transparency
• Not necessarily mobile
• Multilocation

Pocket Office (untethered)
• Location independence
• Weight and task restricted
• Transparent applications

Source: Gartner Group

Key Issue: What are the market forces for connected remote access?

We define telecommuting as work performed at remote sites by users who are served by fixed or "tethered" connection services. Telecommuting can involve routine work regularly scheduled for a remote site, occasional or evening work from home, or occasional travelers calling into their headquarters networks from public network "landlines" in hotels, homes or branch offices.
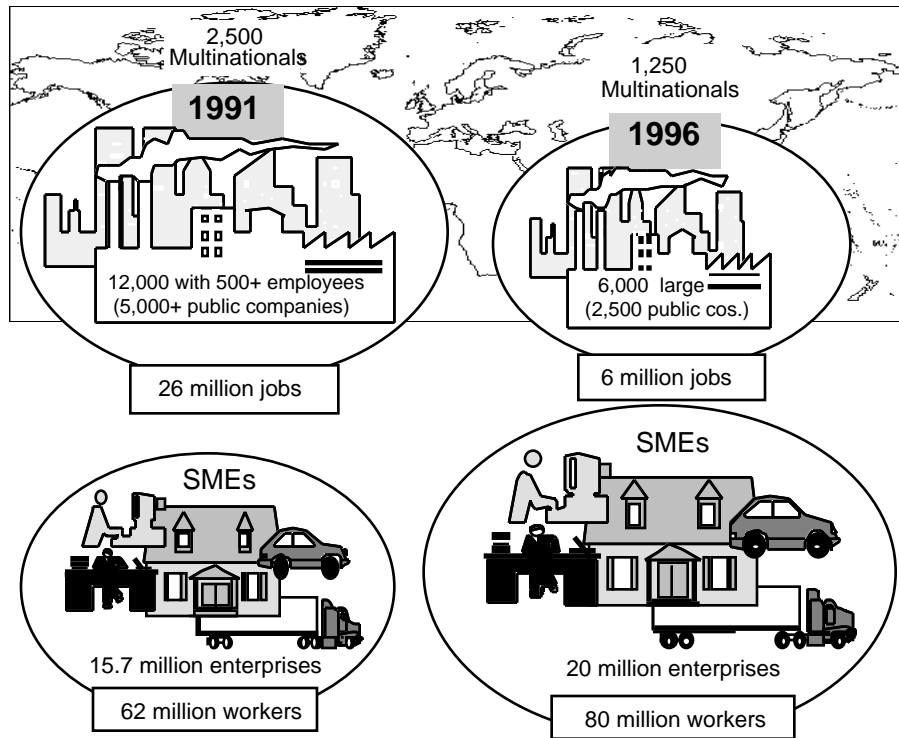
Teleworkers (telecommuters) face the challenge of coping with the need to access a full desktop office environment outside of traditional LAN and supervisory conditions. The large size of the telecommuting *sub-segment* of connected remote access users is sufficient to fuel and finance technological developments across the entire remote access market, as well as to drive competitive rates for wide-area service connections.

While the needs and constraints of telecommuters are different from those of highly mobile, untethered workers, both will benefit from technologies and practices designed for each others' market segments.

By year-end 1997, worldwide corporate downsizing will trigger a major shift toward free-agent, networked, contracted work forces and "virtual corporations" (0.7 probability).

Reader Notes

Worldwide Downsizing Trends

2,500 Multinationals

1,250 Multinationals

1991

1996

12,000 with 500+ employees
(5,000+ public companies)

6,000 large
(2,500 public cos.)

26 million jobs

6 million jobs

SMEs

SMEs

15.7 million enterprises

20 million enterprises

62 million workers

80 million workers

Source: Gartner Group

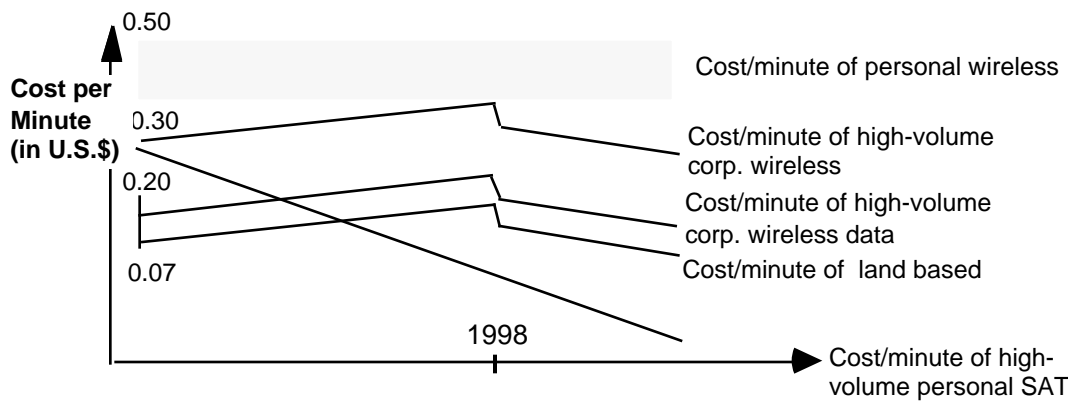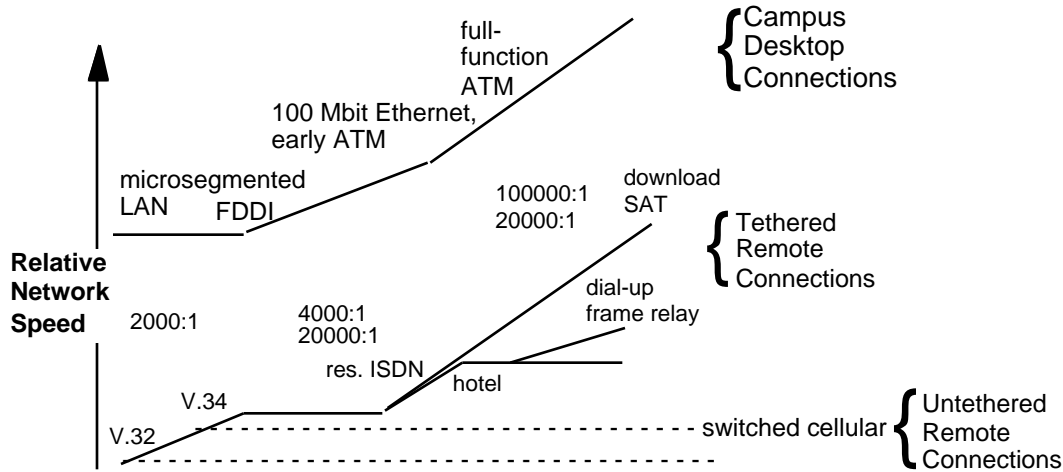**Key Issue: What are the market forces for connected remote access?**

Another business driver that encourages remote work is the global trend toward downsizing, which happens in two basic patterns. First, as companies reduce the size of their work forces to reduce expenses and strengthen stock prices, actual work that must be performed does not disappear. This leads to hiring of short-term and long-term contractors, which are increasingly telecommuters hired over the Internet, as well as "former employees." Second, "telecottages," or independently operated telework centers, are opening in rural areas to stimulate employment. Telecottages offer a combination of services including walk-in use of computer systems and high-speed lines, job placement and short-term contract-bidding coordination services. Overall, these trends are creating a new work force in the Internet community of small- to medium-sized enterprises that are built by laid-off workers. Some of these enterprises are formal organizations, while others are ad hoc teams of independent developers. The size of this new work force will grow by as much as several million persons per year. The skills that an enterprise gains by supporting remote access will aid in understanding and using the future "virtual work force."

During the planning period, tethered remote access will offer significant progress toward parity with campus LAN performance (0.8 probability).

Reader Notes

LAN/WAN Price and Performance Trends

full-function ATM

{ Campus Desktop Connections

100 Mbit Ethernet, early ATM

microsegmented LAN   FDDI

100000:1
20000:1

download SAT

{ Tethered Remote Connections

Relative Network Speed

2000:1

4000:1
20000:1

dial-up frame relay

res. ISDN

hotel

V.34

V.32

switched cellular { Untethered Remote Connections

0.50

Cost/minute of personal wireless

Cost per Minute (in U.S.$)

0.30

Cost/minute of high-volume corp. wireless

0.20

Cost/minute of high-volume corp. wireless data

0.07

Cost/minute of land based

1998

Cost/minute of high-volume personal SAT

Source: Gartner Group

Key Issue: What are the market forces for connected remote access?

Tethered remote users will benefit from increasingly reliable and faster remote communication services during the five-year planning period. While the V.34 modem will remain the common base-level communications method, general availability of ISDN is steadily improving, and even faster services (such as dial-up frame relay) will help organizations manage the speed gap between LANs and remote users. Fixed-station satellite services, particularly the emerging one-way products like Hughes' DirecPC, will provide inexpensive, reliable high-speed data reception to tethered remote workers in response to smaller commands and transactions that have been sent "upward" via modem or ISDN.
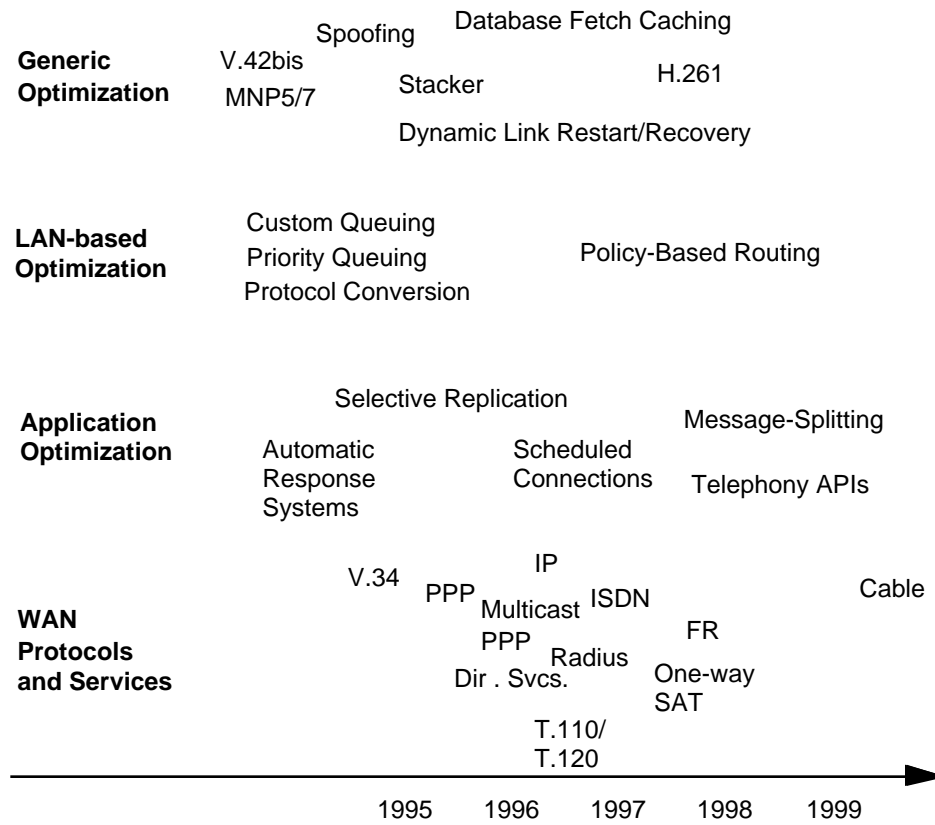
In North America, intense competition among service providers, to follow an anticipated milestone in deregulation of the LECs in 1998, will lead to dramatic price/performance improvements in land-based telecomunications. Toward 2000, wireless message costs will drop, first in Europe and later in North America. However, the speed and reliability of totally wireless connections will continue to limit untethered mobile users to slow and intermittent connections (0.7 probability).

Which communications standards and technologies will be important to future connected remote access users? How will the creation of standards progress, and when will they be adopted?

Time Line for Optimization

Generic Optimization

Spoofing   Database Fetch Caching

V.42bis

MNP5/7   Stacker   H.261

Dynamic Link Restart/Recovery

LAN-based Optimization

Custom Queuing

Priority Queuing   Policy-Based Routing

Protocol Conversion

Application Optimization

Selective Replication

Message-Splitting

Automatic Response Systems   Scheduled Connections   Telephony APIs

WAN Protocols and Services

V.34   IP   Cable

PPP   Multicast   ISDN

PPP   FR

Radius   One-way SAT

Dir . Svcs.

T.110/ T.120

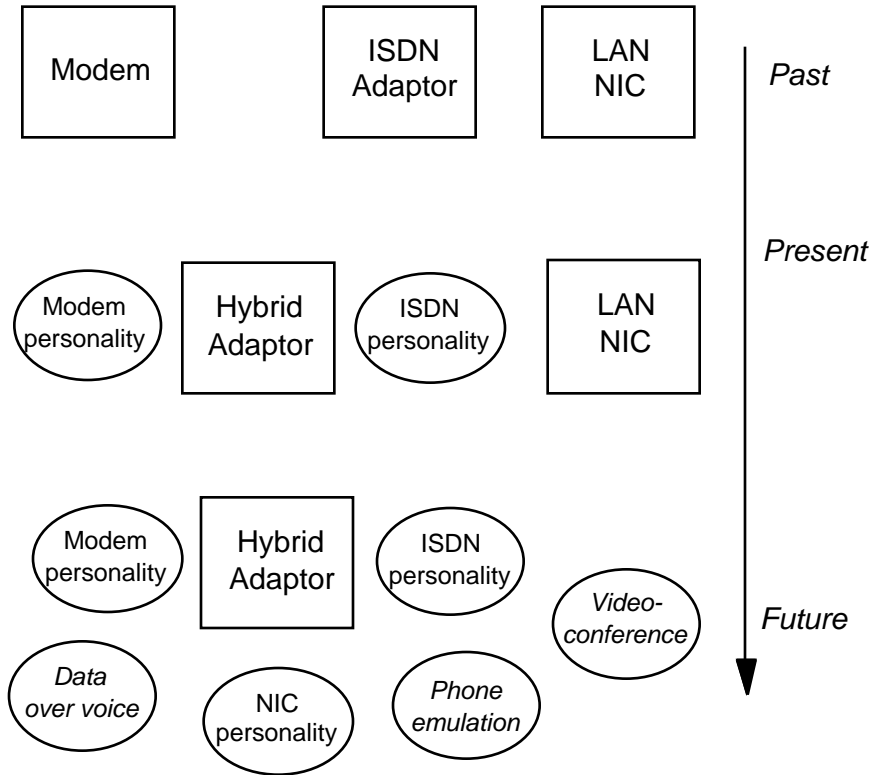1995   1996   1997   1998   1999

Source: Gartner Group

Protocols that govern connected remote access sessions appear on the time line above. All of these protocols have existed or been working candidates for several years. In the graphic, we have not included ones we do not consider viable. During the past few years, these standards have not been fully implemented, due to a variety of political issues between standards proponents, general vendor inertia and the inevitable trial-and-error process of engineering new ideas. Generic optimization techniques offer proven performance irrespective of application design. LAN-based optimization techniques might improve performance by giving priority to remote connections. Application-specific optimization represents a strategic direction for next-generation remote user applications because message-handling decisions can be made in the context of application requirements. Through 1998, users must assemble their own optimization strategies and cannot rely on individual vendors to provide complete optimization for remote communications (0.7 probability).

Communications adaptors will shift from dedicated circuitry to signal processors within the next five years (0.7 probability). The essence of dedicated adaptors will move into software drivers, enabling low-cost hybrid adaptors and new value-added features (0.8 probability).

Reader Notes

Evolution of Communication Adaptors

| Modem | ISDN Adaptor | LAN NIC | *Past* |

(Modem personality) | Hybrid Adaptor | (ISDN personality) | LAN NIC | *Present*

(Modem personality) | Hybrid Adaptor | (ISDN personality) | (Video-conference) | *Future*
(Data over voice) | (NIC personality) | (Phone emulation)

Source: Gartner Group

Key Issue: Which communications standards and technologies will be important to future connected remote access users? How will the creation of standards progress, and when will they be adopted?
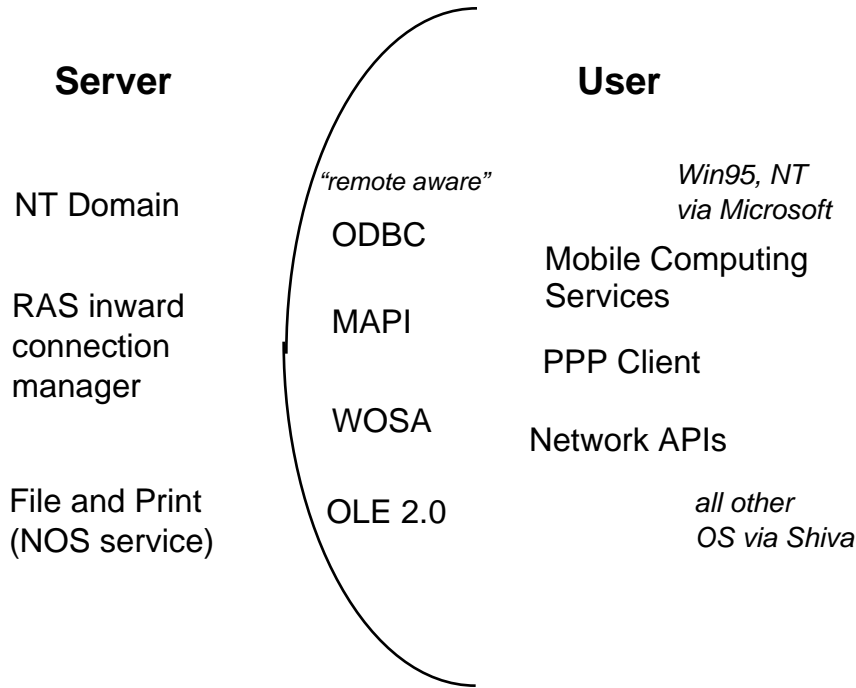
Modems will be an essential, although not exclusive, access method for the remote user in the 2000s. There is strong new demand for "multimode" communications, using devices that occupy only one "slot" in the user's workstation, yet fulfill multiple communications requirements including modem support. Products in this class are already emerging, first in the form of hybrid communications adaptors that support both modem and ISDN connections. This is a natural solution for the user who works at home at times, but also must work when on the road. Initial prices are high — up to $999. In the four-year planning horizon, costs for hybrid products will drop to less than the $250 ("premium modem") price point as communications adaptors evolve from dedicated circuitry to mass-produced, general-purpose digital signal processors (DSP) and native signal processors (NSP) under software control. In the longer, five-year planning horizon, software-controlled hybrid communications adaptors will expand further to include emulation of NICs and support for LAN protocols.

During the planning period, Microsoft's RAS will drive standardization of the remote access client, but will not be a significant market force as a remote access server (0.7 probability).

Remote Access Services in the Microsoft Environment

Server		User
	"remote aware"	*Win95, NT via Microsoft*
NT Domain	ODBC	
		Mobile Computing Services
RAS inward connection manager	MAPI	PPP Client
	WOSA	Network APIs
File and Print (NOS service)	OLE 2.0	*all other OS via Shiva*

Source: Gartner Group

Key Issue: Which communications standards and technologies will be important to future connected remote access users? How will the creation of standards progress, and when will they be adopted?

Microsoft's RAS services, to be included in future Microsoft operating systems, will lead to standardization of behavior, features and function calls in remote access clients. Shiva and Microsoft will share the task and the benefits of this trend. The impact of RAS at the client level is positive for both remote access vendors and ISVs: Use of RAS frees developers from having to create and maintain a number of proprietary interfaces.
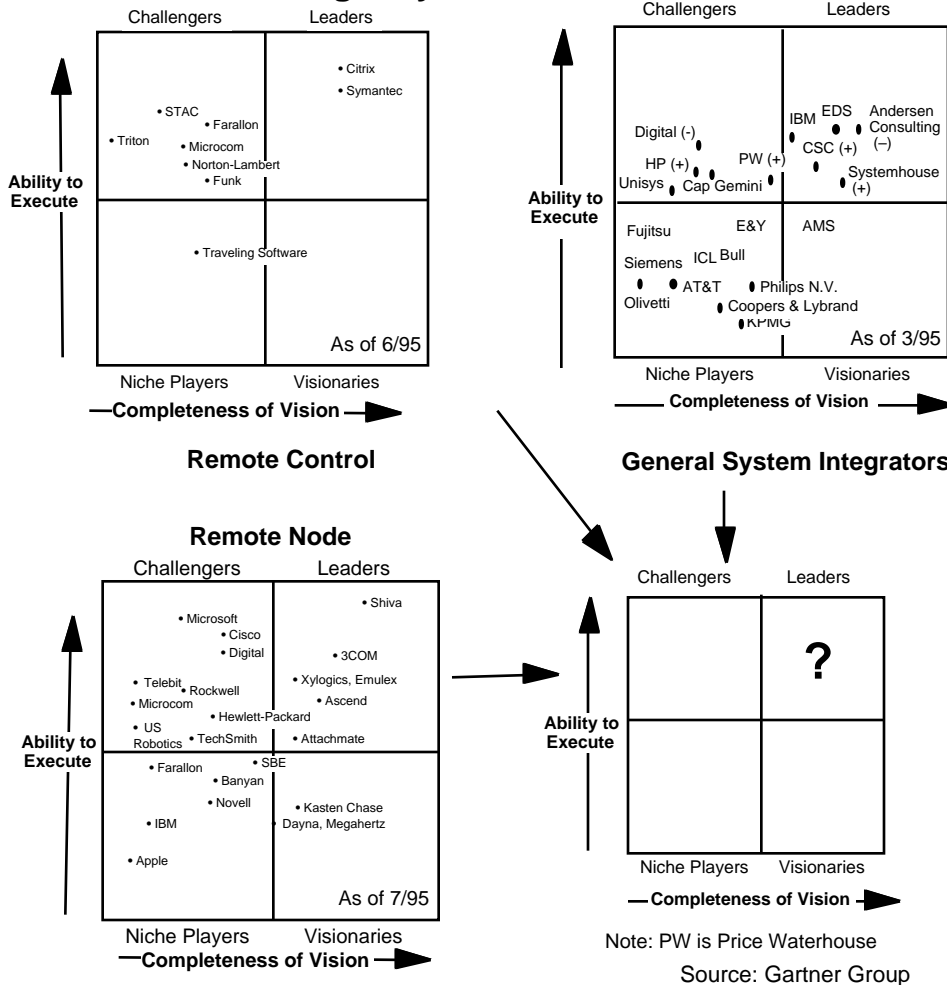
At the server, however, RAS will be less influential. Since RAS is implemented in software, it requires a PC and PC communications expansion cards as a host. The cost to implement a PC server platform is substantially higher than a dedicated remote access device. The same analysis applies to other software-based remote access servers, including NetWare Connect and Attachmate Remote LAN Node.

Which vendors will be the leading suppliers of technology for connected remote access?

Reader Notes

Leading Players in Remote Access

Challengers   Leaders

- • Citrix
- • Symantec
- • STAC
- • Farallon
- • Triton
- • Microcom
- • Norton-Lambert
- • Funk

Ability to Execute

- • Traveling Software

As of 6/95

Niche Players   Visionaries

Completeness of Vision

Remote Control

Challengers   Leaders

Digital (−)   IBM   EDS   Andersen Consulting (−)

HP (+)   PW (+)   CSC (+)

Unisys   Cap Gemini   Systemhouse (+)

Ability to Execute

Fujitsu   E&Y   AMS

Siemens   ICL Bull

Olivetti   AT&T   • Philips N.V.

Coopers & Lybrand

KPMG

As of 3/95

Niche Players   Visionaries

Completeness of Vision

General System Integrators

Remote Node

Challengers   Leaders

- • Shiva
- • Microsoft
- • Cisco
- • Digital
- • 3COM
- • Telebit
- • Rockwell
- • Xylogics, Emulex
- • Microcom
- • Ascend
- • Hewlett-Packard
- • US Robotics
- • TechSmith
- • Attachmate

Ability to Execute

- • Farallon
- • SBE
- • Banyan
- • Novell
- • Kasten Chase
- • IBM
- Dayna, Megahertz
- • Apple

As of 7/95

Niche Players   Visionaries

Completeness of Vision

Challengers   Leaders

?

Ability to Execute

Niche Players   Visionaries

Completeness of Vision

Note: PW is Price Waterhouse

Source: Gartner Group

No vendor offers a compelling vision for the integration of the the remote user into the corporate IT infrastructure. We believe this void in the market will be largely filled by telecommunication providers, such as RBOCs, AT&T, France Telecom, Deutsche Telekom and British Telecom, because the leading WAN providers will ultimately control the most competitive bundling of remote access communications and services technologies. We believe the issues that are important for users to investigate include management of remote platforms, network security and optimizationof telecommunication costs. Users should critically review the vendors' understanding of end-user issues, especially since early remote users are often the organization's power users, and because ongoing user support will require great skill and deductive reasoning.
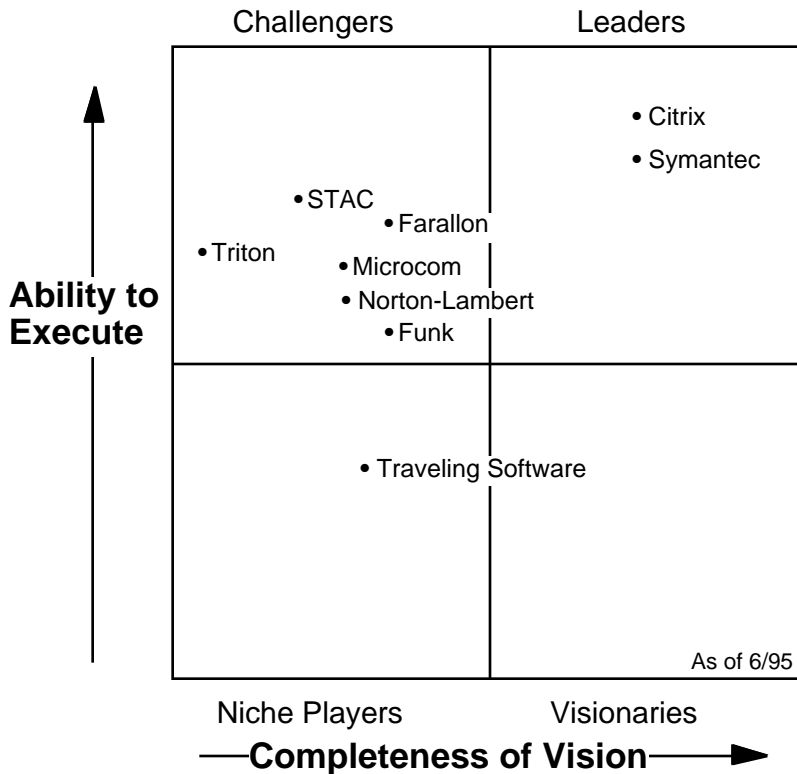
Organizations with small telecommuting needs (less than 100 users) will not gain per-port cost advantages by outsourcing remote access in the next three years (0.7 probability). On the other hand, remote access outsourcing may be an advantage to some organizations that expect to have large fluctuations in the usage of remote access within the next three years or wish to maximize their opportunities to switch technologies within the next three years (0.8 probability).

Multiuser remote control products designed to support Windows 3.x and NT applications will dominate online application access in the planning period (0.9 probability).

Remote Control Vendors' Magic Quadrant

Challengers   Leaders

• Citrix

• Symantec

•STAC

• Farallon

• Triton

• Microcom

• Norton-Lambert

• Funk

Ability to Execute

• Traveling Software

As of 6/95

Niche Players   Visionaries

——**Completeness of Vision**——▶

Source: Gartner Group

Key Issue: Which vendors will be the leading suppliers of technology for connected remote access?

The remote control market segment of the burgeoning remote access industry is experiencing growth despite many trade predictions that remote control is a dead technology. The relative slowness of remote connections (typically less than one-thousandth the speed of a LAN connection) assures users that remote control of online image- and data-intensive applications remains a strategic necessity. In our graphic above, Citrix and Symantec continue to hold the leadership quadrant because no other remote control vendors have articulated a viable multi-user solution for their products. The other vendors are continuing to concentrate on "personal remote control" (i.e., the idea that one user dials into the office to access one CPU, whether it is on the desktop or in a LAN-based server). However, we are convinced that the demand for remote control will grow over time as users increasingly make use of I/O-intensive applications unsuited for relatively slow remote access connections.
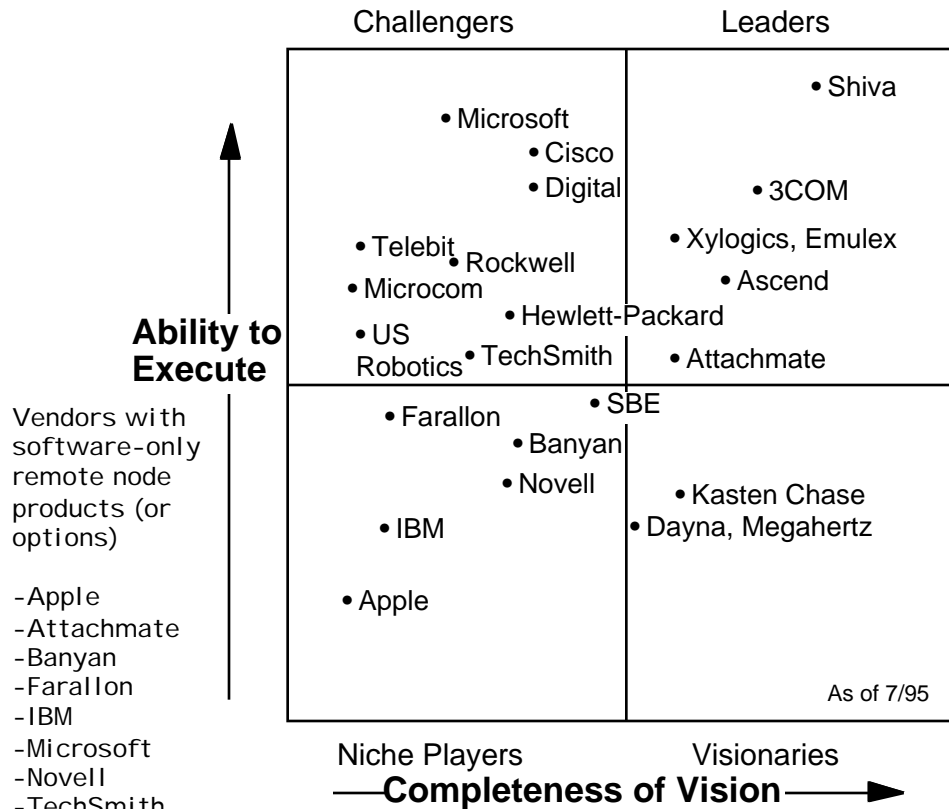
Tethered remote access users get value from remote control applications because they can establish reliable connections easily and quickly over relatively low-cost services. IT departments can save money by avoiding software distribution and remote backup.

During the planning period, the leading remote node suppliers will be those vendors that concentrate on providing dedicated, low-cost hardware and end-user support, and forming strategic alliances (0.8 probability).

Reader Notes

Remote Node Vendors' Magic Quadrant

Challengers | Leaders

Ability to Execute

• Shiva

• Microsoft
• Cisco
• Digital

• 3COM

• Xylogics, Emulex

• Telebit
• Rockwell
• Microcom

• Ascend

• Hewlett-Packard

• US Robotics • TechSmith

• Attachmate

• SBE

• Farallon
• Banyan
• Novell

• Kasten Chase
• Dayna, Megahertz

• IBM

• Apple

As of 7/95

Vendors with software-only remote node products (or options)

-Apple
-Attachmate
-Banyan
-Farallon
-IBM
-Microsoft
-Novell
-TechSmith

Niche Players | Visionaries

——Completeness of Vision——▶

Source: Gartner Group

Key Issue: Which vendors will be the leading suppliers of technology for connected remote access?

In the five-year planning horizon, remote node devices will be the preferred remote access method for connecting into corporate LANs.
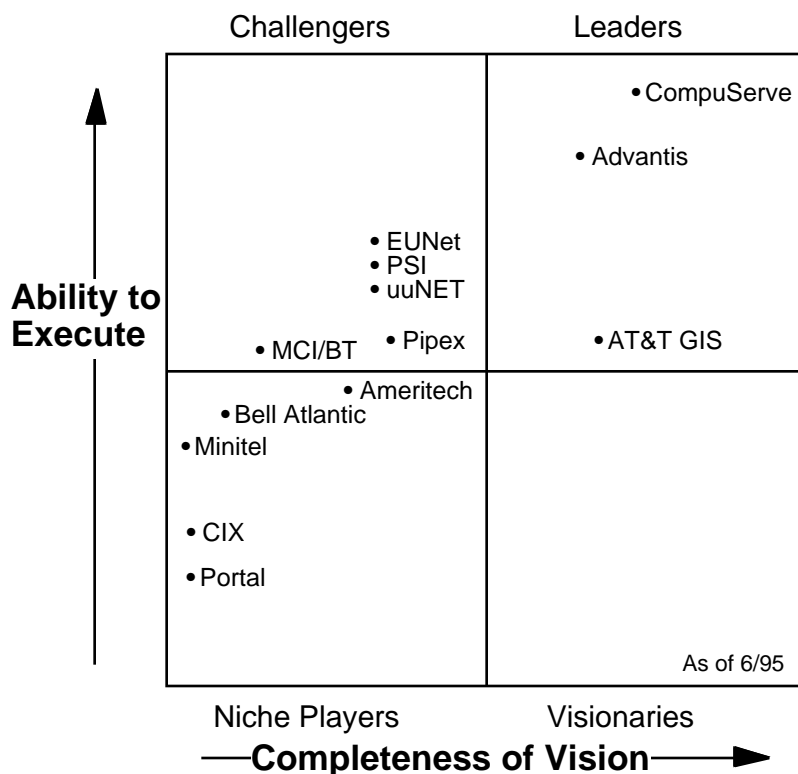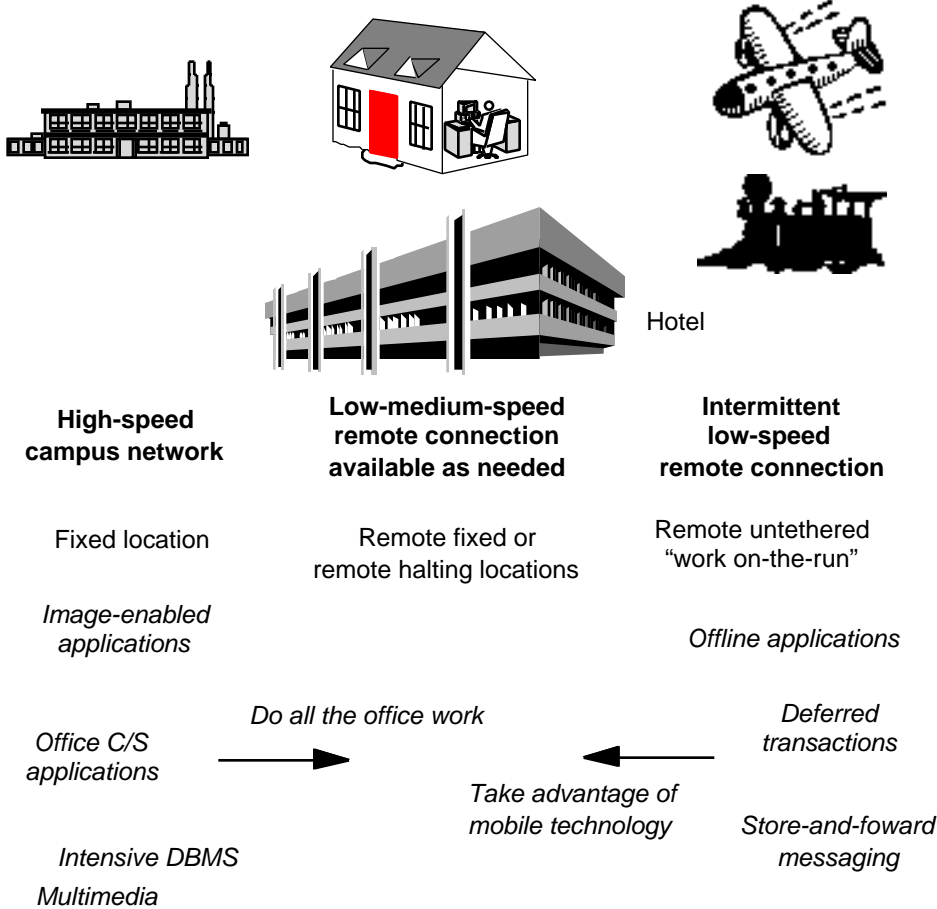
Dedicated remote node access devices offer the best price/performance margins and the least-complex management. Organizations will be forced to make compromises about the quality and quantity of remote work that can be supported, selecting a range of remote access tools that are particularly suited to identified telecommuter scenarios. Each distinctive remote access work scenario must be completely documented, and a solution selected that is most likely to support productive work.

The majority of outsourced remote access solutions offered in the next three years will be niche solutions (0.8 probability).

Remote Access Service Providers' Magic Quadrant

```
          Challengers              Leaders

                                      • CompuServe

                                    • Advantis


                          • EUNet
                          • PSI
                          • uuNET
Ability to
Execute        • MCI/BT   • Pipex      • AT&T GIS

                       • Ameritech
                   • Bell Atlantic
               • Minitel


               • CIX

               • Portal

                                          As of 6/95

          Niche Players           Visionaries
            ——Completeness of Vision——▶
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Source: Gartner Group

Key Issue: Which vendors will be the leading suppliers of technology for connected remote access?

Our "magic quadrant" analysis of noteworthy remote access service providers in 1995 (shown above) bears little resemblance to a full analysis of network outsourcing service providers.

With the exception of services from CompuServe, Advantis and AT&T, most of the "remote access outsourcing" offers tendered (to date) appear to be limited in both functionality and scope. Traditional service providers have not been motivated by the potential, large numbers of users to support. In addition, a successful remote access outsourcing plan requires thorough analysis of the organization's business process and work requirements. Few outsourcers possess these skills. When trade restrictions and franchise areas are relaxed in the United States (we anticipate this will happen by 1998), competitive offerings from LECs will create highly cost-competitive opportunities.

Users should note that remote access outsourcing can be logically pursued as an isolated activity that would not otherwise raise the threat of full IT department outsourcing.

How will users select appropriate combinations of connected remote access technology?

Hotel

High-speed campus network	Low-medium-speed remote connection available as needed	Intermittent low-speed remote connection
Fixed location	Remote fixed or remote halting locations	Remote untethered "work on-the-run"
Image-enabled applications		*Offline applications*
Office C/S applications	*Do all the office work* →	← *Deferred transactions*
	Take advantage of mobile technology	*Store-and-foward messaging*
Intensive DBMS		
Multimedia		

Source: Gartner Group

In the five-year planning horizon, no single remote access technology solution will meet all tethered remote access user needs in a large enterprise (0.8 probability).

Tethered remote users will find themselves in a challenging position between office-bound workers and highly remote workers. Tethered remote workers will be expected to use the same applications that are found in the office, on the campus LAN. At the same time, these users will be able to share the benefits of "intelligent" messaging and optimization techniques that are being developed to aid the untethered mobile users. By 1998, technologies developed for mobile users will offer even greater access improvements in the connected remote access model (0.9 probability).
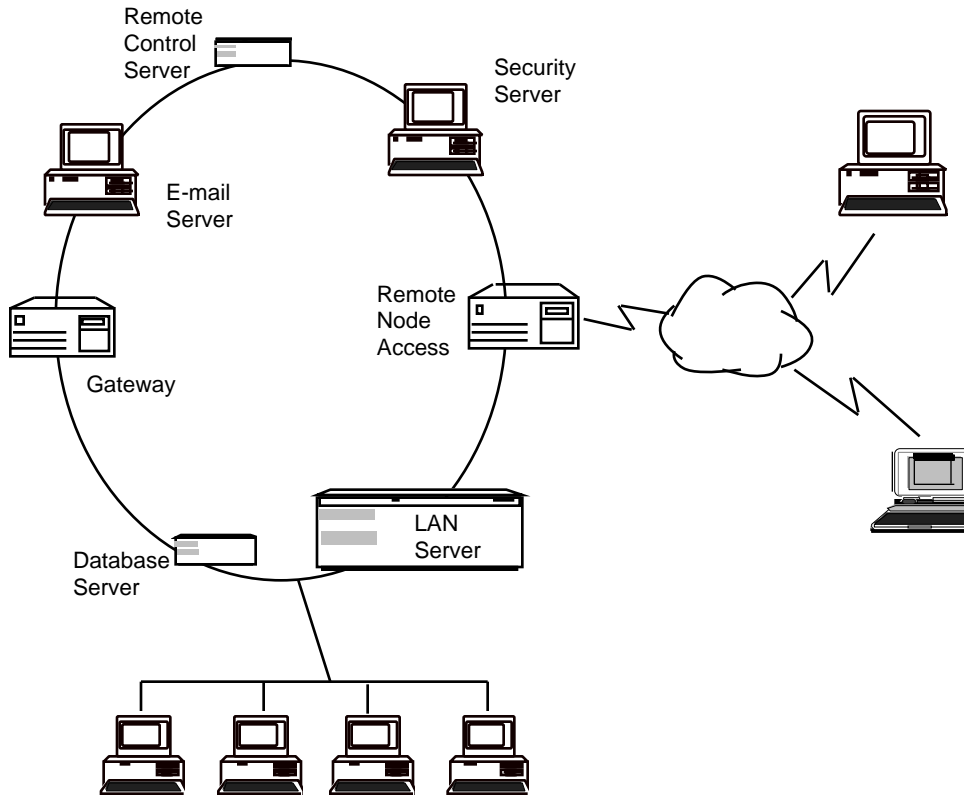
Organizations pursuing connected remote access should track intelligent messaging technologies immediately.

Remote work infrastructures that are based on generalized remote node access to multiple service types may achieve payback in the IT department within 24 months (0.7 probability).

A Recommended Remote Access Environment

Source: Gartner Group

Key Issue: How will users select appropriate combinations of connected remote access technology?

A large enterprise will always have a wide range of remote access needs. A well-designed infrastructure for connected remote access will exhibit the following characteristics:

• The general access point will be via dedicated remote node

• Users will log into a network service, not a specific server

• A security token will be used for access control

• Remote control services will be accessed optionally on a multiuser server after entering the network

• Store-and-forward services will be accessed optionally after entering the network
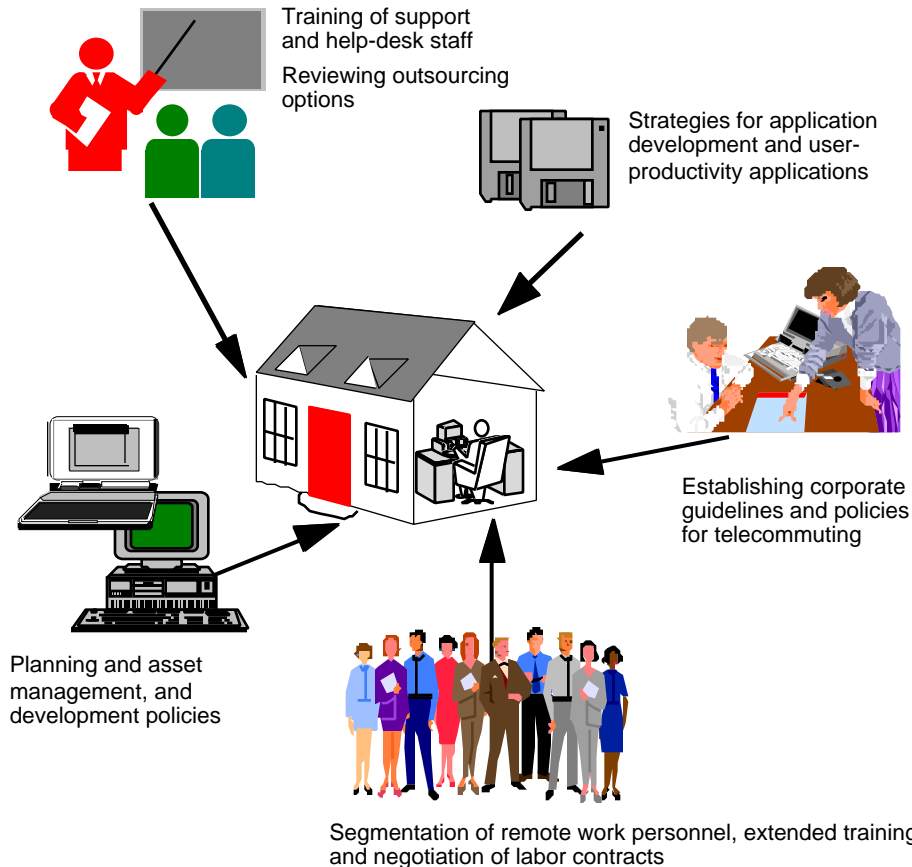
Using the generalized access model, a common set of servers, services and applications can be readily shared by campus, remote-tethered and mobile-untethered workers, resulting in a fast return on investment for the organization.

How will users manage the costs associated with remote communications and work?

Elements of a Remote Work Program

Training of support and help-desk staff

Reviewing outsourcing options

Strategies for application development and user-productivity applications

Establishing corporate guidelines and policies for telecommuting

Planning and asset management, and development policies

Segmentation of remote work personnel, extended training and negotiation of labor contracts

Source: Gartner Group

No remote work program will be successful without a formal plan for implementation, tracking and ongoing management.

The acceptance and/or implementation of a remote access strategy requires that the IS organization carefully design the infrastructure to support pervasive remote work as well as form a partnership with the remote workers' business units.

We believe there are five areas that are critical to the success of remote access: 1) identification of suitable workers and jobs in cooperation with line management, 2) planning the client infrastructure and managing that infrastructure through tools and help-desk staff, 3) training of internal help-desk and support staff, 4) re-engineering of work so that it may be performed and tracked outside the normal business setting, and 5) incorporation of the concepts of an occasionally connected user into the internal development of applications (this includes training development staff to understand the requirements of remote users, such as instant training and network optimization).

Where costs are carefully controlled, tethered remote access may result in a demonstrable return on investment in less than 15 months (0.7 probability).

Remote Worker Cost Savings

Savings

• **Increased employee productivity/effectiveness** — **$5,250**

Studies show an increase of between 10 percent and 20 percent in end-user productivity, caused by less time spent commuting, fewer unproductive disturbances and a more flexible time schedule.

• **Increased corporate productivity/effectiveness** — **$700**

Studies have shown that having a group of people become (individually) more effective will increase overall group productivity. The average is about 2 percent.

• **Increased ability to retain employees** — **$595**

This will reduce the need for employee training and search costs equivalentto between 1 percent and 1.7 percent of salary costs.

• **Reduction in office space** — **$4,000**

This will vary depending on the space occupied by the employee, the cost per square foot and the slight increase in space required for a shared office space for telecommuters when they are in the office. If an employee's dedicated space can be eliminated, the average reduction will be about 135 square feet, with an average price of about $6 per square foot.

• **Reduced parking space** — **$320**

Reduction in monthly parking space requirements by 30 percent to 100 percent per telecommuter.

• **Miscellaneous positive impact** — **?**

Studies also show a reduction in sick leave, increased client satisfaction, and an increased possibility for the creation of new products.

Source: Gartner Group

Key Issue: How will users manage the costs associated with remote communications and work?

We strongly recommend that project managers of remote access projects evaluate both the tangible and the intangible benefits before starting a trial project. The cost reductions shown in the chart illustrate a typical set of cost savings and productivity increase situations that are currently assumed for regular offsite work, as in telecommuting. (Users are advised to perform this analysis with their own numbers.) While the potential reduction in business unit costs or increase in productivity are staggering, since they are annual recurring savings, there are equally recurring costs for the organization, which include travel costs to corporate offices, the lack of daily participation in informal discussions, and incurred complexity costs for the remaining corporate staff. In Europe, where costs for office space, transportation and energy are often higher than in the United States, the savings may be greater. These reductions must be reconciled with new IT infrastructure investments to arrive at an accurate cost/benefit calculation.

Tethered remote access requires new *and* redundant IT infrastructure investments that will add 10 percent to 30 percent to the workstation/network five-year total cost of ownership compared to an office-bound worker (0.8 probability).

Remote Access IT Investments

End-user Equipment

Fax center software	$100/user
Personal printer	$300/user
Telephone	$200/user
Two to three telephone lines and/or other WAN lines	$40 to $400/month
Security card	$45 to 150/user
Modems and/or other communications adaptors	$250 to $1,.000/user

Data Center Equipment

Network access server	$500/port
Security server	$5,000 to $30,000/domain
Modems and/or other communications adaptors	$500/port
Audioconference/videoconference support facilities	$60,000 to $120,000
New/added WAN connections	$3,300/port
Network management interface and training	included above

Training $3,000/user-staff

Fax applications
Remote-access device
End-user general training/setup
Help-desk training and diagnostic tools

Ongoing Costs

Five hours per month support	$250/month
Monthly phone charges	$100 to $1,500/month
Liability insurance	$250 to $1,000/year
Onsite support contracts	$100 to $1,000/year
Periodic office visits	$0 to 5,000/visit

Source: Gartner Group

Key Issue: How will users manage the costs associated with remote communications and work?

Tethered remote users, whether dedicated telecommuters or occasional remote workers, need their own remote office environment, which results in the investment of equipment that would be redundant at the office. Telephone and other WAN access charges must be closely managed and tracked. If only one employee is remote, local employees can call that person directly for meetings, but this is not feasible for multiple remote sites. Audioconferencing and videoconferencing equipment will facilitate meetings with remote workers. Also, organizations should remember that any malfunctioning equipment is costly in terms of productivity and dollars. Before any worker relocates to a remote site, an organization should set up regional service contractors that will be responsible for servicing faulty equipment. Occasional travel to headquarters may still be necessary for remote workers to attend meetings, receive some types of service and updates, and, equally important, to maintain relationships.

In general we believe that the setup costs for remote workers will be at least 10 percent to 30 percent higher than for office workers, but that these costs will be more than justified by business unit savings, if and only if, all factors are accounted for in the cost/benefit analysis.

- By 2000, more than 55 million worldwide users will be regular telecommuters (0.7 probability).

- Through 1998, users must assemble their own optimization strategies and cannot rely on individual vendors to provide complete optimization for remote comunications (0.7 probability).

- Communications adaptors will shift from dedicated circuitry to signal processors within the next five years (0.7 probability). The essence of dedicated adaptors will move into software drivers, enabling low-cost hybrid adaptors and new value-added features (0.8 probability).

- During the planning period, Microsoft's RAS will drive standardization of the remote access client, but will not be a significant market force as a remote access server (0.7 probability).

- Multiuser remote control products designed to support Windows 3.x and NT applications will dominate online application access in the planning period (0.9 probability).

- During the planning period, the leading remote node suppliers will be those vendors that concentrate on providing dedicated, low-cost hardware and end-user support, and forming strategic alliances (0.8 probability)

- The majority of outsourced remote access solutions offered in the next three years will be niche solutions (0.8 probability).

- In the five-year planning horizon, no single remote access technology solution will meet all tethered remote access user needs in a large enterprise (0.8 probability).

- Remote work infrastructures that are based on generalized remote node access to multiple service types may achieve payback in the IT department within 24 months (0.7 probability).

- Where costs are carefully controlled, tethered remote access may result in a demonstrable return on investment in less than 15 months (0.7 probability).