# THE TEXAS TELECOMMUNICATIONS REVIEW


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The University of Texas at Austin

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## 1998 Issue Focus:
## Building a Networked Texas

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# Texas Telecommunications Review: Building and Maintaining a Networked Texas

## Policy Concerns

# TELECOMMUNICATIONS OVERVIEW

The following essays highlight some of the recent changes in telecommunications regulation. While Dr. Sinha's essay summarizes some of the privatization and deregulation trends worldwide, Dr. Strover's essays on national information policy, universal service and Texas' telecommunications deregulation explore how deregulation has proceeded here in the U.S. and some of the difficulties in implementing competition policies while maintaining safeguards for the public. Kyle Nicholas outlines the current status of telephone providers in Texas. Another essay explores how telecommunications and computer technology are accessed and used differently by different population groups in the state.

## IN THIS SECTION:

# GLOBAL INFRASTRUCTURES

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Telecommunications sectors the world over are undergoing a radical transformation. Around the world, developing economies are reforming their telecommunications sectors in various ways, including privatizing state telcos and in many cases injecting competition into long-established monopoly markets. These countries are attempting to overcome decades of neglect of their telecommunication infrastructures. At present, high-income countries, which contain less than 15% of the world's population, account for 70% of the world's main telephone lines. Of the remaining 85% of the population, less than half have ever used a telephone. This situation prompted the International Telecommunications Union, which assigns spectrum around the world, to define universal service as a condition in which every person in a country lives within three miles of a telephone.

**Less than 15% of the world's population, account for 70% of the world's main telephone lines.**

The world's developing countries will spend over $200 billion from 1995-2000 to bring their phone networks--and nations--inline with current technologies. These countries plan to increase the number of phone lines by an average of 12% a year for the next five years. Deregulation and new technologies are driving telecommunications growth in the richer countries as well, but liberalization in these countries is preceding only in fits and starts. For example, two years after the landmark 1996 Telecommunications Act was passed, the United States has yet to witness full competition in local phone services and the local phone companies are still prohibited from offering full long-distance service.

The expansion of telecommunications in developing countries comes from the realization that emerging nations cannot develop their economies or hope to compete in world markets without world class communications systems.

The relationship between telecommunication density and national productivity is well established. Specific telecommunication projects can help boost economic activity in localized environments. Early results from countries who have rapidly expanded their telecommunication systems, like Chile and Turkey, suggest that as telephone density rises, so do economic activity, productivity and national incomes.

However, poor nations cannot afford to upgrade and expand their networks without significant infusions of foreign investment, skills and technologies. To get them, countries are loosening regulations and opening the doors to foreign telecom companies of all types- equipment manufacturers, fixed-line and wireless service providers and telecom software developers. As U.S. companies enter foreign markets to take advantage of these opportunities, the business models must be reformed. "Local" U.S. telephone companies, like SBC Corp., have already become "global" companies whose customers, markets and revenues are spread over several continents. These developments are rapidly blurring the distinction between the national infrastructures. The failure or success of telecommunication ventures in Asia, Africa and Latin America can reverberate half-way around the world.

**Top 15 Countries in Internet Usage Per Capita***

| | |
|---|---|
| Finland | 244.5 |
| Norway | 231.1 |
| Iceland | 227.3 |
| U.S. | 203.4 |
| Australia | 178.0 |
| New Zealand | 155.9 |
| Canada | 148.9 |
| Sweden | 147.3 |
| Singapore | 141.2 |
| Denmark | 125.6 |
| Switzerland | 107.1 |
| United Kingdom | 99.5 |
| Netherlands | 88.9 |
| Hong Kong | 64.9 |
| Japan | 63.1 |

***1997 Rank, Country, Internet Users Per 1,000 People)**
**(Source: Computer Industry Almanac Inc., 1997)**

For additional information, see:
International Telecommunications Union: http://www.itu.org
Telecommunications Online: http://www.telemagazine.com/
Public Network Europe: http://www.pnewire.com/
Business Communications Review: http://www.bcr.com/bcrmag/default.html

# National Information Policy

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While no single document presents what one might label the definitive "U.S National Information Policy," several laws, regulations and policy statements can be examined in order to piece together a core set of values that may comprise a national information policy. First, it is worth pointing out that the term "information" as used in current policy-making generally refers to entertainment as well as what is more conventionally considered information. Similarly, information policy is an amalgam of ideas and rules that refer to transmission industries such as the telephone and satellite, content industries such as cable and television programming, and various related endeavors such as Internet Service Providers as well as computer vendors that defy easy classification.

While the First Amendment offers strong protection for self-expression in print, every medium since print has had to re-define the appropriate government role. (We are going through this with respect to the Internet right now.) The American tradition expects private ownership and control of communication systems, which historically has not been the case for most countries. Most other nations, for example, established national telecommunication agencies that provided phone, telegraph and telephone services, and many also established national state-owned and run radio and television services. Corporate ownership of communication and information industries has meant that the U.S. government largely focused on what the appropriate structure for industries should be – how they should perform, how they should compete, terms of their dealings with consumers and suppliers, and so forth. Currently, fostering a competitive structure in telecommunications is a high priority.

In 1993 Vice President Gore announced the Administration's proposals to reform the communications marketplace, a key component of a vision for a National Information Infrastructure (NII), in a speech to the Academy of Television Arts and Sciences. He cited the need to bring the economic, health, and educa-

tional benefits of the information revolution to all Americans and challenged his audience to connect every classroom, library, hospital and clinic to the NII by the year 2000 so that all Americans can benefit from the communications revolution. In addition, Vice President Gore proposed and strongly encouraged the development of a Global Information Infrastructure that bridges sovereign nations' information infrastructures to connect people around the world through a massive network of networks. A range of social benefits, increased employment in information jobs, and private sector leadership are hallmarks of his "Agenda for Action" to create the NII.

**By one estimate, two- thirds of U.S. workers are in information-related jobs, and the rest are in industries that rely heavily on information.**

**—NII Agenda for Action**

If Gore's remarks put a vision of the Information Superhighway in front of the country, the 1996 Telecommunications Act added legislative force to it. This Act, the first major re-working of the 1934 Communications Act, established the structure for competition in many of the information/communication industries. Asserting that a vibrant and competitive industry is in the national interest, the Act modified many of the existing regulatory practices. The Act extended the license terms for television stations, required V-chips in television sets, set up a timeline for removing regulation on cable television, authorized the entry of new companies to provide local telephone service and redefined Universal Service. The FCC was charged with implementing many of the Act's provisions, and in the years since 1996 the Commission has busily interpreted and rolled out new rules under the Act's provisions.

The growing significance of the Internet and its potential for e-commerce has sprouted another dimension to the National Information Infrastructure. In July, 1997, the Administration announced a framework for electronic commerce. Its tenets include:

- private sector leadership and industry self-regulation
- support for private sector efforts to develop technology and practices that

facilitate the growth and success of the Internet

• minimal government involvement or intervention and avoidance of new and unnecessary regulations, bureaucratic procedures, or taxes and tariffs on commercial activities that take place on the Internet

• where governmental involvement is necessary, its aim should be to support and enforce a predictable, consistent, and simple legal environment for commerce

• insofar as the Internet is emerging as a global marketplace, the legal framework supporting commercial transactions on the Internet should be governed by consistent principles across State, national, and international borders that lead to predictable results regardless of the jurisdiction in which a particular buyer or seller resides.

By smoothing the way for growth in electronic commerce, this approach reasons that the private sector will have added incentives to construct the Information Highway that will bring commercial as well as non-commercial benefits to the U.S. and the world. That said, however, important questions regarding privacy, security, surveillance, and content control remain. By relying on industry self-regulation and commerce-related incentives to grow information infrastructure, the U.S. government approach has sidestepped several significant equity and social goods issues in favor of assuming that market-based solutions will emerge to address those problems.

For additional information, see:
On the 1996 Telecommunications Act: http://www.fcc.gov/telecom.html
National Information Infrastructure: http://nii.nist.gov/nii/whatnii.html; also http://www.whitehouse.gov/WH/EOP/OVP/html/nii1.html
National Information Infrastructure: Agenda for Action: http://metalab.unc.edu/nii/NII-Agenda-for-Action.html
On e-commerce: http://www.whitehouse.gov/WH/New/Commerce/directive.html

# TELECOMMUNICATIONS DEREGULATION IN TEXAS

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Telecommunications deregulation in the U.S. has been prompted in part by advances in electronic technology, such as the microprocessor-based switches used in telephone systems, and in part by the political popularity of reduced government oversight in communication – and other - industries. Historically, government policies in the U.S. have been designed in order to facilitate the operations of the private businesses offering telecommunications services while ensuring price and service standards. The thinking has been that properly functioning businesses could in turn deliver efficient and cost-effective services to consumers. By 1984, when AT&T's divestiture occurred, the advantages of open competition exceeded those of regulatory oversight associated with a guaranteed rate of return and monopoly status. AT&T's entry into competitive long distance signaled a wave of new services, vendors and opportunities, expanding and complicating the communications domain.

Such changes challenged regulators at the federal and state levels as they were faced with applying old categories and methods of regulation to what increasingly appeared to be vastly different types of companies and new operating circumstances. Many states subsequently adopted their own laws deregulating intrastate telecommunications, employing various strategies to replace strict rates of return with incentive regulation.

**Historically, government policies in the U.S. have been designed in order to facilitate the operations of the private businesses offering telecommunications services while ensuring cost and service standards.**

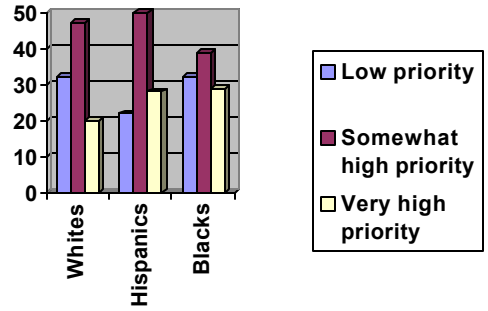
In 1995, Texas passed its own telecommunications deregulation act in HB 2128 (later PURA95). By then the local telecommuni-

cations service market was perceived to be potentially as competitive as long distance services had proved to be in the 1980's. The Texas statute encouraged competitive entry into the local exchange telecommunications market by allowing incumbent telephone companies the option of electing into a regulatory framework with pricing incentives (rates and access charges were frozen) as opposed to a traditional rate of return. This bill also created a $150 million per year fund, the Telecommunications Infrastructure Fund, designed to upgrade the communications infrastructure of K-12 schools, higher education, public libraries and health care facilities.

PURA95 has not been without its critics. Two main provisions in the state law were questioned. The build-out requirements and limitations for network resale for would-be competitors providing local service (CLECs) were charged with being onerous and the prohibition against municipalities entering into the telecommunications business was charged with being counter to the spirit of competition. After the federal Telecommunications Act of 1996 was passed, conflict between provisions of the federal law and these elements of PURA95 begged for resolution. The build-out provisions of the state law were set aside in the wake of the federal law. The primary focus of activity since 1996 has turned on two related issues in Texas: the status of local competition and Bell's progress interconnecting with its competitors.

**Texans' support for publicly-funded programs that connect public schools and libraries to the Internet (%)**

**Source: June 1998 Texas Poll**



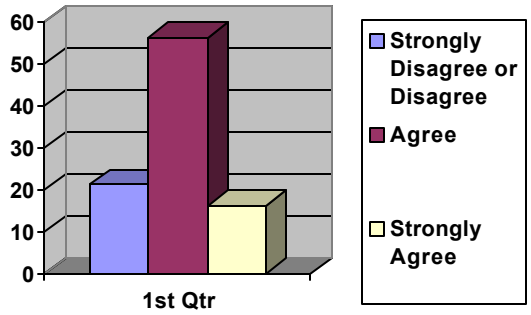

A primary goal of the '96 Act was to open up local markets to competition while also making available an avenue for providers of local service to offer long distance service (§271 of the Act applies to Bell Operating Companies). A Regional Bell Operating Company (RBOC) that wants to get into long distance must first open its local market to sustainable competition. The incentives offered to the RBOCs were considered the best

method of convincing them to give up their exclusive, monopoly franchises. To date, the FCC has not yet granted any Bell operating company the right to offer long distance service.

In September 1996, the Texas PUC presided over a three-week arbitration under the Federal Act between Southwestern Bell Telephone and potential local competitors MCI, AT&T, Teleport, MFS, Sprint, and ACSI. Ultimately, the PUC issued an award on some 130 disputed points, set interim rates and directed further proceedings in 1997 to establish permanent rates. In the summer of 1997 the PUC arbitrated several additional issues, particularly relating to pricing and the competitors' use of unbundled network elements. Commissioner Pat Wood commented to the FCC that "Without question, the §271 incentive has been a critical element for SWBT to more fully cooperate in opening its local market. Over the course of our arbitration hearings, SWBT witnesses made it clear that the §271 incentive was highly 'motivational.'" In Texas, long distance telephone service is a $6 billion business.

**Texans' Attitudes (%) about Whether they have More Choice in Companies that Provide Telecommunications Services Since 2 Years Ago**

**(Source: June 1998 Texas Poll)**




Disagreement continued in 1998 between SWBT and the PUC over what constitutes opening up local markets. The PUC at one point rebuked SWBT for a bad attitude toward local competitors. Southwestern Bell, for its part, claims the PUC is being unreasonably restrictive. This situation is reflected across the country as local exchange companies gear up to move into the lucrative long distance business

For additional information, see:
Public Utility Commission of Texas: http://www.puc.state.tx.us/
Southwestern Bell: http://www.swbell.com/

# UNIVERSAL SERVICE

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With the passing of the 1996 Telecommunications Act, the concept of universal service became a revitalized issue. The Act makes significant changes in the broader telecommunications environment and redefines the components of universal service.

When the U.S. telephone system primarily consisted of AT&T's monopoly service, universal service was a tacit commitment to affordable phone service for all households. In return for AT&T's assistance, the FCC regulated telephone services in such a way that AT&T was a *de facto* monopoly, shielded from competition and with a guaranteed fair rate of return and sanctioned long-term capitalization structures. This was accomplished through a system of internal subsidies that ensured that charges for local calls would be kept relatively low by selling long distance and business services above cost. These subsidies were designed to enable most households to afford local calling services. Universal service enhances the utility of the network because it increases the number of connected subscribers. As such it is an expression of a social good most regulators have sought to protect.

The Telecommunications Act of 1996 explicitly addressed Universal Service, defining it as "an evolving level of telecommunications services" and acknowledging that what society considers basic to telecommunications needs may change over time. Inasmuch as this Act deregulated much of the communications industry, the FCC was particularly interested in eliminating implicit, internal subsidies as a source of support for Universal Service. Congress also added to the provisions of Universal Service by requiring universal service support for eligible schools, libraries and rural health care providers. (In 1996 the U.S. Department of Education found that only 14% of all public school instructional classrooms were connected to the Internet.) All telecommunications carriers that provide service between states contribute to the universal service.

A newly created Federal-State Joint Board on Universal Service was estab-

| U.S. Telephone Penetration Data for Selected States, 1997 | |
|---|---|
| New Mexico | 88.1% |
| Mississippi | 89.2% |
| Arkansas | 89.9% |
| Louisiana | 91.0% |
| **TEXAS** | **91.3%** |
| Iowa | 96.7% |
| Minnesota | 96.9% |
| Nebraska | 97.1% |
| Pennsylvania | 97.1% |
| **U.S. average** | **94.1%** |

Source: FCC Common Carrier Bureau, Industry Statistics

lished by the Commission to make recommendations on how to restructure this program, and, in May 1997, the Commission adopted its recommendations. They included continued support for "Link-Up" and "Lifeline" programs to help low income households afford telephone service;[1] discounted rates for Internet access for public schools and libraries, called "E-rate;" and discounted telecommunications services for rural and not-for-profit health providers. The fund for such support was capped at $2.25 billion.

In 1998 the Commission designated the Universal Service Administrative Company (USAC), a successor to the initial Schools and Library Corporation, as the organization that will administer universal service programs. As of November 1998, about $73 million dollars in discounts began to reach eligible institutions. The majority of the funds is set aside for school districts primarily comprised of students eligible for participation in the National School Lunch Program and school districts located in rural areas. The funding provides discounts only for telecommunications services, Internet access, and internal connections. Related costs such as training, software, and internal wiring are not covered by Universal Service.

The E-rate program is not without critics. Some people argue that Universal Service is a "tax" and that it duplicates programs already in place on the state level. However, others see Universal Service as insurance that the gap between information "haves" and "have-nots" does not further widen. By facilitating some access to the expansive information and communication resources represented by the Internet, Universal Service can be a force for equity.

For additional information, see:
Benton Foundation's links to Universal Service:
http://www.benton.org/Policy/96act/#uniserv/
FCC resources on universal service:
http://www.fcc.gov/ccb/universal_service/welcome.html

# TELEPHONE PROVIDERS IN TEXAS

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The introduction of competition into local phone service has covered Ma Bell's kitchen with alphabet soup. The seemingly simple days of one company, one bill have been replaced by a rapidly evolving scene wherein a single phone bill may contain charges from several phone companies, each with its own role to play in comprehensive phone service. Long distance companies are poised to offer local services and local companies are eager to get into long distance. Cable companies are surveying both markets. One key to this expansion is increased data traffic, particularly from Internet use. Time Warner has launched its high speed *Roadrunner* cable modem service in El Paso and Austin to capture part of that market; other companies are counting on digital line services, such as ISDN (Integrated Service Digital Network) or high speed connections based on the old copper wire, like ADSL (Asymmetric Digital Subscriber Line). Cellular, wireless, microwave and satellite companies all compete for business and residential phone traffic, giving customers a dizzying array of options that can be difficult to evaluate. The situation is particularly complex in Texas, where the 59 incumbent phone companies have been joined by 240 new competitors at last count. Together, these companies operate 1300 local telephone exchanges as well as numerous private systems throughout the state. To understand how changes in policy, utilization, technology and services affect telecommunications customers, we need to dive into the sea of acronyms and come up with a few definitions.

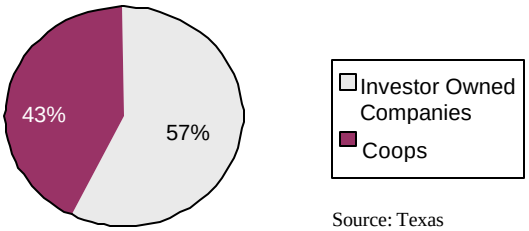
**Texans can expect to see steady decreases in wireline long distance rates as competition heats up, both within the industry and between wireline and wireless companies.**

Local exchange carriers are the companies that provide local phone service. Following the breakup of AT&T in 1984,

Southwestern Bell became the Regional Bell Operating Company (RBOC) for Texas. Several independent phone companies, including GTE, have also traditionally served Texas communities. Much of rural Texas has been served by local telephone cooperatives, created as an outgrowth of the Rural Electrification Act and other policies. These three types of providers are collectively known as Incumbent Local Exchange Companies (ILECs). Competitive Local Exchange Companies (CLECs) are the newcomers challenging local companies for residential and business customers. Generally, CLECs are national chains looking for profits from high-traffic exchanges. Competitive Access Providers (CAPs) are a type of CLEC that preceded open competition policy. CAPs target businesses and sometimes employ proprietary telecommunications systems. Often, their main business is providing high speed connections to long distance carriers.

Long distance phone companies route traffic from local exchanges to distant exchanges using proprietary lines, or by contracting with other providers to lease lines and switches. Interexchange Carriers (IXCs) are long distance companies that provide service between either two local phone companies or between distant exchanges within a single company. Long distance rates include a charge for IXC service. One key issue in long distance pricing is the decreasing role of distance in long distance carriage costs. Advanced switching technology and route redundancy are two factors that have reduced distant sensitive pricing. Texans can expect to see steady decreases in wireline long distance rates as competition heats up, both within the industry and between wireline and wireless companies.

**Ownership of Texas Telephone Companies**




Source: Texas Telephone Association

Local and long distance calling areas are determined by Local Access Transport Areas (LATAs). These areas were created following the breakup of AT&T; each area was supposed to include a dominant city and its surrounding community. Texas has 16 LATAs and two Special Mar-

ket Areas (SMAs), which function as LATAs. All calls that cross LATA lines are technically long distance calls, hence subject to federal regulations. Within each LATA are several local exchanges, each with at least one central switching office. The central switch is a computer that monitors line traffic, routes phone calls, and provides advanced services, such as call forwarding and caller ID.

Dramatic changes in public policy spur telecommunications competition in Texas. The 1996 Telecommunications Act mandated competition in both local and long distance and paved the way for new players, like cable companies, to enter the telephone business. Texans had already made a move toward competition in 1995 when major providers, including Southwestern Bell and GTE, hoping to get into the long distance business, opted to open their local monopolies to competition in an agreement eventually codified as PURA 1995. As a condition of that bill, ILECs had to install digital switches at each exchange and upgrade to fiber optic lines. They also committed more than $1 billion to the Telecommunications Infrastructure Fund to help schools and libraries in Texas acquire digital technologies. Those technology upgrades should help rural customers get advanced services. However, the operating costs of advanced services have limited their diffusion in rural areas served by coops and competitive providers alike. A host of alternative technologies engender dynamic competition in the Texas telecommunications scene. Cellular phones, digital wireless systems, spread spectrum radio signals, satellite systems and mini-microwave systems, like Telligent, challenge traditional providers, particularly with business customers. These systems may also provide viable options for rural customers, further reducing the distance penalty for rural communities.

Despite a plethora of regulatory and market incentives, competition for local residential phone customers has not flourished. The marketplace is not yet an adequate device to ensure efficient and equitable service for all Texans.

For additional information, see:
Public Utility Commission: http://www.puc.state.tx.us/
Texas Telephone Association: http://www.tta.org/
U.S. Telephone Association: http://www.usta.org/
National Telephone Co-Op Association: http://www.ntea.org/

# THE TEXAS "DIGITAL DIVIDE"

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Recent national reports point to a growing gap between information "haves" and "have nots" when it comes to access and use of personal computers and the Internet. New data from a statewide survey in Texas illustrate some similar trends; however, the Texas data reflect not only gaps in access to technology, but also significant differences in how Texans are using information technology.

**National Findings**

National data from the Commerce Department suggest that the "digital divide" between racial and income groups grew between 1994 and 1997, even though computer ownership and Internet use increased for people in these same racial and income categories. These gaps are growing larger as those in the White majority who already are more advantaged perceive the utility of home computers and move more quickly to acquire them. Gaps persist at all income levels, and are particularly great for online access. The report documents the need for concern about some groups lagging behind others. The "least connected" groups include the rural poor (earning less than $5000 per year); rural and central city minorities; young households (below age 25), and female-headed households.

**Texas Findings**

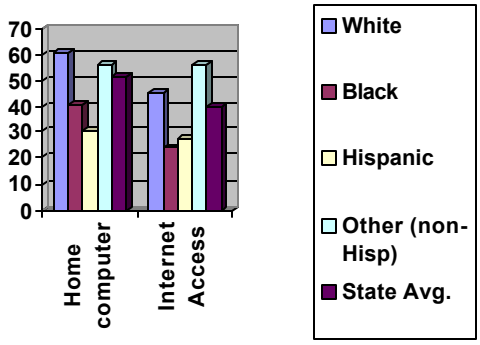
Our analysis of Texas data suggest that race and income function as summary statistics that mask a range of cultural conditions affecting technology use.

**Basic Computer and Internet Use**

The statewide average of 51.2% citing home computer ownership and 39.5% having Internet access is somewhat higher than the national penetration figures cited in the NTIA study (36.6% home computers and 18.6% with on-line access). Nonetheless, the pattern of differential access reported in other studies is confirmed here, with the Hispanic population at roughly half the home computer level as the non-Hispanic White population (60.9% v. 30.1%), and nearly half the Internet access level as well (45% v. 26.8%).

There also are significant regional differences in these items, with South Texas (51% Hispanic overall in the sample), West Texas (49% Hispanic), and East Texas (predominantly White, and poor) showing the lowest home computer and Internet use figures. The metropolitan-rural setting also is strongly related to whether one has a home computer and uses the Internet. People in larger cities are much more likely to use the Internet and also much more likely to have computers at home.

**Home Computers and Internet Use (%)**




**(Source: 1998 June Texas Poll)**

## Technology-Related Behaviors or Attitudes

Where people obtain access to the Internet and what they use the Internet for may provide some insight into perceived utility of computers and the online access. Similarly, whether people use the Internet for email, for information, for games or for other purposes may help explain some of the digital divide, as may uses of home computers. To the extent that there are differences among groups on attitudinal or behavioral items concerning the use of computers and the Internet, we may understand some of the culturally related preconceptions about electronic technologies.

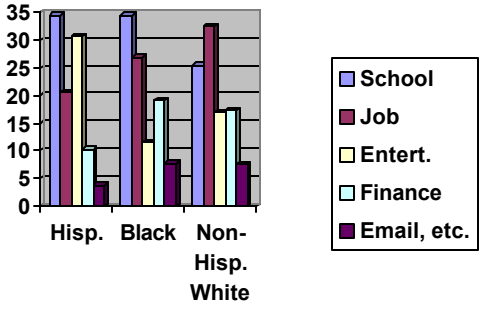
Our findings suggest that people at different income levels use computers for different purposes. Those at the lowest income levels cite school-related uses more than do people at higher incomes; people in the very highest income category (over $60,000) primarily use home computers for job-related purposes and for home finance. Only 8.7% of that group indicated that entertainment was a primary use, while between 22.4% and 27.8% of the other income groups said that entertainment was primary.

We found that within the groups of home computer users, there were significant differences between what different ethnic groups state as their primary use of the computer. Hispanic and Black groups said that school-related uses were

primary, while the major use for the White group was job-related. In addition, nearly 31% of the Hispanic members of the sample used computers primarily for entertainment, a figure dramatically higher than those for Blacks or Non-Hispanic Whites (11.5% and 16.9%, respectively.) Cross-tabulating these ethnic subgroups with computer uses illustrates that Non-Hispanic Whites use computers less for school-related purposes, and more for personal finance reasons. Hispanics use computers less frequently for email and other communication than do other groups. They also do not cite personal finance as often as do Blacks or the non-Hispanic White group.

**Ethnic Group Percentages by Primary Computer Use (Source: 1998 June Texas Poll)**

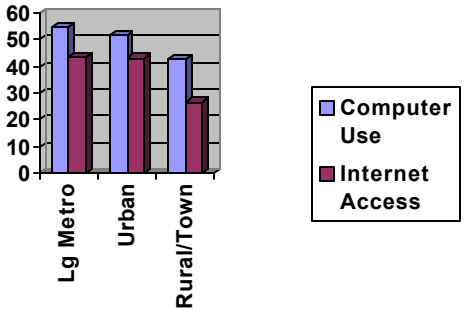
We also found that schools and libraries are very important for minority groups: nearly 36% of Hispanics and 24% of Blacks access the Internet at school, compared to just 15% of the Non-Hispanic Whites. Hispanics and Blacks also cite library access more often than do Non-Hispanic Whites (27.5% and 17.6% respectively, compared to 10.7% of Non-Hispanic Whites). Predictably, access at home illustrates the reverse pattern, with 83.6% of the Whites stating they have Internet access at home, compared to 62.9% and 64.7% of the Hispanic and Black members - high percentages but still uneven.




There was a significant difference across the three groups on one related item: the priorities they assigned to having a state program for connecting schools and libraries to the Internet. Minority group members assigned higher priority to this project than did members of other groups. This follows from the earlier finding that minorities disproportionately use computers for schoolwork. Both findings have strong policy implications regarding the importance of enhancing access opportunities through schools and libraries.

**Differences Among People in Rural Versus More Urban Areas**

**Home Computer and Internet Use by Rural-Urban Setting (%)**
**(Source: 1998 June Texas Poll)**

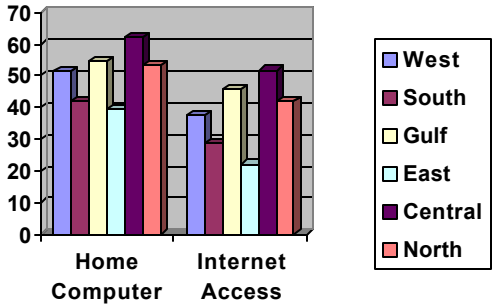



There is a clear rural disadvantage in terms of owning a computer and having used the Internet, one probably associated with income. Data revealed that the southern region had the highest level of using the library to access the Internet. The central region of the state is relatively wealthy and has extremely high home computer penetration and online access figures, in part a by-product of its plentiful technology companies. While comparisons on accessing the Internet by region did not show statistical significance, the trend between a region that has fewer resources and heavier use of a public access point bears further scrutiny. The city or town one lives in also was not significantly associated with where one accessed the Internet or for what one used the Internet.

**Conclusions/Implications for Policy Research**

Our data confirm national statistics: overall computer and Internet access penetration rates vary significantly by region and rural-metropolitan setting. Minority group members report proportionately more frequent access to the Internet from schools and libraries, and they also report more school-related uses for their computers. The finding that the Hispanic members of the sample used computers for entertainment is a striking contrast to the more job-oriented applications cited by the White members, suggesting the possibility of differing cultural and functional needs. Our data suggest profiles that underscore the job-oriented and solitary, home-based Internet access model for the White subgroup, while the profile for minority groups is one that illustrates the importance of public places for access, and possibly the significance of school for prompting or promoting computer use. We could hypothesize that certain access points (schools, libraries) lend themselves better to certain endeavors than to others. Public points of access may be less amenable for undertaking work-related tasks than other activities.

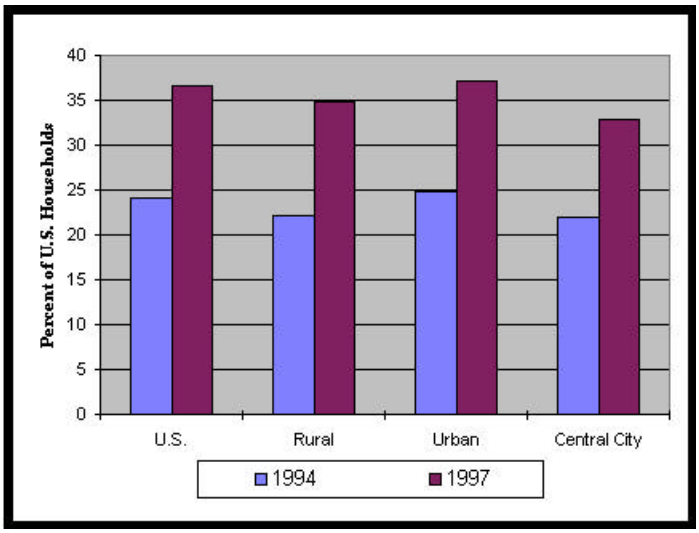
**Region by Home Computer and Internet Access (%)**
**(Source: 1998 June Texas Poll)**




These data hint at the utility of pursuing more explanations for differences across subpopulations with respect to computer and Internet use in Texas. The access gap is well known, and it is worrisome that it appears to be growing. These data also enhance our understanding of the importance of schools and libraries for promoting computer and Internet use. Our conclusions strongly support the utility of the initiatives taken in many states and regions of the country to subsidize the extension of Internet access to schools and libraries. Beyond merely providing access, however, our findings also suggest the need to demonstrate applications of computers and the Internet that can go beyond school-related work and on to other uses for exploring these tools, such as job-related uses or other communications-related tasks.

For more information, see:
Goslee, S. (1998). Losing Ground Bit by Bit: Low Income Communities in the Information Age. Washington, D.C: Benton Foundation. Online version at http://www.benton.org/Library/Low-Income/
Garmer, A. (Ed.). (1998). Investing in diversity: advancing opportunities for minorities and the Media. Report of the Aspen Institute Forum on Diversity and the Media. Washington, D.C: Aspen Institute.
Department of Commerce. (1998). Falling through the Net. Washington, D.C. Online version at http://www.ntia.doc.gov/ntiahome/net2/.

**Changes in Percent of U.S. Households with a Computer**




**Source: NTIA, Falling through the Net, 1998**

# Additional Resources

Telecommunications Policy is an international and interdisciplinary journal concerned with the social, economic, political and regulatory aspects of telecommunications and information systems. http://www.elsevier.nl:80/inca/publications/store/3/0/4/7/1/

National Telecommunications and Information Administration: http://www.ntia.doc.gov/
Federal Communications Commission: http://www.fcc.gov/
Telecom Digest Homepage:
http://hyperarchive.lcs.mit.edu/telecom-archives/
The Telecommunications Corner: http://telecom.tbi.net/
TelecomPolicy.net: http://www.telecompolicy.net/

# PUBLIC SECTOR

These essays introduce some elements of state government's use or regulation of telecommunications. Bill Mitchell, former Chair of the TIF Board, reviews that agency's mission to upgrade infrastructure around the state. The PUC is our primary telecommunications regulatory agency ensuring that competitive services and consumer-friendly practices are sustained. Some applications of new communications systems for emergency 911 services, for monitoring transportation traffic, and for facilitating the state's own purchasing and services are reviewed in the final essays in this section.

## In this Section:

# THE ROLE OF TIF:

## IMPLEMENTING TELECOMMUNICATIONS INFRASTRUCTURE IN TEXAS

Bill Mitchell
Former Chairman, Telecommunications Infrastructure Fund Board

In May 1995, when Governor George W. Bush signed HB 2128 into law, Texas's telecommunications regulatory environment changed dramatically. HB 2128, also referred to as the Public Utility Regulatory Act of 1995, or "PURA '95," was designed to encourage a fully competitive telecommunications marketplace while also protecting and maintaining the wide availability of high quality, interoperable, standard-based telecommunication services at affordable rates. Competition had arrived in Texas.

**As of August 1998, TIF has funded 11 discovery or "model" collaborative projects, 775 school districts (out of approximately 1044), 57 community colleges (out of 57), and 158 public libraries (out of approximately 500.)**

HB 2128 also created the Telecommunications Infrastructure Fund ("TIF"), which is governed by a nine-member board and is specifically charged with disbursing $1.5 billion over ten years in grants and loans to assist in developing the telecommunications capabilities in public entities such as public schools, public libraries, institutions of higher education, and not-for-profit public healthcare providers. As of August 1998, TIF has funded 11 discovery or "model" collaborative projects, 775 school districts (out of approximately 1044), 57 community colleges (out of 57), 158 public libraries (out of approximately 500), and has recently released two grant opportunities for not-for-profit healthcare facilities, two additional grant opportunities for public libraries, and two additional public school distance learning and Internet connectivity grants. By the end of the year, all Texas public schools and public libraries will have had the opportunity to receive TIFB funding.

As the TIF Board considers its future goals, one of our most important roles will be to continue to use TIF's grant program to drive advanced telecommunications infrastructure into the rural, remote, and/or underserved regions of Texas. By providing "start-up" funds in the form of

both competitive and non-competitive grants, TIF has given entities traditionally lacking the means for high-speed telecommunications capabilities the ability to finance advanced services. In addition, the TIF Board recently funded a $22.5 million joint project between TIF, the General Services Commission, and the Texas Education Agency to assist in the establishment of a data warehouse for use by educational institutions and a statewide infrastructure. The purpose of the statewide infrastructure portion of project is to provide advanced telecommunications services to TIF constituents on a cost-effective basis. The data warehouse will allow teachers and administrators rapid access to information collected about K-12 education,from detailed student performance data about TAAS (Texas Assessment of Academic Skills) results to statewide aggregate and comparative information about school finances.

Infrastructure will always be TIF's primary focus. However, as public access to advanced services increases as TIF grants are implemented and the statewide infrastructure is extended, TIF is turning its attention to the issue of sustainability, our greatest challenge and biggest concern. Community networks, increased collaboration, training, and information sharing projects such as the TIFBase data warehouse, will all be ways in which TIF will work to prepare our citizens for the new millenium.

For more information, see:
TIF:http://www.tifb.state.tx.us/
Texas Education Agency Public Access Initiative:
http://www.tea.state.tx.us/pai

# A New Role For the Public Utility Comission

Margaret Wilson
Director, Information and Education, Public Utility Commission of Texas

The Texas Legislature created the Public Utility Commission (PUC) in 1975 with the passage of the Public Utility Regulatory Act (PURA). Texas was the last state to establish regulatory authority over monopoly utilities when the PUC opened in 1976. Today, the PUC regulates 160 utilities, which include 61 local telecommunications companies and 99 electric utilities. The PUC's mission is to assure the availability of safe, reliable, high quality services that meet the needs of all Texans at just and reasonable rates. In addition, the PUC is charged with facilitating a transition to competition for both of the industries it regulates, while protecting and educating customers in Texas and supporting the operation of a free market.

In recent years, the commission's responsibilities have evolved in response to a new PURA enacted in 1995 and other legislative mandates which reflect the national trend toward deregulation of public utilities. Today's PUC has four basic responsibilities. First, it continues to set rates for many utilities, a traditional regulatory responsibility. Second, the PUC monitors services of regulated utilities to ensure that they are following state rules, orders and service standards. Third, the PUC grants certification for new facilities and new market entrants. Finally, the PUC resolves customer complaints, enforces the agency's laws and rules, and educates customers.

The agency has three major offices including the Office of Policy Development, which functions as the policy advisor for the agency; the Office of Regulatory Affairs, responsible for developing the record in protested cases and reviewing unprotested filings for consistency with PUC policies; and the Office of Customer Protection, responsible for educating and informing customers of their rights and enforcing PUC rules and statues.

For more information, see:
Public Utility Commission of Texas: www.puc.state.tx.us.
If you have additional questions, feel free to call the PUC Customer Complaint toll-free number, 1-888-782-8477, or send an e-mail to customer@puc.state.tx.us.

# THE TEXAS GOVERNMENT STATEWIDE TELECOMMUNICATIONS NETWORK

Eddie Esquivel
Manager of Statewide Issues, Texas Department of Information Resources

**Background**

The Telecommunications Planning Group (TPG) -- consisting of the Executive Directors or designee of the Department of Information Resources (DIR), the General Services Commission (GSC) and the Comptroller of Public Accounts -- was charged by the 75th Texas State Legislature through Senate Bill 365 to develop a plan for a statewide telecommunications network with the goal of achieving a single centralized telecommunications network for state government. The TPG completed the Texas State Government Telecommunications Strategic Plan (Plan) in the fall of 1998.

Based on an analysis of the current state government requirements and the existing technological environment, the Plan proposes a fiber-based SONET infrastructure to meet future state government telecommunication infrastructure requirements. The Plan does not propose a specific solution (state-owned, leased or outsourced); rather, it delegates the implementation aspects of the network to the GSC, the managing agency of the state telecommunications network (TEX-AN). The proposed network is known as TEX-AN 2000.

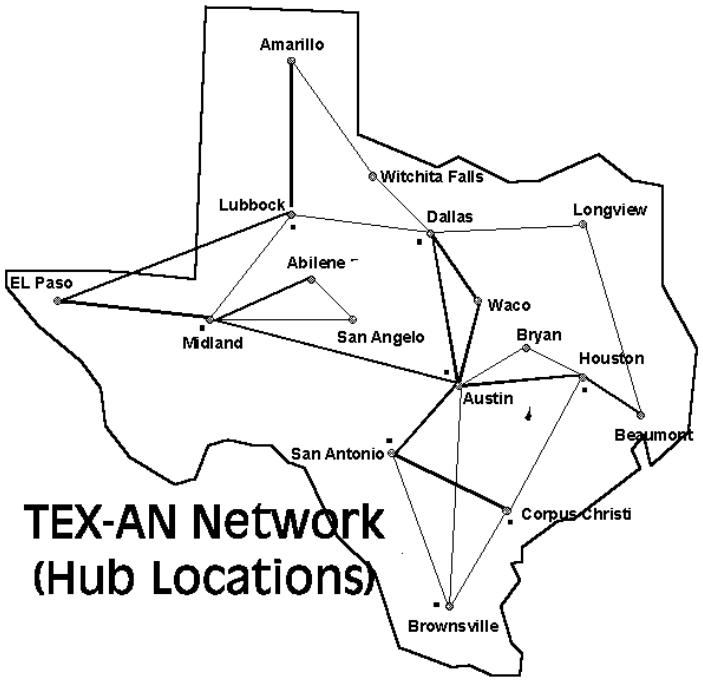
**The implementation of TEX-AN 2000 in fiscal years 1999-2000 will ensure the state is well positioned to provide services and access to public information to the state citizenry.**

**Accomplishments**

In order to address telecommunication issues in state government, the following initiatives were accomplished:

- Consolidation of telecommunication service bureaus: In April 1997, DIR and GSC entered into an inter-agency contract whereby the DIR transferred all existing telecommunication support functions provided to GSC. The consolidation of the service bureaus benefited the state by ensuring a single entity would provide all the networking and telecommunication services to the state.
- Development of a statewide data

network on TEX-AN and the cooperative initiative with state universities: In 1996, GSC implemented a statewide data network to support the state legislature's access requirements for the field offices. As part of the support and service providing function, GSC purchased direct Internet access for the statewide data network. This was completed in coordination with the state universities. The coordination of access has allowed GSC and the universities to:



TEX-AN Network (Hub Locations)

- Present a single network for state agencies' access to the Internet;
- Represent the state as a single intranet to the rest of the Internet community, facilitating router configurations and address distribution throughout the Internet; allow for technical sharing of information and planning the future needs of the state between the combined staffs; and
- Reduce the overall costs for access connections to the Internet.
- Partnership with TIFB on an Educational Infrastructure: In July 1998, GSC, the Telecommunications Infrastructure Fund Board (TIFB), and the Texas Education Agency (TEA) partnered to build an educational infrastructure to ensure low rates for access to the state network and the Internet for schools, libraries and other eligible TIFB clientele. The TIFB funding for an educational infrastructure allows for the infrastructure to be provided by GSC and the educational content to be delivered by TEA.
- Planning for TEX-AN 2000: GSC has hired a telecommunications-engineering firm to assist in the process of implementing the requirements in the Plan.

The following phases are to be completed:

- The first phase is the data collection process and an assessment of areas in the current network that may produce additional savings.
- The second phase is the setup of focus sessions with TEX-AN users and telecommunication vendors to determine the TEX-AN 2000 requirements.
- The third phase is the development of the requirements and specifications for the TEX-AN 2000 network.
- The final phase is the completion and release of a Request for Offer with the specifications for telecommunications vendors to bid on the TEX-AN 2000 network.

**Issues**

Though the TPG accepted the responsibility of implementing a consolidated network, many issues that were raised during the planning process, including:

- State agency requirements can be grouped into community of interest networks. There are issues in consolidating all agency needs into a single data network. As an example, interests of the criminal justice systems and health and human services areas do not coincide with the needs of education areas in regards to security, privacy issues and other requirements.
- There is a large investment in the existing state agency networks, implemented to meet specific needs. Migration of these networks to a single consolidated network should be based on voluntary compliance, if at all, and over several years.
- The state network increasingly is supporting local government access, especially in remote regions where there are no other willing service providers, to the state and national networks (Internet). This growth in service compounds the above issues (K-12 education on the same network as sensitive criminal justice transactions) and also increases the support and management required to operate the network.
- The state network cannot currently support non-governmental institutions. This is a factor in providing connectivity for some projects (telemedicine and services to rural areas) and may affect future electronic commerce endeavors.
- Finally, the Year 2000 issues also have implications on the statewide in-

frastructure. Approximately seventy local exchange carriers and six inter-exchange carriers support TEX-AN III. GSC is working with the Y2K Project Office on reporting any outstanding items that may impact the agencies and educating local governments on telecommunications issues that will need to be addressed. Part of the GSC and Y2K Project Office effort will include contingency planning for the infrastructure.

**Summary**

The state is well under way in meeting the vision and goals of the Telecommunications Plan. The implementation of TEX-AN 2000 in fiscal years 1999-2000 will ensure the state is well positioned to provide services and access to public information to the state citizenry. In doing so, the state must be prepared to address issues with the expansion of telecommunications services and connectivity.

For more information, see:
DIR: http://www.dir.state.tx.us
GSC: http://www.gsc.state.tx.us

# EMERGENCY COMMUNICATIONS/911

Jim Goerke
Executive Director, Advisory Commission on State Emergency Communications

Widespread acceptance and use of 9-1-1 has been brought about by a combination of factors, including public education and an awareness of 9-1-1's efficiency. The divestiture of the Bell operating companies from AT&T, the deregulation of customer premises equipment, and the resulting proliferation of equipment vendor offerings to consumers have facilitated 9-1-1's implementation.

From the basic dialing of 9-1-1 to reach a responding agency to today's enhanced emergency communications, 9-1-1 has undergone a fast-paced evolution since its emergence on the technological scene. The ability now exists to route calls to the nearest responding agency, to receive vital information about the calling location, and to access 9-1-1 from mobile locations. Additionally, data can be analyzed by date, time and/or season, as well as by location, call type and response time. Attention is focused on intelligent multi-station and multi-site display of information to responding agencies, improved transmissions through fiber optics, and simultaneous transmissions of voice and data. Voice recording equipment, uninterrupted power systems, fax/remote printing, access for hearing- and speech-impaired, and integrated mapping are examples of the components of many communications centers today.

**From the basic dialing of 9-1-1 to reach a responding agency to today's enhanced emergency communications, 9-1-1 has undergone a fast-paced evolution since its emergence on the technological scene.**

Expanding communication technologies like cellular and personal communication services (PCS) are already having great impact on 9-1-1 service. Today, in the state's larger metropolitan areas, as much as thirty percent (30%) of total 9-1-1 call volume originates from wireless telephones. Operationally, it takes a 9-1-1 operator much longer to process a wireless 9-1-1 call, since the calling party's telephone number and location are not automatically generated along with the call. Growth in the wireless industry obviously impacts both the quality and cost of 9-1-1 service.

The above technological change has likewise provided the opportunity for great institutional change within the telecommunications industry-including, for example, competition for local access to such services. To date, the Texas Public Utility Commission, has received and certified over 200 applications for "alternative" local service providers. All in all, the potential milieu of calling scopes, service areas and interconnection arrangements is daunting. In part, the resulting environment has fostered a variety of telephone number exhaustion, area code relief, rate center consolidation, and number portability issues for 9-1-1. A decade ago, when the ACSEC was created, it would not have been possible to predict the issues now facing the emergency communications community, particularly with respect to the degree, speed, and complexity of the demands placed upon the system today.

Along with new challenges come new opportunities, however. As the emergency communications industry seeks new solutions to tracking emergency calls for help from an increasingly mobile customer base, the 9-1-1 community will need to constantly assess its role and adjust to the environment in which it operates. Dynamics in the delivery of services are ever-changing in emergency communications as with most professions that rely heavily on technology. The world of technology is not a constant one. The future -- and it is not so distant -- will continue to see changes in the way we conduct our business. The public demands on professionals will be for quicker and better responses to their needs. The opportunities exist. It's up to the community to take advantage of them.

For more information, see:
Texas Advisory Commission on State Emergency Communications:
http://www.acsec.state.tx.us/

# The Role of Telecommunications and Information Technology in Transportation

Mayela Sosa
Planner, Texas Department of Transportation

As our transportation network becomes increasingly congested, we look toward current and emerging technologies to provide us with some relief. The traditional solution of adding more lanes to our highway system is becoming less economically feasible; therefore, other methods are being explored. Since the late 70's, transportation planners and engineers began using Intelligent Transportation Systems, or ITS, as a traffic management tool. Today, technological advances allow us to consider the potential of telecommunications as an alternative to traditional commuting.

ITS uses electronics, communications and computer technologies to improve the safety and efficiency of the transportation system. Since its inception, ITS has grown to include public transit systems, commercial vehicle operations, ports, waterways, airports, and freight and passenger rail.

Several cities across Texas, including Austin, have employed ITS as a means of traffic management. These systems incorporate the use of fiber optics, computers, overhead variable message signs, lane control signals, cameras, closed circuit television, detectors, and other devices to provide travelers with real-time highway and travel information.

Telecommuting and teleconferencing reduce travel expenses, energy use and emissions. However, telecommuting and teleconferencing have indirect effects that may be off-setting these reductions. For example, telecommuters might make trips from their home during the day that they might not otherwise make from their workplace. The use of ITS has resulted in a safer, more efficient transportation system. While additional research is needed to determine the net impacts of telecommuting and teleconferencing, early results indicate that these too have a positive effect on overall travel demand.

For more information, see:
An international advisory council on telecommuting: http://www.telecommute.org
One West Texas town recruiting telecommuters: http://www.webtex.com/spearman

# ELECTRONIC COMMERCE TRANSACTIONS AND STATE AGENCIES

Jerry Johnson
Senior Policy Analyst, Texas Department of Information Resources

The total value of goods and services traded electronically between U.S. companies will be $327 billion by the year 2002, according to predictions by Forrester Research, Business Trade & Technology Strategies Group. While the citizens of Texas and business can benefit from this growth, electronic commerce (EC) interactions with state agencies may be limited without specific legislation. If fees or rates are specified in legislation, agencies may not be able to accept the most common form of payment over the Internet, the credit card.

All credit card companies charge a transaction fee to the organization accepting the card for payment, based on a percentage of the transaction. If an agency accepted a credit card for payment minus the transaction fee, it would be collecting less money than the legislature intended. In 1997, the Department of Transportation was provided an option in Senate Bill 370:

Sec. 201.934. PAYMENT OF FEES. The commission may adopt rules regarding the method of payment of a fee for a license issued under this subchapter. The rules may authorize the use of electronic funds transfer or a valid credit card issued by a financial institution chartered by a state or the federal government or by a nationally recognized credit organization approved by the department. The rules may require the payment of a discount or service charge for a credit card payment in addition to the fee.

However, several credit card companies/organizations (e.g., Visa/MasterCard) specifically prohibit adding a service charge. If the card company/organization finds out that an agency is adding a service fee, they can impose fines and/or terminate the contract to accept their card. Other card companies (e.g., Discover Card) will allow a fixed transaction fee (not based on a percentage of the amount) to be paid by the customer, but only if the service fee is applied to all credit card transactions.

Another issue with credit cards is that the percentage charged can vary based on the type of transaction. The lowest fees are charged when the customer appears in person and the transaction is verified on-line. Currently, almost

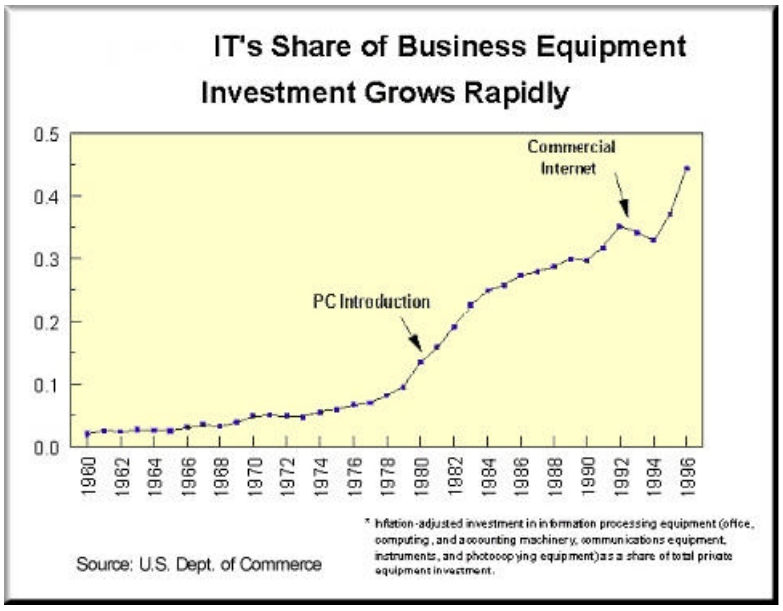
all online (telephone or Internet) transactions are in a category called "hypothecation." Hypothecation refers to the debiting of a credit card without a hard copy authorization (signature/imprint) and draws its name from the "hypothetical" nature of the authorization. Hypothecated credit card debits could cost agencies more than normal credit card transactions. This fee structure could change when organizations start using the secure electronic transactions (SET) protocol for on-line payment information. However, the SET protocol has not been widely implemented and alternatives have been proposed (Europay C-SET and e-COMM). The Department of Information Resources, Comptroller of Public Accounts and the University of Texas at Austin are working with the National Automated Clearing House Association (NACHA) to pilot improvements for the security of on-line transactions over the Internet using digital signature/certificate technology. The future/acceptance of the SET protocol and results of the NACHA pilot may not be available until mid to late 1999.

**Currently the Comptroller of Public Accounts collects over 70% of all taxes using electronic funds transfer (EFT) transactions.**

Currently the Comptroller of Public Accounts collects over 70% of all taxes using electronic funds transfer (EFT) transactions. Eight other agencies collect taxes or fees electronically from about 2,600 businesses and several agencies send out regular electronic debits to collect payments owed (over 15,000 transactions per month). This indicates the state is doing a good job using electronic transactions for scheduled payments or where a relationship between a state agency and a customer is in place. Allowing agencies to accept credit cards for non-scheduled transactions and small dollar purchases would facilitate:

- Improved service delivery for citizens and the business community.
- Reduce processing time for transactions (paper vs. electronic).

Business and other government entities have found that they can obtain even lower rates if they combine accep-




tance of credit cards with the organizations' use of credit cards (e.g., purchasing, travel, fleet maintenance). Currently the General Services Commission (GSC) is responsible for credit card contracts for purchasing and travel. Contracts for fleet maintenance are decentralized. Some government entities have combined these functions when issuing contracts, but in most cases will award multiple contracts to ensure vendor performance and promote competition. Also, government entities may not want to limit citizen access by accepting only a single brand of card.

For more information, see:
Biannual Report on Information Resources Management by the Department of Information Resources: http://www.dir.state.tx.us/DIR/bpr98.html
National Automated Clearinghouse Association: http://www.nacha.org
ECommerce Times: http://www.ecommerce.com/
Electronic Commerce Guide: http:e-comm.internet.com

# SMART CARDS

Gary Chapman
Director, The 21st Century Project at the LBJ School of Public Affairs
Associate Director, Telecommunications and Information Policy Institute

A relatively new and exciting technology for delivering government benefits is the use of data cards, either familiar magnetic stripe cards, identical to credit cards, or newer "smart cards" that carry a microprocessor chip.

The State of Texas runs the largest card-based benefits program in the world, the Lone Star card, which is currently used by clients of the federal food stamp program and by those eligible for a small program of welfare benefits, Temporary Aid to Needy Families (TANF). The Lone Star card program serves nearly 2 million people at any given time, and processes more than 6 million transactions per month.

**If smart cards take off in Texas, they will probably be introduced first by the public sector, by the State of Texas, which can rapidly implement a program that serves millions of customers simultaneously.**

Other states are required, by federal law, to move their welfare programs to electronic benefits transfer systems, like the Lone Star card, by 2002. In Texas, it was the Lone Star card program, introduced in 1995, that prompted grocers, convenience stores and other retailers to introduce automatic, card-based "point-of-sale" systems for other customers, such as those with bank debit cards or credit cards. Because of this, Texas and many other states have a widespread and highly utilized infrastructure for card-based electronic transactions using telecommunications circuits. In Texas over 15,000 retailers have Lone Star card terminals.

Smart cards are different from magstripe cards in that they can carry more data, they can process information on the card itself, and they can be used for more secure transactions, such as by carrying and processing encrypted "digital signatures." Magnetic stripe cards, on the other hand, only provide enough data to launch an authorized interaction with a remote database

or computer application.

The possibilities opened by smart card technology are numerous. A "smart" Lone Star card, for example, could become a flexible platform that could be used by many different state agencies for different purposes, through discrete "application stacks" on the card itself. Smart cards are currently being investigated for use in the Women, Infants and Children program (WIC) in Texas, which, unlike the food stamp program, requires purchases to be matched against a database of approved commodities. The database could be carried on the card itself. Smart cards may also be used for licensing, building or facilities access, ticketing, medical records, or computer access and authorization.

Ironically, the main obstacle to moving toward this new, more advanced technology is the widespread, nearly ubiquitous infrastructure for magnetic stripe cards. Retailers are reluctant to replace their point-of-sale terminals and systems software so soon after introducing mag-stripe technologies, and smart card systems are much more expensive than mag-stripe systems. The U.S. also needs to settle several outstanding issues about developing a national set of standards for smart card interoperability. Consumers have shown little interest in the potential benefits of smart cards because there are so many alternatives in the U.S. for electronic value transfer; this lack of interest presents a major obstacle to the development of smart card systems. Citibank Visa and MasterCard conducted an experimental pilot program of smart card use in New York City in 1998 and learned that consumers were not attracted to the technology.

If smart cards take off in Texas, they will probably be introduced first by the public sector, by the State of Texas, which can rapidly implement a program that serves millions of customers simultaneously. This, the Lone Star card demonstrated, could be the "critical mass" needed to build a standard and a customer base that will attract retailer investments in supportive technologies.

For more information, see:
The Electronic Benefits Transfer project, conducted by the L.B.J. School of Public Affairs and the State Comptroller's Office:
http://www.utexas.edu/lbj/21cp/ebt/ebtinfo.htm/

# Community Networking

Community networking is a vital part of the public's use of the Internet today. In this section, John Collins, board member of the Telecommunications Infrastructure Fund, describes recent developments concerning community networks in Texas. Next, Gene Crick, president of the Texas Internet Service Providers Association, discusses the role of Internet services providers in community development initiatives. Leland Beatty and John Moore focus on how rural communities are using telecommunications technologies. Finally, Dr. Sharon Strover wraps up the section with a call to action concerning the sustainability issues involved in publicly funded community networks.

## In this Section:

# TEXAS COMMUNITY NETWORKS

John Collins
Board Member, Telecommunications Infrastructure Fund Board

Texas community networks are poised to spread like hill-country bluebonnets after a fresh spring rain. Now that schools, community colleges, public libraries and health care facilities are installing basic telecommunications connectivity, the next major step should be to ensure that all citizens have easy, low-cost access to these same services. As Texas students are now learning basic telecommunications skills at school, their parents and friends suspect that something exciting is taking place in public education - a new enthusiasm, one based on learning new skills for a new economy.

Why should Texas communities consider building a local telecommunications network? To be able to quickly communicate with each other, share information, video, data and files. This should lead to lower costs for public and community services. Rural Texans, especially, are familiar with the benefits of electrical, agricultural and telephone co-ops. Similar benefits could easily flow from community computer networks - sharing basic costs allows access for everyone.

Community networks are still very much in their infancy. Only a few are known to be up and running, actually providing services to their communities (in El Paso, Austin and LaGrange).

The Telecommunications Infrastructure Fund Board (TIFB) is interested in encouraging community networks as part of its legislative mandate to fund infrastructure for rural and under-served areas of our state. The TIFB has learned that its early "seed money" for school districts that had little or no telecomm infrastructure has gone a long way toward providing a foundation for community leaders to build on and create projects that can provide life-long learning for the entire community. Students (and their adult parents) should have the opportunity to learn and experiment at home with this new technology.

Local libraries should play key roles in collaborating with school districts and health-care facilities. These community-based partnerships could enable not only the usual information and data but also

sorely needed health-care resources in under-served areas. Community networks should strive to involve students at an early stage. Local high school and community college students could play a major role in designing, building and maintaining a local community network.

It will not be easy to form these new institutions from scratch, but useful models are already in their formative stages. As with other public projects, each community will most likely do it their own way, at their own pace. One model probably will not work for the entire State of Texas. With TIFB "seed" money, each community willing to put together a workable technology plan will have an opportunity to provide basic computer networking capabilities for all citizens.

Texas community networks have the potential to provide a firm base for equal access to the new technology. Low-cost telecommunications services will be as essential in the 21st century economy as a highway, railroad and telephone have been in the old one. Community networking will allow students of all ages a chance to experiment and tinker at home on their own time to supplement the more formal, structured learning environments in schools and colleges.

The community networking effort is ultimately about people - getting them to sit down and talk to each other and create a new resource for their own community. If this happens, the creative results flowing from this process will surprise all of us. Who will lead us on this journey? Most likely our young Texans - our most precious and valuable resource, now and in the future.

For more information, see:
Austin Freenet: http://www.austinfree.net
Association for Community Networking: http://bcn.boulder.co.us/afcn/
Telecommunication Information and Infrastructure Assistance Program:
http://www.ntia.doc.gov/otiahome/tiiap/
International Community Networks: http://www.lights.com/freenet/
Free Community Network: http://fcn.net/
Action Plans for Starting Community Networks:
http://spectre.ag.uiuc.edu/~heca/action.htm
Community Networks: An Online Guide to Resources:
http://ralph.gmu.edu/~pbaker/

# ISPs and Community Development

Gene Crick
Director, TeleCommunity Resource Center
President, Texas Internet Service Providers Association.

Increasingly, communities across the country are recognizing the potential power of telecommunications technology for community objectives and public interest goals. More and more local leaders are planning Internet projects for regional information management, communication, and economic development. It's daunting however, to seek the best longterm choices within a complex and rapidly changing technology; project planners need all the help they can get. Unfortunately many don't take full advantage of the assistance available from their Internet Service Provider (ISP) for local online development projects.

**The Role(s) of Internet Providers**

The basic Internet service is "access" - providing the electronic data link to other computers on the Internet. Usually this means connecting community network machines (often via telephone lines or higher speed links) to a "backbone" of other Internet sites worldwide. But for community projects, ISPs can also offer additional services, including valuable assistance in planning cost-effective, sustainable online projects and Community Networks (CN).

**Access Providers as Design Partners**

Wide community involvement is a key to CN success, and access service providers are an essential element of community Internet. Their stake in local Internet development and direct experience with local telecom resources make ISPs valuable partners to be recruited early in the collaborative planning process. For example, ISP functions like network system administration and support may seem technical and unglamorous, but they are vital to a useful, sustainable community network. ISPs can offer knowledgeable counsel in making bandwidth choices, working with telcos, aggregating demand,

**ISPs can offer knowledgeable counsel in making bandwidth choices, working with telcos, aggregating demand, and identifying local problems and opportunities.**

and identifying local problems and opportunities.

Though the "best" choices for ISP project partners will vary as widely as the communities being served, some factors to consider include the following:

**Twenty-three of the TeleCommunity Resource Center project cities asked for assistance and in every one of these cities an ISP offering local service donated free access service for community Internet terminals.**

**National Commercial Providers**

Large companies like AOL and AT&T, who provide dialup Internet access from many cities in the country, have not always been able to become active partners in local project design and operation. Though they do sometimes participate in local efforts, the national ISP marketers may (understandably) be reluctant to directly assist any single community unless they offer similar assistance to all other communities where they sell services. Don't automatically dismiss these big national companies as possible sources of support, however. Some may offer grant and promotional programs for which your community project could be eligible to apply.

**Non-Commercial Providers**

Sometimes, perhaps for areas where no commercial provider can be found, the only net access may be arranged via a school or government agency. This does provide access and is usually reasonably priced. But be aware this access is usually too limited in terms of eligible users and acceptable communication for true community-wide projects. Some experts also express concern that basing local projects on government-related access may inhibit development of private sector access providers serving the whole community. Please note however that even if some CN planners consider public providers a preliminary solution at best, the public sector remains an important element in overall planning. A local network plan should include major components like schools and the various government entities.

**Existing Local Commercial Providers**

During the past three years of assist-

ing Texas projects, our most promising ISP partners for community development seemed to come from locally-managed commercial providers. To illustrate: twenty-three of the TeleCommunity Resource Center project cities asked for assistance and in every one of these cities an ISP offering local service donated free access service for community Internet terminals. This does not suggest national and government ISPs have less community spirit, merely that local ISP companies seem well suited as general access partners for community online development. They operate under fewer constraints and are usually "market motivated" to participate in local development of telecommunications activities.

One word of caution in this recommendation of local ISPs: community leaders should remember the Internet industry is highly volatile; they must consider ISP stability in planning local networks. This does not imply that smaller companies are not good partners, only that overall design should be prepared to deal with possible change. For example, local networks are usually wise to register their own Internet domains, which can be supported on any provider's servers without dislocation.

**Establishing a New Local Provider**

Not all geographic areas currently have local dialup Internet access service. One solution for this has been local Internet initiative, where leaders from the community either recruit or establish their own community ISP. Examples might include assessing potential Internet customers, then approaching regional access providers, working with utility companies to offer access, or underwriting the creation of a local commercial ISP.

For more information, see:
Several sources of information and assistance are being developed to aid community Internet planners. The TeleCommunity Resource Center is building an information site listing many of these sources, available online at http://www.tcrc.net/ and by mail: TCRC, PO Box 328, Bastrop, TX 78602-328.
A directory of Internet Service Providers: http://www.tispa.org/
Other recommended information sites include:
Texas Community Network Project: http://www.txcomm.net/
Texas Rural Communities, Inc.: http://www.texasrural.org/

# YULENET

Leland Beatty/John Paul Moore
Texas Rural Communities, Inc.

The Internet enlightens and empowers. It turns many of the old rules on their head, and it is uniquely important to rural Texans. Given adequate network connections, rural Texans can market themselves to the world. They can attract the mobile knowledge workers who will soon be able to live where they please. For one thing, that means young people will be able to have careers without moving away to the city.

Twenty-four small town libraries across rural Texas made Internet history over the 1997/98 Christmas Holidays with YuleNET'97, "Bringing the Net Home for Christmas." YuleNET'97 brought college students home for the holidays to teach local library patrons how to use the Internet effectively, training 1,000 patrons over the course of the academic Christmas break. YuleNET'97 was designed to speed adoption of new technology in rural areas. But for there to be real demand, there has to first be a true appreciation of the value of the technology.

Using the "Train the Trainer" model, YuleNET'97 equipped its 24 student instructors with on-line and off-line training aids and instructed them in the use of the material with web-based distributed training. Students received training on-line from their homes and/or campuses with no face-to-face instruction and very little telephone contact. In their communities, students offered one-on-one consultation and group presentations, demonstrating how rural areas are using the Internet for business, education, and personal purposes.

Supported with grants from Texas Rural Communities, Inc. (TRC) and the Tocker Foundation, students began their teaching duties in December 1997, and completed their work in early 1998. Texas Rural Communities has been instrumental in creating this appreciation of the Internet's ability to support world wide marketing and economic development, building a Texas telecommunity since 1995.

YuleNET'97 students were selected by local libraries, and began training from their campuses shortly before Thanksgiving, using a web-based curriculum developed by John Paul Moore for the Rural Education Center. Most of the Student Instructors use the Internet at college, although several high

Rural vs. Non-Rural Internet Users in Texas

| | Use Internet % | N |
|---|---|---|
| Town/Rural | 6.2 | (63) |
| Metro | 11.7 | (118) |
| Very Large Metro | 21.6 | (218) |
| **Total** | **39.5** | **(399)** |

Chi-square = 21.530 (p = .000)

How Rural Texans Access the Internet

| | % | N |
|---|---|---|
| Local ISP | 6.4 | (19) |
| National ISP | 5.7 | (17) |
| Local Phone Company | 3.4 | (10) |
| **Total** | **15.5** | **(46)** |

Chi-square = 3.686 (p = .450)

school students were among the participants and exhibited more advanced Internet harvesting and creation skills than their older colleagues. Librarian/Student Instructor teams who successfully completed the initial training program also created a new town web page for their communities, using the InterActive Vacation/ Smartest Little Towns in Texas web site operated by TRC since 1996. Requiring no special network access beyond a web browser and an email account, and no knowledge of HTML or other code, the InterActive Vacation web site is part of TRC's growing on-line Texas Rural Telecommunity that now numbers more than 80 participating towns and hospitality businesses. This tourism effort began in the Spring of 1996 with the BluebonNET, now 40 rural bed and breakfasts accessing the web through one of the earliest TRC network projects. Participants in the network have reported a 30 percent increase in their revenues and a marked increase of international visitors since they joined. A study by the National Center for Super Computing Applications at the University of Illinois has shown that tourism is an important first civic use of the Internet, and YuleNET'97 students learned how to build on these first steps in creating growing community networks in rural communities.

For more information, see:
Texas Rural Communities, Inc.: http://www.texasrural.org
Development options for rural communities:
http://www.texasrural.org/DORT/DORThome.html

# SUSTAINING COMMUNITY NETWORKS

Sharon Strover
Director, Telecommunications and Information Policy Institute
Professor, University of Texas at Austin

Many people have become enthusiastic about creating community networks. The energy and good-will created in working on a joint project that can yield substantial benefits can carry such endeavors for many months or even years. In the long term, however, sustaining these networks - that often may lack commercial underpinnings – means more than individual commitment and good will.

Sustaining community networks must entail (1) realistic assessments of how new and old elements of the community can continue to be integrated into the network; (2) planning for technical changes and upgrades; and (3) new or continuing financial resource demands. Let's consider each in turn.

Communities are always changing. People move in, they leave, and their interests change. Some attention must go to insuring that people are invited continuously to join the electronic forum. The network must be able to adapt to new people and their unique perspectives and goals. This may be as simple as creating a "space" for additional interests. In any case, since the community itself is the key resource of the network, it is worthwhile to spend time tailoring the network and its operations to what people really want and need. Good online communities need care and tending!

**The network must be able to adapt to new people and their unique perspectives and goals.**

Some community networks begin by providing points of access to the Internet for people who do not have home computers or home access. Others create online spaces for interaction and sharing. No matter what the original goal of a network, the technologies that can support that goal are always improving. Trying to stay in step with the most appropriate software and transmission should be a priority. This means working with local ISPs or telcos to make sure that the right network configuration is in place. It also means people need to stay in touch with other sources (academic com-

puting units, for example) to make sure their software is as useful as it should be.

Equipment and staff mean money. While many community networks have received seed grants from local, state or federal sources, this type of money is finite. A long-term solution to supporting community networks should always be sought. Many organizations simply continuously write grants, but this inevitably burns out the grant writers and runs the risk of sending the network after money by subtly perverting its real goals. By looking within the community itself, a community network may find the means to sustain itself. Some networks have begun to support themselves through advertising or through transaction fees; others are bolstered by larger commercial organizations such as AOL or Excite that see an advantage in providing "portals" for communities to congregate, the members passing by their own advertising and promotions in the process. Excite, for example, offers local areas their own "community of interest" via the "My Community" program. Connectivity may be sufficiently important to some in the community that they are willing to contribute financially. When large and small users can share the same facilities, opportunities for cost-sharing appear. For example, in smaller towns the larger users might be schools, health facilities, libraries, and certain businesses. If they can join together to provide a certain level of backbone demand, others in the community can "piggyback" on their presence and together draw and support network services. The human, economic and technical factors work together in ensuring the success of community networks. Being cognizant of how they interact means building local capacity to sustain community endeavors.

For more information, see:
Metropolitan Austin Interactive Network: http://www.main.org/
Excite's local communities:
http://www.excite.com/lifestyle/cultures_and_groups/community_services/
Alliance for Public Technology: http://www.apt.org/

# PUBLIC SERVICES

Telecommunications technologies are being used in innovative ways to make public services more available and more efficient to many people in Texas. In this section, Dr. James Jarrett from UT's Bureau of Business Research describes how disadvantaged populations and communities are using telecommunications to telecommute to work. Dr. Helen Cronenberger from UT's Health Sciences Center in San Antonio provides an update on telemedicine and its increasing impact on public health services in Texas. Finally, Dr. Robert Martin from the Texas State Library provides up-to-date information on library networks throughout the state.

## In this Section:

# TELECOMMUTING FOR DISADVANTAGED POPULATIONS

James Jarrett
Senior Research Scientist, IC$^2$ Institute, University of Texas

"Telecommuting, the practice of working away from the office via computer, has become more prevalent because of a convergence of trends. Knowledge-based jobs utilizing computers have increased exponentially, as have service jobs, continuing growth in the number of independent workers and consultants, and a need by metropolitan areas to comply with air quality standards. Telecommuting projects, also reduce the demands for office space, bring jobs to non-metropolitan areas, increase organizational productivity, and provide an employment accommodation for individuals who cannot work every day in a traditional office setting because of a physical or cognitive disability.

**"Commuting is the single most anti-productive thing we do."**

**- Alvin Toffler**

Dr. James Jarrett has been performing research and data collection on telecommuting as an employment option for persons with permanent or major temporary disabilities since 1993. Early data collection concentrated on identifying and learning more about projects established to (1) serve the employment needs of employees with disabilities prior to the passage of the Americans with Disabilities Act (ADA); (2) provide accommodations under the ADA; and (3) reemploy employees on workers' compensation.

In 1994 and 1995, private and public employers were surveyed about their experiences with telecommuting. Findings from the survey were reported in two guides. The first, "Questions and Answers About Telecommuting Regarding Persons with Disabilities: A Guide For Employers" was prepared to educate and inform human resource staffs and supervisors. The 20-page guide addressed employer concerns related to telecommuting by employees and job seekers with disabilities. This guide presented not only the employer's opinions but also materials which had been submitted by corporations and governmental departments as well as

providing analysis of prior telecommuting studies. The second guide examined issues from the perspective of employees and job applicants with disabilities. In both guides, appendices provided examples of useful materials which could serve as resources for employers: guides and handbooks, agreements and forms, reports, training offerings, electronic sources of information, and videotapes.

**Commuting to office work is obsolete. It is now infinitely easier, cheaper and faster ...to move information to where the people are."**

**- Peter F. Drucker**

Results from the survey of employers were very positive, suggesting that telecommuting has the potential to provide dramatic employment opportunities for persons with disabilities. The interest in telecommuting and telework, as it is referred to in Europe and several other parts of the world, is on the rise.

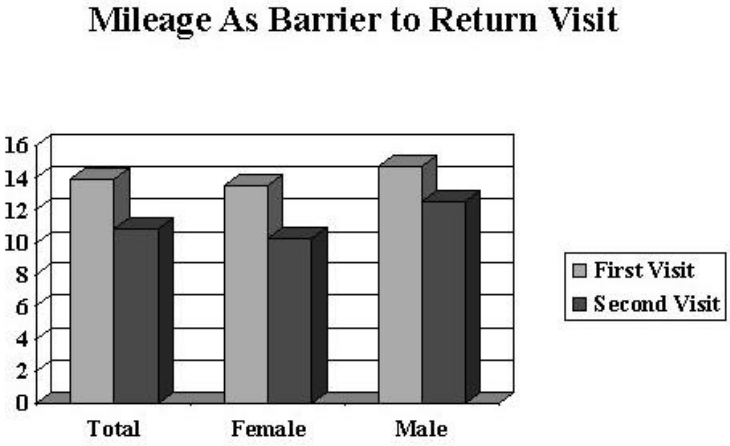
Since the national survey and preparation of the two guides, Dr. Jarrett has participated in a limited field test project in a northeast metropolitan area and co-developed a website regarding telecommuting as an option for individuals and students with disabilities. He has also begun research on the potential of telecommuting for other disadvantaged populations, specifically those receiving temporary assistance while seeking permanent employment. Research and field testing are still needed on the potential and limitations of telecommuting as an alternative to traditional transportation subsidies in welfare-to-work projects, although positive results are expected.

For more information, see:
Telecommuting Review:http://www.gilgordon.com/
Telecommuting Research: http://www.engr.ucdavis.edu/~its/telecom/

# TELEMEDICINE AND PUBLIC HEALTH

Helen Cronenberger, T. Lightner, and T. Bickford
University of Texas Health Science Center at San Antonio

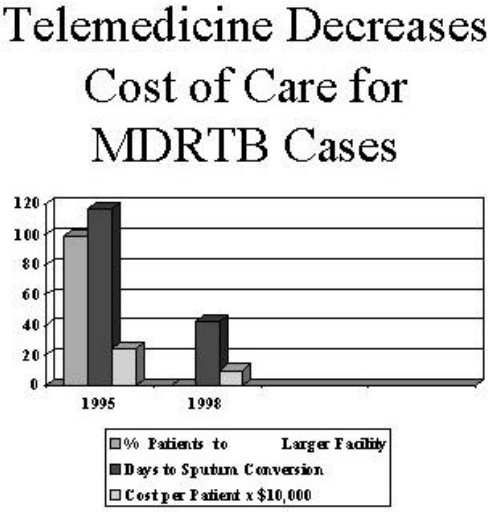
Telemedicine is the management and directing of health care delivery by an expert to a patient who is located at some physically distant site. This is accomplished by communications providing video, audio and image exchanges. Long touted for the ability to bring expert health care to remote and rural areas, telemedicine is only now becoming an accepted form of health care delivery in Texas with reimbursement from Medicaid and third party insurance and, beginning January 99, from Medicare. The University of Texas Health Science Center at San Antonio (UTHSCSA) has had telemedicine communications with various sites throughout South Texas for the past five years. Telemedicine 1) erases the distance barrier for patient access to quality health care, 2) reduces public cost for care of severe, chronic illnesses and 3) brings concentrated health care to areas manifesting contagious diseases to decrease threat to the general public health.




An example of erasing distance barriers is the Texas Department of Health (TDH) Region 11 Diabetes Screening and Early Intervention program. A baselne study of 1639 patients found that only13% returned for subsequent follow up. Distance from the medical facility was the major factor in return versus non-return. Now, a mobile medical van with satellite telemedicine communications travels to patients, screens and delivers diabetes intervention care on site in the Colonias along the Texas-

Mexico border. To date, more than 80% of the patients return for follow up and management.

An example of telemedicine reducing public cost is the South Texas Hospital management of multi-drug resistant tuberculosis (MDRTB). Experts provided consultations via teleconferencing to help the hospital determine the appropriate drug treatment for this disease. Before telemedicine, the cost of treatment was $248,000 per patient and after telemedicine, it was $98,000.




An example of telemedicine bringing concentrated health care to areas manifesting contagious diseases that threaten the general public health is the epidemic of pediatric multi-drug-resistant tuberculosis (MDRTB) that recently occurred in South Texas. This highly contagious disease was rapidly being transmitted to more and more young patients. Radiological screening of entire Colonia populations was performed and digitized images were transmitted to consultants in Tyler, San Antonio, and Houston for diagnostic evaluation. Infected individuals were immediately isolated and the epidemic spread was confined within a few months.

For more information, see:
UT Health Science Center at San Antonio: http://dlserve.uthsca.edu/
International Telemedicine center: http://int-telemedecine.com/index.html
Telemedicine Information Exchange: http://tie.telemed.org/

# LIBRARIES IN A NETWORKED TEXAS

Robert Martin
Director and Librarian, Texas State Library and Archives Commission

Public libraries in Texas have been the recent recipients of an unusual amount of publicity, partly due to the availability of money for telecommunications. The Internet itself has been a boon for public librarians providing information to their patrons. With the addition of a single resource, many previously unanswerable questions have suddenly become answerable and the public library is regaining its stature as the community's information resource.

In 1995, the Texas Legislature passed House Bill 2128 (Public Utility Regulation Act 95). This landmark legislation provides reduced rates for point-to-point services such as T-1, toll-free Internet access for those libraries within the local Southwestern Bell area which did not have local access. It also created a $1.5 billion Telecommunications Infrastructure Fund for building telecommunications infrastructure for schools, public libraries, and non-profit hospitals.

In Fiscal Years 1996 and 1997, the State Legislature provided the Texas State Library and Archives Commission $2.5 million dollars to connect public libraries to the Internet and to make electronic resources available to them. This resulted in a grant program aimed at providing computers, printers, servers, Internet access, and telecommunications to the libraries. The reduced rates from House Bill 2128 provided a higher level of networked access than would have been doable beforehand.

**With the addition of a single resource, many previously unanswerable questions have suddenly become answerable and the public library is regaining its stature as the community's information resource.**

Fiscal years 1998 and 1999 see the Telecommunication Infrastructure Fund beginning to provide money to public libraries for Internet access, and for en-

hancing existing access. By the end of 1999 virtually every public library in Texas will have public Internet access or enhanced access through the Telecommunications Infrastructure Fund. Future monies will be directed toward involving public libraries in community networking, providing content through the Internet, and implementing distance learning technologies in the community.

**99.8% of all public libraries will have public Internet access by December 31, 1999.**

Although many public libraries were automated in other ways (online public access catalog, providing CD-ROM databases to the public), the Internet has spurred even more development. Libraries are looking toward purchasing full-text databases using the Internet as the transmission mode. Bulk purchase discounts for these databases are encouraging public libraries to create consortia among themselves and among other entities.

**Statistical Data**

At this time, approximately 70% of public library buildings in Texas have Internet access. The majority of these offer unmediated access to the Internet. Every major urban library has Internet access but so do the majority of rural libraries and small libraries. By summer 1999, every public library that wants Internet access will have had the opportunity to obtain it using grant funds.

**Network Development**

As is true for most states, it is the rural libraries that are less likely to have Internet access or to have sufficient infrastructure. This is primarily due to the lack of satisfactory telecommunications in their areas. It was not long ago that some libraries still used rotary dial telephones. With the incentives provided by state telecommunications legislation, this obstacle is fading. Only a few libraries are still without adequate and cost-effective telecommunications; it is anticipated that 99.8% of all public libraries will have public Internet access by December 31, 1999.

**Texas in the National Context**

Texas public libraries are among the leaders in the use of telecommunications and electronic resources when compared to other states. Despite having one of the highest state populations and very high levels of geographical isolation,

Texas has overcome these obstacles with the assistance of far-reaching telecommunications legislation and support from the Texas Legislature. In the national arena, Texas is misperceived as having little in the way of networked resources, statewide telecommunications and training. On the contrary, Texas is and has always been one of the leaders in this arena.

**Future Concerns**

As Texas public libraries are becoming more and more interconnected, the issue of technical expertise becomes increasingly critical. The Internet and networked connections must be maintained and repaired when necessary. In some cases, the librarians have had to learn to maintain their networks and connections. However, as the networks become larger and the telecommunications more intricate, it becomes impossible to be both a network manager and a librarian. Each can be full-time job. Where this expertise will come from and how it will be funded is one of the next issues for Texas public librarians.

Another concern involves upgrading technology and networked resources. Much of the technology currently in libraries has been and is being provided through grants (state, federal, and private). Most of these grant programs offer a one-time infusion of technology. Local funds will be required to keep pace with upgrades and replace out-dated or worn-out technology.

For more information, see:
Texas State Library and Archives Commission: http://www.tsl.state.tx.us
Americn libraray Association: http://www.ala.org/
The 1998 National Survey of U.S. Public Library Outlet Internet connectivity:
http://www.ala.org/oitp/research/survey98.html

# EDUCATION

This section provides an update on how K-12 schools, community colleges, and higher education institutions are using telecommunications to extend their reach throughout the state. Dr. John Slatin describes innovative uses of computers in K-12 settings. Dr. Mary Lee of IQNet discusses, among other things, the use of laptop computers in Texas classrooms. Dr. Tom Edgar introduces the Internet 2 initiative - an advanced, high capacity Internet being launched at several universities around the country. Dr. Marshall Hill of the Texas Higher Education Coordinating Board describes how universities are making innovative use of the Internet; also representing the perspective of higher education is Ron Thompson of Austin Community College. Arnold Viramontes, the executive director of the Telecommunications Infrastructure Fund describes state efforts at increasing connectivity in public schools throughout the state. Finally, Frank Gonzalez describes the University of Texas system's perspective on telecommunications technologies.

## In this Section:

# INFORMATION TECHNOLOGY

**John Slatin**
Professor, Department of English, University of Texas at Austin
Director, Institute for Technology and Learning, University of Texas at Austin

Texas educational institutions and systems face massive changes on three fronts simultaneously. The first is demographic, the second is technological, and the third is curricular.

**Demographics**

The school-age population is growing rapidly and its composition is changing. In 1997-98 there were more than 3.9 million students in Texas public schools. The majority of these children were non-white. The new minority status of the Anglo population will become even more pronounced over the next 10-20 years. As time goes on, therefore, the gap between the ethnic and racial makeup of the public schools and the ethnic and racial makeup of UT Austin's student body will widen further without effective and systemic intervention. The University's response must go far beyond the well-intentioned but ineffective "10 per cent solution" instituted in the 1997 legislative session. The most rapid population growth is occurring in the most economically distressed regions of the state, where the lack of qualified teachers is most acute. University intervention in these areas is therefore likely to have significant impact.

**Technology**

Short of thermonuclear war, there is no conceivable scenario for the future in which information technology does not play a more important role in education than it does today. The Federal Communications Commission has recently issued a requirement that makes Internet service available to public schools at a sharp discount; the nationwide value of these E-Rate discounts is estimated at approximately $1.43 billion. The U.S. Department of Education has issued technology-related challenge grants to be administered by state education agencies. Here in Texas, the Telecommunications Infrastructure Fund Board (TIFB), Texas NetResults, and other federal, state, and local programs and private-sector initiatives are directed at connecting Texas schools, public libraries, not-for-profit healthcare facilities, two- and four-year colleges, and research universities to the Internet. The TIFB is expected to distribute approx-

imately $1.5 billion by 2005.

Using these federal, state, and private-sector moneys to supplement their own initiatives, Texas' 1,044 independent school districts are investing in information technology at the rate of several hundred million dollars per year. Most are concentrating on acquiring equipment and establishing Internet connectivity, and on very narrowly defined skills training for teachers. This pattern is typical of the very early stages of technology integration. Research has repeatedly shown, however, that extensive pedagogically-oriented training and release time for experimentation are essential to successful curriculum reform. Thus the narrow focus of most current training programs actually increases the burden on teachers, who will be expected to integrate this expensive technology into the curriculum despite a lack of appropriate training—and despite an acute shortage of qualified support personnel.

**Curriculum**

**Short of thermonuclear war, there is no conceivable scenario for the future in which information technology does not play a more important role in education than it does today.**

The challenges presented by demographic and technological change are compounded by the fact that the curriculum itself is changing. The new Texas Essential Knowledge and Skills (TEKS) frameworks, which went into force in September 1998, represent significant change in every area of the curriculum, including technology. The TEKS call for a learner-centered, inquiry-based approach to teaching and learning that differs sharply from familiar "stand-and-deliver" teaching practices. Implementation of the TEKS frameworks will therefore demand significant changes in the way teachers are trained.

The new curriculum will also require a massive investment in new textbooks and other materials; this in turn is putting additional pressure on investments in technology. In 1997, the Texas Legislature authorized a Computer Network Study Project to investigate the challenges involved in making K-12 curriculum materials available online on a statewise basis. In May 1998, Dr. Jack

Christie, outgoing Chairman of the Texas Board of Education, organized a one-day conference to dramatize the significance of his call to spend money previously earmarked for textbooks to lease a laptop computer for every student in Texas. The proposal to replace textbooks with computers would, if interpreted literally, would mean a tragic waste of money; transferring textbook content from the printed page to the LCD screen would only make the material harder to read while highlighting its essentially static, presentational character. It would not address the need to transform pedagogical practice and learning behavior or the need to re-invent the function of the textbook in the context of new environments for teaching and learning.

These are vital issues with long-term consequences for the United States as a whole. As the second-most populous state in the country, Texas textbook decisions have significant national impact. Christie's initiative has been endorsed by former Speaker of the House Newt Gingrich and Governor George W. Bush. Along with related topics in education it is certain to be an important issue in the 1999 legislative session and in the 2000 presidential elections as well.

**The proposal to replace textbooks with computers would, if interpreted literally, would mean a tragic waste of money**

For more information, see:
Institute of Technology and Learning: http://www.ital.utexas.edu/

# TELECOMMUNICATIONS AND EDUCATION

Mary Lee
Director, Interactive Quest Network
President-Elect, Texas Distance Learning Association

Advanced telecommunications and information technologies can provide exciting new opportunities for teaching and learning. They can open new worlds of information and new lines of communication; help educators pose "real world" problems; help students propose multiple solutions to problems; and offer new ways to evaluate and choose between solutions. Public schools can "share" master teachers via educational telecommunications. Professionals and skilled workers, who have little time or patience to spend in a traditional classroom setting, can meet the lifelong learning demands of today's economy through distance learning courses. And, under the right policy conditions, these technologies can help us address problems of access and equity by offering parallel learning environments to learners in inner city, rural, and suburban settings.

**An often-heard complaint today is that graduates, at both the secondary and post-secondary level, "have few or no communication skills."**

These technologies also play a more rudimentary role in education today. "The 3 Rs" are the basic skills students must master to navigate through life: receiving communications, sending communications, and problem solving. Telecommunications and information technologies are today's dominant tools for accomplishing those fundamental tasks. In today's information-intense society, anyone who does not master the essentials of retrieving and managing electronic information is functionally disadvantaged. An often-heard complaint today is that graduates, at both the secondary and post-secondary level, "have few or no communication skills" and "don't know how to *learn.*" Other than specific technical expertise, these are precisely the skills that employers say recent graduates lack.

The fact that public school adminis-

trators themselves widely use such technologies illustrates their pervasiveness in today's work environments. As shown by a recent U.S. Department of Education study of Internet access in schools, among public schools having Internet access in the Fall of 1996 (sixty-five percent of all surveyed), sixty-seven percent used it for record keeping within the school or school district. In fact, more public schools used advanced communications technologies for administrative purposes than for distance learning or communicating with parents. This is consistent with the finding that only fourteen percent of instructional rooms had been wired for access by 1996. By the end of this century, the same study projects that ninety-five percent of public schools will have Internet access. However, if the current trend continues, many of our instructional classrooms will still lack connections.

Post-secondary schools have been rapidly investing in advanced communications technologies to offer courses at a distance. According to a 1995 study by the U.S. Department of Education, over half the 1,203 institutions surveyed currently offered or were planning to offer courses at a distance. The study found that colleges and universities are using these technologies to increase access. Advanced telecommunication and information technologies provide more convenient access for students who have time and place constraints. Higher education administrators believe this will benefit the students as well as the institutions: improved access will result in greater enrollments. However, public post-secondary institution administrators who would like to initiate or increase distribution of distance learning courses often find that state policies impede their progress. Policies formed on the basis of localism or "turf" protection are seldom conducive to equitable access for end users.

As is any technology, educational telecommunications and information technologies are merely tools. Like any tool, they must be properly wielded to accomplish the intended purpose. And, like many tools, they have a double-edged blade. They are not panaceas to solve all the problems in education that are faced daily by legislators, administrators, teachers, parents, employers, and learners. When applied as a cure-all for education, they will create more problems than are solved. When they prolif-

erate under disparate conditions, they will perpetuate existing inequities. However, with careful planning and use, these tools can help us achieve the intended result: increasing the opportunities for learners to master new skills.

Recognizing this potential for both advantage and disadvantage, Texans have responded with a flurry of activity in recent years. In 1995, the Texas Legislature established the Texas Telecommunications Infrastructure Fund (TIF) to finance advanced telecommunications systems for public schools, libraries, and rural health care entities. While the Fund's administrative policies are often criticized and are still evolving, equity in access remains a primary concern of the TIF Board. During 1997, the Texas Legislature also passed HB 1404, giving greater autonomy to Texas' public colleges and universities in expanding distance learning course offerings statewide. The Texas Distance Learning Association, now in its third year of operation, provides a forum for educators, students, and technology companies to exchange ideas and information about teaching and learning at a distance.

Texas NetResults, Texas's "Net Day" effort sponsored through public-private partnerships, organizes volunteers to wire classrooms for advanced telecommunications. Projects like the Austin Free-Net Neighborhood Network and the Austin Access Model can introduce technology into technologically underserved neighborhoods. The federal Telecommunication and Information Infrastructure Assistance Program (TIIAP) administered by the U.S. Department of Commerce, has recently been emphasizing the importance of such Community Computing Centers to address access and equity. Texans need take full advantage of such programs to establish new points of access in rural and inner city settings.

**When used as a cure-all for education, telecommunications and educational technologies will cause more problems than they will solve.**

As we move toward introducing new telecommunications and information technologies into Texas' classrooms, controversy and discussion will follow. These discussions are critical

to forging the policies that will help us use these tools wisely. Already, HB 1404 has come under fire from those factions who would protect their "turf" from encroachment by other state-supported distance learning providers. This issue may again be raised next year. In the upcoming 76th Texas Legislature (1999), one policy issue sure to engender much discussion is the use of "electronic textbooks." During the 75th legislative session, SB 294 called for a study to determine the costs and benefits of using computer networks and the Internet in public schools, including the possibility of delivering electronic "supplements" to textbooks under Texas' Free Textbook Law. The study, to be conducted by the Texas Education Agency, must also investigate the feasibility and cost-effectiveness of developing electronic textbooks that may be used by students who are blind or have other disabilities. The results of the study are to be reported to the 76th Legislature not later than February 1, 1999. Interim hearings on the issue have already brought forth the idea of providing every public school student with "laptop" computers, so as to eventually replace Texas' textbooks with electronic versions. Emotions on both sides of the issue have run high. It remains to be seen whether or not that particular recommendation will taken-up by legislators in 1999.

For more information, see:
IQNet: http://www.IQNet.org/
Texas Distance Learning Association: http://http://www.baylor.edu/~TxDLA

# INTERNET 2

Tom Edgar
Professor and Associate Vice President for Academic Computing and Instructional Technology Services, University of Texas

More than 150 US research universities have joined to participate in the creation of a new national network, called Internet 2 (I2), that is dedicated to research and education. I2 will be a nationally coordinated network architecture that will offer vastly higher connection speeds and more reliable service. The larger "pipeline" - 100 to 1000 times faster than today's Internet - will allow the simultaneous transmission of voice, video, and data to enable distance learning, enhance digital libraries, and make possible new realms of on-line collaborative research. Such a network can transmit the contents of the entire Encyclopedia Britannica in less than a second.

**Internet 2 will be 100 to 1000 times faster than today's Internet.**

Today's Internet represents the largest change in human communications since the printing press. Every day, this rapidly growing global network touches the lives of millions of Americans. Students log in to the Library of Congress or take virtual field trips to archeological sites. Entrepreneurs get the information they need to start a new business and sell their products in overseas markets. The Internet is a commercial outgrowth of federal investment in research networks. President Clinton's "Next Generation Internet" initiative intends to continue national investment with proposed funding of $100 million per year and connect universities and national labs with high-speed networks.

Higher-speed, more advanced networks will enable a new generation of applications that support multimedia, scientific research, national security, distance education, and health care. For example, Universities are now piloting near term technologies such as two-way video to remote desktops, VCR-like replay of past lectures, modeling and simulation, collaborative environments, and on-line access to courseware, i.e., instructional software. Distance education will improve the ability of universities to serve working Amer-

icans who want new skills, but who cannot attend a class at a fixed time and place during the week.

The charter university members have agreed to establish and finance a new organization to help create the network, called UCAID (University Corporation for Advanced Internet Development). This university consortium, together with a number of federal research and development agencies - the National Science Foundation, the Advanced Research Projects Agency, the Department of Energy, NASA, and the National Institutes of Health - and leading computer and telecommunications firms, will not only design and develop the network, but will develop applications for its use, and will rapidly disseminate the fruits of their research and development to the broader Internet community.

Academic representatives meet twice a year to discuss technical issues and lay the groundwork for the future. Universities are excited by the prospect of a system that would let researchers develop new tools similar to the innovation of the World-Wide Web. Most member colleges and universities have already made commitments to another effort, the Very High Speed Backbone Network Service, or vBNS, run by the National Science Foundation that is being integrated with I2.

Internet 2 will rely on participants joining forces in various multistate regions of the country to build extremely high-speed regional networks. Each of these shared pieces of the Internet 2 infrastructure would be known as a "gigapop," which stands for "gigabit capacity point of presence." A gigabit connection can offer speeds hundreds of times as fast as today's typical Internet connection. In addition to contributing to the development of regional gigapops, participants must pay for a high-speed connection between the gigapop and campus networks and improve the speed of connections all the way down to the desktop computers of the campus users.

For more information, see:
Internet 2: http://www.internet2.edu
University Corporation for Advanced Internet Development:
http://www.ucaid.org/

# HIGHER EDUCATION NETWORKS IN TEXAS

Marshall A. Hill
Assistant to the Commissioner, Texas Higher Education Coordinating Board

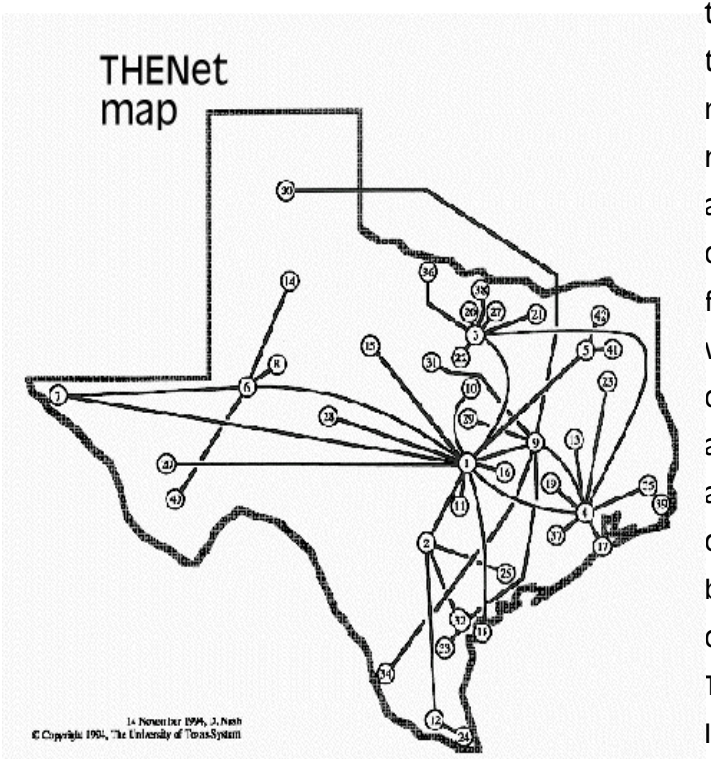
## Texas Higher Education - a Large and Complex Enterprise

Texas higher education institutions enrolled approximately 940,000 students in 1997-98 - about 100,000 students in the state's independent institutions and 840,000 in Texas's public institutions. The public system is large - thirty-five universities, eight health-related institutions, fifty community college districts, and three technical colleges - and governance is complex, with seven governing boards for universities and technical colleges, fifty community college boards of trustees, and broad oversight of the complete system by the Texas Higher Education Coordinating Board. The 1998-1999 "all-funds" appropriation for public higher education is approximately $10.9 billion for the two-year period. These projects, with their considerable demands for resources, are having a major effect upon the central teaching, research and service missions of higher education.

## How Does Higher Education Use Telecommunications Networks?

Texas higher education institutions were among the first to utilize telecommunications technologies to carry out, support and manage their missions. Although these institutions have been using telecommunication technologies for decades, current developments are enhancing the systems further and spawning rapid growth For example, the number of students taking classes through telecommunications is increasing rapidly, with interactive video and Internet-delivered programs adding to the large numbers of courses delivered over broadcast, satellite, or cable TV systems. Almost 1,500 courses are now available through those means, with more than 35,000 course enrollments per semester. Undergraduate and graduate courses from Texas institutions are now available in a broad range of disciplines and offer a means to increase access to higher education by reaching areas of the state where higher education opportunities are less readily available. These distance learning programs also provide the time flexibility which allows many

people to pursue higher education while meeting other responsibilities. Another promising development is the concept of off-campus "multi-institution teaching centers" such as the University Center of Dallas, the University Center in the Woodlands, the University of Houston System at Fort Bend, and similar centers in eastern Dallas and southern Williamson County. These centers rely heavily on telecommunications networks to deliver to the centers the courses offered by their partner institutions.




Networks enhance on-campus instruction as well. During the past year, for example, government classes at The University of Texas at Austin and Texas A&M University together held weekly conferences with high-level federal officials in Washington, D.C. Those officials could manage an hour's video conference, but they couldn't manage a trip to two Texas campuses.

Telecommunications networks support as well as deliver instruction. They are used for a variety of other purposes, too. All public institutions have at least a modest level of Internet access for faculty and students, who can get information from around the world and communicate with others across the country or across campus. Some of that access has been supported recently by the Telecommunications Infrastructure Fund, with some indication that additional funding from that source may become available to support higher education telecommunications needs and further enhance collaborations with public schools.

Telecommunication technologies have spawned many opportunities and improvements in a variety of areas in higher

education. Most of the state's institutions participate in TexShare, a project which electronically links the catalogs and services of the state's libraries to enhance the availability of learning resources throughout Texas. Today, almost any student can, without leaving his home campus, determine whether a particular book or journal is in any of the state's libraries. Texas's health-related institutions provide an increasing amount of service "at a distance" through telecommunications networks. They offer continuing education, academic coursework, and allow primary care physicians and their patients in rural areas of the state to have video consultations with medical specialists at the health centers. Thousands of video conferences held each year by administrators and faculty offer significant savings to always-short travel funds. Data about the whole enterprise (enrollments, financial aid, sudent progress, funds distribution and accounting, and related matters) is submitted by institutions to the Coordinating Board and other state agencies over telecommunications networks.

**Higher Education Network Development and Structure**

Higher education networks have developed along regional, organizational, or task lines. A few examples: the Texas Higher Education Network (THENET), administered by The University of Texas at Austin, links UT System schools and more than 60 institutions of higher education and research in Texas and Mexico; the Trans Texas Video Network (TTVN) links the universities and organizations within the Texas A&M University System; HealthNet is a satellite network used by Texas Tech University Health Sciences Center to serve health care professionals at over 80 rural hospitals and clinics throughout West Texas; Starlink is a satellite network serving community colleges throughout the state; and the TAGER Network, administered by the Alliance for Higher Education, has for more than 30 years served education and training needs of Metroplex corporations with both degree and non-credit offerings from area colleges and universities. These and many other higher education networks, with increasing connectivity between them, leverage the investments Texas has made in its higher education resources to provide a broad range of services throughout the state.

**The Future - the Challenge and Opportunities of Growth**

As Texas moves forward in its telecommunications planning, the needs of higher education and its contributions to the state's economy, well-being, and future development are increasingly important. The continued vitality of our higher education research infrastructure requires a connected, reliable, high-speed, high-bandwidth telecommunications network operating within and outside the state at the highest possible level. The state's research institutions have been working together to support our competitive position in this regard; participation in the developing Internet 2 project provides one example of that effort. Some of our institutions are national and international leaders in important areas of research; they will need state-of-the art networks to continue to offer state-of-the art performance.

In the competitive and rapidly growing arena of distance learning-- illustrated by the development of the Western Governors University, the Southern Regional Electronic Campus, and other "virtual" institutions--it is clear that Texas institutions will be active participants, offering courses throughout the country and around the world. Texas developments such as the Virtual College of Texas (an initiative of Texas' community and technical colleges), and the UT TeleCampus already point in that direction. We could, in time, become "net exporters" of higher education. It is also clear that Texans will draw increasingly on educational opportunities provided on-line by out-of-state institutions. All of this activity -- import and export -- will place increasing demands on the state's networks.

It's an exciting time, and the rapid growth we are now experiencing is likely to continue for the foreseeable future.

For more information, see:
Texas Higher Education Coordinating Board: http://www.thecb.state.tx.us/
Texas Higher Education Network: http://www.utsystem.edu/MIS/MapTHEnet.html

# VIRTUAL COLLEGE OF TEXAS

Ron Thomson
Director of Operations, Virtual College of Texas
Austin Community College

**Mission and Membership**

The mission of Virtual College of Texas (VCT) is to provide all Texans access via instructional technologies to quality instruction and support wherever they may live, regardless of geographic, distance, or time constraints. The Virtual College of Texas is a consortium of all accredited, public Texas community and technical colleges. It includes fifty community college districts and the three colleges of the Texas State Technical College system.

**Making the Most of Distance Learning Resources**

The basic VCT strategy is to share distance learning resources among its member colleges. These resources include their telecommunications infrastructure, courses and curricula, faculty, student services, and administrative support. This strategy will make it possible for students across the state to access a wide range of distance learning courses and services provided by colleges throughout Texas.

Courses will be shared among VCT member colleges by using the host-provider model, which works this way:

A student enrolls in a local, host college to receive instruction from a remote college, the provider college.

The host college supports the student with the same full range of services that it provides students enrolled in traditional on-campus courses or its own distance learning courses. The host college collects all of the student's tuition and fees and receives the state reimbursement.

The host college then reimburses the provider college for its instruction by paying an instructional lease fee specified in the inter-institutional agreement that the host and provider colleges have

signed.

**Implementation**

The Virtual College of Texas will be implemented over a period of three academic years, beginning with a pilot in the 1998 fall semester. For the first semester of the pilot, thirty of the state's fifty community college districts and its technical college system have committed to exchange distance learning courses. Eve more colleges will participate in the 1999 spring semester, making an expanded roster of distance learning courses available to students throughout the state. By the fall semester of year 2000, the Virtual College of Texas will be fully implemented, maximizing the courses available to Texans everywhere.

**Governance and Management**

The mandate for the Virtual College of Texas derives from the membership of the Texas Association of Community Colleges (TACC). Governance authority over VCT rests with TACC, operating through a Telecommunications Committee composed of college presidents and a Distance Learning Advisory Committee, consisting of administrators over instruction and technology. A small VCT staff is headed by a Project Director and a Director of Operations.

For more information, see:
Virtual College of Texas: http://www.vct.org
Statewide Teleconferencing Network Starlink: http://www.starlink.dcccd.edu/

# UT TELECAMPUS

Frank Gonzalez
UT Telecampus Policy and Finance, University of Texas System

The UT TeleCampus is a support unit of The University of Texas System designed to facilitate, coordinate and expand the reach of distance education among its 15 component institutions. It also serves as a brokering agent for the components as they seek to send and receive distance education courses and programs.

The TeleCampus provides a full range of services for distance education students and faculty. In addition to improving access to the more than 200 courses already offered in the U.T. System, it provides support services to students at a distance, including library access, financial aid, registration, admissions, and advising. As well, the TeleCampus encourages U.T. System faculty to design and develop new distance learning courses by providing free training and access to a courseware construction set.

The TeleCampus is based on a "virtual building" concept. Each of the seven buildings (Registrar, Student Services, Library, Classroom, Faculty, Information and Commons) houses various "departments" similar to those found on a traditional campus. Links to admission, degree programs, and course information can be found in the Registrar Building; financial aid, and veterans services in the Student Services Building, etc. The Library Building, as in any traditional campus, is the heart of the TeleCampus. The U.T. System Digital Library works with the UT component libraries to provide electronic and traditional library services to support distance learners and links students to online library services, designated distance education library contacts, and many other resources. Similarly, support and resources for students and faculty are found in the other virtual buildings of the TeleCampus.

The U.T. System recently announced that two on-line graduate degree programs, in general management and educational technology, will be offered through the UT TeleCampus beginning next fall. The programs will allow students to complete a master's degree through instruction delivered to a computer at the office, home, a public li-

brary, or other remote site that is accessible to the Internet.

In the business program, students will take 48 semester hours of classes and will earn an MBA in general management. To participate in the program, a student must enroll in one of the eight U.T. System general academic universities participating in the program. Faculty from the eight campuses will teach the courses, but a student's degree will be awarded from the institution in which the student is enrolled.

The educational technology program will be offered through UT Brownsville. The program will consist of 39 hours of which UT Brownsville will offer the first 12 hours, and the remaining hours will be provided by other UT component institutions.

For more information:
The TeleCampus resources are available to anyone with access to the World Wide Web. Anyone wanting more information about the TeleCampus or the web-based degree programs can find it at the web site at http://www.uol.com/telecampus or by calling 1-888-TEXAS 16.

# TIF K-12 Internet Connectivity Grants:

Arnold Viramontes
Executive Director, Telecommunications Infrastructure Fund

By the end of 1998, the Telecommunications Infrastructure Fund Board will have provided all 1081 Texas public school districts the opportunity to apply for TIF funding. Excepting districts that chose not to apply for funding, every district in the state of Texas will have high-speed Internet access available for students in multiple classrooms. We estimate that 92% percent of Texas school districts will have implemented or will be in the process of implementing a TIF grant when 1999 begins.

**Every Texas child deserves Internet access.**

Although TIF is proud of its achievement of funding connectivity in almost every district, we still have a long way to go in increasing classroom Internet access. For example, our non-competitive grant, our largest grant program to date, funded approximately $100,000 to over 500 districts for a basic connectivity package. But even though larger districts were allowed to fund up to five campuses at $100,000 per campus, hundreds of unconnected campuses in both large and medium-sized districts remain. Every Texas child deserves access. That is why further increasing campus connectivity is our next step.

The Education Working Group, an advisory group consisting of education leaders from across the state, is currently developing our next K-12 grant program. The Working Group is considering several approaches to increasing campus connectivity by helping districts extend their current technology projects. One of the challenges TIF faces is to create grants that reach out to those without access while also recognizing the need to assist districts and campuses who have taken initiative with respect to technology in spite of scarce resources. The Education Working Group is working on creative ways in which our grant program can encourage cost-effective planning and high-quality training so that sustainability will be a reality in our public schools.

Increased collaboration is one way TIF foresees that districts and campuses

## TIF Grant Categories

**Planning grants** fund the support of planning processes in which organizations or groups of organizations eligible for TIF funds can develop strategies that solve educational, information sharing, healthcare, and connectivity problems by using advanced telecommunications technologies.

**Demonstration grants** fund exemplary projects that solve educational, information sharing, health care, and connectivity problems by using advanced telecommunications technologies.

**Connectivity grants** fund projects that increase equitable access statewide by providing greater access to advanced telecommunications technologies.

can stretch their resources and share costs. In our second grant round, TIF funded 13 collaboratives of school districts, ranging from as small as two districts to as large as sixty. As the number of districts and campuses with high-speed connectivity increases, the opportunity for sharing T-1 lines, purchasing equipment in bulk, and utilizing alternative technologies such as wireless for intercampus connections should also increase. For this reason, future TIF grants will encourage – if not require -- such collaborations. A collaborative grant program is currently in the development stage at TIF and will soon be available for public comment.

TIF's middle name is infrastructure. Our priority will always be increasing access to advanced telecommunications technologies for all Texas citizens. But, as everyone realizes, once we have increased access in Texas schools and communities, we must also help our citizens sustain these networks. As we look to the future, encouraging collaboration by means of collaborative grants, training, and outreach programs such as the Community Networking Conference are some of the ways TIF will help Texas succeed in the twenty-first century.

For more information, see:
TIF: http://www.tif.state.tx.us/
Regional Technology in Education Consortium: http://www.rtec.org/

# Policy Concerns

Some contemporary policy issues are examined in this section. Conflict between state and federal level regulation is examined in Steve Bickerstaff's essay. Parallel federal, state and local jurisdictional issues for siting wireless towers occupy Becky Lentz's article. Paul Smolen reviews franchising and use of public rights of way issues, both current legislative subjects. In similar fashion Mark Zion reviews some of the ways electric and telecommunications deregulation may follow similar courses. Dr. Phil Doty's essay tackles some of the Internet filtering controversies facing libraries. Juli Krute surveys the wireless technologies and their impact on current telecommunications policy.

## In this Section:

# A DUAL SYSTEM OF REGULATION

Steve Bickerstaff
Adjunct Professor, School of Law, University of Texas at Austin
Partner, Bickerstaff, Heath, Smiley, Pollan, Kever & McDaniel, L.L.P.

When adopted in 1934, then Communications Act established a dual system of state/federal jurisdiction over telecommunications. The Federal Communications Commission (FCC) generally was empowered to regulate interstate communications and the nation-wide telephone network. States were left with authority to regulate intrastate rates, facilities and services. Most states entrusted this authority to state utility regulatory commissions. The Public Utility Commission of Texas was created in 1975 with oversight over telephone utilities.

A recurring theme in the evolution of telecommunications regulation over the past sixty-five years has been the tension between the FCC and state regulatory policies. While federal and state regulators generally adopted common or similar policies until the 1970s, many state commissions resisted the moves by the FCC over the past 25 years to encourage competition in different segments of the telecommunications marketplace. Beginning with the manufacture and sale of telephone equipment and the provision of computer services, the FCC opened up the one nation-wide and system-wide telephone monopoly to competition. Eventually through a combination of FCC actions, court mandates and legislative acts, each of the telecommunications market segments was opened to the possibility of competition. At virtually every stage of this seemingly inexorable march, state commissions resisted federal policies and the attempts by the FCC and the federal courts to preempt state authority. Many court and legislative battles reulted.

**A recurring theme in the evolution of telecommunications regulation over the past sixty-five years has been the tension between the FCC and state regulatory policies.**

The provisions of the Telecommunications Act of 1996 embody the intent of Congress to open the last bastion of

monopoly telephone service (the local exchange network) to competition. To accomplish this objective, the Act prevents states from imposing barriers to the entry of the new local exchange competitors and gives the FCC new authority to prescribe rules governing certain aspects of telecommunications that previously were considered within the jurisdiction of the state commissions. Nevertheless, the 191996 Act reserves certain areas of regulation for state and local authorities and leaves an unclear line between state and federal jurisdiction in regard to certain other issues.

Therefore, it is not surprising that some of the most important issues arising from the 1996 Act and affecting the future of the telecommunications industry involve this continuing struggle between federal and state regulatory authorities. Three areas of conflict are: the FCC's rules implementing the local competition provisions of the Act; the concern of states over the proper classification (local or interstate) of certain facilities and transmissions used for accessing the Internet; and local enforcement of zoning requirements for the siting of wireless facilities.

Earlier this fall, the United States Supreme Court heard oral arguments in a case arising from Iowa in which the Iowa Utilities Board challenged the FCC's rules designed to implement the local competition provisions of the 1996 Act by setting guidelines for the pricing or costing of certain aspects of local exchange service. Previously, the Eighth Circuit Court of Appeals found that the FCC had exceeded its jurisdiction even under the 1996 Act and had effectively tried to set local rates in contravention of the dual system of jurisdiction in the Act. The issue now awaits a ruling by the United States Supreme Court. The outcome may impede the FCC's effort to see competition develop on a uniform basis nationwide, but will probably not seriously delay local competition in most states because many state commissions have gone forward on their own to adopt rules similar to those sought by the FCC.

A second area of conflict exists in regard to facilities used to access the Internet. Approximately thirty states have ruled that such access is local, not interstate in nature. Therefore, such access remains under state regulatory authority. This outcome also affects what users must pay for the service and whether the incumbent local exchange telephone

company (e.g. the Bell Operating Company) must compensate another carrier (e.g. an Internet Service Provider) for terminating the transmissions. Several incumbent local exchange companies have asked the FCC to declare the Internet transmission and access facilities to be interstate in nature. The FCC has promised to decide this issue within the next several weeks. It is likely that states will challenge any ruling that dial-up access to an Internet service provider is interstate in nature.

Finally, the future of some wireless companies rests as a practical matter with local governments who exercise control over the siting of transmission towers and receivers. Wireless services, such as fixed-base wireless and mobile radio services, require multiple transmission towers within a service area. The availability and cost of such sites affect the viability of the wireless carrier. Neither local nor state authorities can directly regulate wireless service providers because wireless carriers are licensed by the FCC as part of its function of controlling the use of the public spectrum. However, local authorities can impact the availability and cost of wireless systems through their regulation of local land use. Carriers have asked the FCC to preempt local authorities in their exercise of land use or zoning powers that operate as a barrier to the entry of these carriers in the local market. Thus far, the FCC has been very reticent about being drawn into these controversies. Recently, the FCC and representatives of several local government organizations have reached an agreement generally describing how these siting issues will be addressed.

**The future of some wireless companies rests as a practical matter with local governments who exercise control over the siting of transmission towers and receivers.**

The boundary between federal and state authority has been redrawn many times over the past sixty-five years, but both states and the FCC continue to have significant responsibilities in regard to shaping the nature of the telecommunications marketplace.

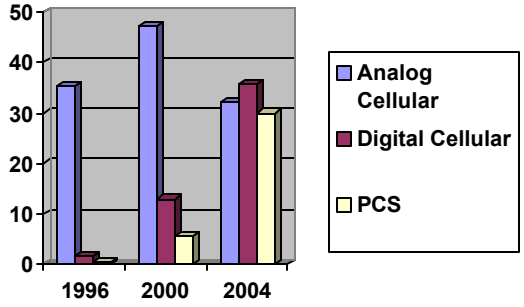
For more information, see:
Telecom Information Resources: http://china.si.mich.edu/telecom-inf.html

# WIRELESS TOWERS: LOCALS DEMAND CONTROL

Becky Lentz
Research Associate, Telecommunications and Information Policy Institute

The deregulation of U.S. telecommunications in 1996 has encouraged rapid expansion of wireless services in the United States. Aiding this expansion are the constraints placed on state and local governments' control over the placement of wireless antennas and towers in their jurisdictions. While federal law encourages the availability of new communication technologies, localities are interested in preserving their ability to control rights of way and the appearance of pubic spaces. Constraints are outlined in Section 704 of the 1996 Telecommunications Act which prohibits local governments from 1) discriminating among competing wireless services providers, 2) enacting laws that result in the banning of wireless facilities in an area, 3) intentionally protracting deliberations about a wireless siting permit application, and 4) imposing additional restrictions designed to prevent environmental hazards or threats. The law also requires that local jurisdictions provide a written account that supports any decision to deny a siting application. This written account is the only "evidence" admissible in possible subsequent appeals by wireless providers who have been denied a siting permit. According to one analyst, "this relatively small provision in federal law has had more visual impact upon the local landscape than anything since the advent of funding for the interstate highway system

**Predicted growth of cellular market**




**Source: http://www.freenet.msp.mn.us/people/brose/papers/pcs.html**

Recent growth in demand for wireless services indicates that the number of towers and antennas needed to support wireless services will increase. In 1997, Brose estimated the number of wireless facilities in the United States at approximately 25,000. He predicts that by the

year 2007, this may reach 125,000. These wireless facilities will require one of three different types of support structures to control the height of their wireless antennas: lattice towers, monopoles, and building-attached facilities.

During the drafting of the 1996 Act, heavy lobbying by the wireless industry resulted in federal preemption of all local moratoriums that communities had been using to buy time to consider the numerous applications for siting permits. Initially unprepared for the legal battles needed to protect their local zoning and land use decisions, communities organized a national coalition to protect their interests. According to the Cellular Tower Coalition, wireless services and their related facilities 1) misuse architectural landmarks; 2) cause driving accidents when drivers use cellular phones; 3) reduce property values; 4) obstruct the flight paths of migratory birds; 5) create health risks as a result of tower emissions; and 6) polarize communities as a result of disputes about tower sitings.

In support, Senators Leahy and Jeffords from Vermont have sponsored bills to empower state, county, and municipal authorities, and these actions have inspired numerous other lawmakers to sign onto the proposal. On August 5, 1998, FCC Chairman William E. Kennard announced the creation of a formal, cooperative agreement on the sitings issue between the Commission's Local and State Government Advisory Committee (LSGAC) and groups representing the wireless industry (CTIA, PCIA, and AMTA). The formal agreement establishes two initiatives: 1) implementation guidelines ("best practices") for facilities siting and 2) dispute resolution procedures. Senator Leahy's office indicated in September 1998 that while he welcomed this action, this does not negate the need to repeal federal preemption of local authority. Leahy has introduced (before the end of the 105 congressional session) a revision to his original bill (S. 1350) in order to broaden its base.

For more information, see:
Brose, M. (1997). Wireless Personal Communications Services (PCS) Antenna and Tower Sitings: Strategic issues and options for industry and local government. http://www.freenet.msp.mn.us/people/brose/papers/pcs.html [1998, April 11].

# FRANCHISING PUBLIC RIGHTS-OF-WAY

Paul N. Smolen
Executive Managing Consultant, Resource Management International, Inc.

**Background**

Local governments have traditionally maintained licensing and franchise agreements with telecommunications service providers to reduce conflicts over the use of public lands, including public rights-of-way (PROW). Rights of way have become an information age commodity, sources of revenue for their owners and necessary access points for providers. License agreements grant limited uses of PROW, such as point-to-point services that may need to use only a portion of the right-of-way. In contrast, franchises are granted to providers of city-wide services.

Cities purchase land to use as PROW for streets and utility infrastructure such as phone, electric and cable companies. In most states, service providers pay rent in the form of fees to use this public land to conduct their business. The providers are obligated to repair specific damage--such as street cuts--caused by placing their facilities (poles, conduits, lines, etc.) in the PROW. Cities shoulder the larger burden of repairing the cumulative damage.

**NATOA Policy Statement**
**Uses of Public Rights of Way**

- Cities have a duty and obligation to bear the costs of acquiring and maintaining public ROW.
- Commercial use of public property for private profit requires equitable, fair and reasonable compensation to the public.
- Both public and private entities have roles to play in the delivery of advanced telecommunications services to all Americans.
- Federal, state and local governments each have roles in ensuring that the goals of the 1996 Telecommunications Act are achieved and each must respect the authority of the others.

*Prepared by the NATOA Ad Hoc Committee for Rights-of-Way Policy, August 20, 1998.*

**Texas Joint Interim Committee on Municipal Franchise Agreements for Telecommunications Utilities**

- Establish uniform general-use ordinance.
- Limit cities' revenues to defined set of city functions.
- Freeze revenues at 1998 levels.
- Provide PUC review and audit authority.
- Prohibit fees for application, permit, excavation, inspection, etc.
- Prohibit substitution of in-kind services for cash payments.
- Prohibit double-collection of fees.
- Establish framework and timeline for transition from current contracts.
- Adopts FTA's use of "competitive neutrality" as state standard.

**Post – 1996 Federal Telecommunications Act**

Since the passage of the Federal Telecommunications Act of 1996, the telecommunications industry has sought changes in the traditional methods that cities use to franchise their PROW. In over half the state legislatures, bills have been introduced that would drastically alter the franchising landscape and reduce cities' rights. Fifty percent of these bills have passed and have resulted in dramatically reduced franchise fees. The National Association of Telecommunication Officers and Advisers (NATOA) has waged a vigorous information campaign at the state level and is working to alert Congress and the FCC to the substantial financial impact of these statutes, but the legislative initiatives reducing cities' rights seem to be gaining momentum.

**Texas Legislative Action**

In the last legislative session, providers lobbied the Texas Legislature for broad changes that would erode the cities' traditional rights to manage their PROW and to collect compensation for PROW use. After a bill that would have restricted city fees to their out-of-pocket costs and give much of their franchising power to the Public Utility Commission of Texas failed, a substitute bill passed which established an interim study committee. After conducting nine meetings around the state, their 1998 report recommends the same sort of changes included in the previously defeated bill.

As other public groups watch the Texas case closely, the Texas Municipal League has stated that the defeat of any bill restricting cities' rights and compensation is their "highest priority." The next Texas legislative session may see a flurry of industry-sponsored bills that limit the cities' power over their PROW.

For more information, see:
NATOA: http://www.natoa.org/row

# ELECTRIC AND TELECOMMUNICATIONS DEREGULATION

Mark Zion
Executive Director, Texas Public Power Association

What is an article about electric utility deregulation doing in a telecommunications review? Good question. There are many similarities, and quite a few misconceptions about "deregulation" in these two industries. This article compares and contrasts some of the changes underway, gives an update on the outlook for deregulation of the electric utility industry in Texas, and offers a few observations about the prospect of electric providers moving into the telecommunications business.

**Similarities and Misconceptions:**

In both the electric and the telecommunications industries, deregulation doesn't mean less regulation. In the electric industry, we have figured this out and changed the name from "deregulation" to "industry restructuring".

Regardless of the name, the changes underway mean real competition in only a portion of both industries. The delivery of electricity (about 40% of total costs) would remain a monopoly function after restructuring. Retail competition would be confined to the generation side of the business (about 60% of total costs).

Market dominance is an unresolved problem as both industries make the transition from regulated monopoly to partial competition. In virtually every telecommunications market there is a dominant provider. For most of the Texas electric market, two investor-owned utilities control nearly 55% of the total generating capacity and over 75% of peaking capacity.

**Public and private electric utilities, with their combination of internal communications needs, ready access to right-of-way, and in-house engineering expertise, are now routinely installing high capacity fiber optics on bulk power transmission circuits throughout the state.**

Customer choice of an electric generation provider is often likened to choice of a long distance supplier. However, while the reliability of long distance doesn't really affect local service, reliable power generation is a prerequisite to local electric service. What does a busy signal look like in the electric business? In Texas during the summer it looks dark (and hot).

For cities, the franchise battles currently being fought over telecommunications are likely to be repeated as the electric industry restructures. The key question is the same. How should a city be compensated for commerce taking place in public right-of-way when a monopoly supplier is replaced by many different (and constantly changing) competitive providers?

**Outlook for Electric Restructuring in Texas:**

Electric utility restructuring will be one of the key issues for consideration during the 1999 Session of the Texas Legislature. Those in favor of moving quickly toward restructuring include investor-owned utilities, industrial and business users, independent producers and marketers like ENRON, and the PUC. Those urging a cautious approach include many consumer groups, rural electric cooperatives, and municipally-owned electric utilities. The Texas Public Power Association (TPPA), representing municipal utilities and other public providers, has raised significant concerns about restructuring. Will there be equitable benefits for large and small customers? Will a restructured electric market be diverse and functional, or dominated by a handful of powerful "competitors"? Will the financial integrity of municipal electric utilities that serve 3 million Texans in 75 cities be preserved? TPPA is seeking solutions to those concerns and protections for municipal utility customers and their cities. Today, consumer-owned municipal utilities are locally governed, not regulated by the PUC. TPPA believes that successful system of local control should stay in place after restructuring.

**Electric Utilities in Telecommunications?**

A business strategy commonly proposed for electric utilities after restructuring involves the provision of "bundled services" – a single provider selling a package of services which might include electricity, telephone, Internet, home security, and so forth. However, this strategy is off to a slow start in the

already deregulated states as bundled service affiliates of investor-owned utilities wait for new markets to mature. Recent marketing studies are showing some consumer skepticism about "one stop" utility shopping. Nonetheless, electric utilities in Texas are getting active in telecommunications. A major investor-owned utility has purchased a Texas telephone cooperative. Public and private electric utilities, with their combination of internal communications needs, ready access to right-of-way, and in-house engineering expertise, are now routinely installing high capacity fiber optics on bulk power transmission circuits throughout the state. In rural Texas, electric cooperatives are providing Internet service, satellite TV, and radio communications. The ultimate role of municipal utilities in telecommunications is uncertain, due to conflicting state and federal statutes.

Natural synergies between utility functions will favor the convergence of the electric and telecommunications industries. Arrival of the "electrocomm" integrated mega-utility predicted by some pundits is far from assured. As deregulation goes forward in the electric industry, we hope to learn from the telecommunications experience.

For more information, see:

Texas Public Power Association: http://www.tppa.com
American Public Power Association: http://www.APPAnet.org
Public Utility Commission of Texas: http://www.puc.texas-gov
Texas Senate Interim Committee on Electric Restructuring: http://www.senate.state.tx.us/75r/senate/commit/IC/IC10.htm

http://www.policy.com.issue236.html
Consumers Union: http://www.consunion.org/other
Bill filed on December 4, 1998 by Rep. Steve Wollens, D-Dallas, see article in Austin American-Statesman at: http://www.austin360.com/biz/12dec104/4power.html

# INTERNET FILTERING IN PUBLIC LIBRARIES

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Changes in computing and telecommunications have given rise to a number of contentious and politically volatile public policy issues, especially as organizations of all kinds adjust to the increased integration of advanced information tools. One of the most contentious issues is whether public libraries should filter access to the Internet (especially the World Wide Web) or not. This issue is particularly volatile because one of the apparent choices is between parents' assumption of responsibility for what their children see and hear on the one hand and the obligation of public institutions to protect minors from material that adults consider inappropriate on the other.

Many commentators have created a lot of heat around the issue but shed little light. The use and misuse of terms has been particularly problematic. For example, terms such as "obscenity," "indecency," and "pornography" have been used very loosely and confusingly. Only materials judged obscene are illegal to distribute in the United States –- pornography and indecent material, however defined, are not illegal to possess, distribute, or otherwise use. For materials to be judged obscene, they must meet the three-fold test of the classic *Miller v. California Supreme Court* decision:

1. The material in question must appeal to the "prurient interest."
2. The material must have no "socially redeeming value."
3. The material must not adhere to local community standards.

While pornographic materials have not been the sole focus of debate about Internet filtering in public libraries, they have often been the primary focus of such debate.

The relative crudity of many filtering software applications is another of the reasons for the lack of agreement about this topic. It is common for filtering software to restrict access to displays of nudity and other sexually oriented material that can be retrieved on the Web using

such words as "breast." The difficulty is that, as many opponents of filtering have made clear, information about important public health problems such as breast cancer will also be impossible to retrieve.

This point leads to two of the most fundamental underlying conflicts about Internet filtering in public libraries. The first is the unwillingness of developers of filtering mechanisms, which rely on simple character string matching, protocol blocking, or site blocking, to make their code available for professional critique and improvement. Citing the proprietary nature of information and the need to keep such information from competitors, filtering software developers exacerbate the public debate by making the so-called technical fixes such a crude and ineffective tool. Some filtering packages are more adaptable than others, but, as a class, most are very crude indeed.

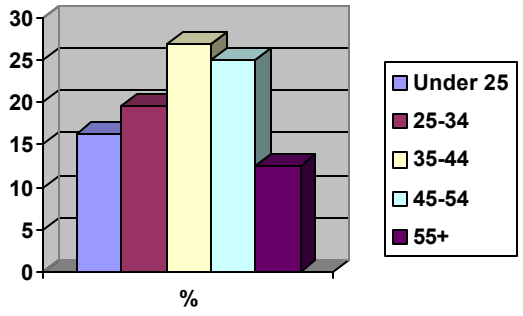
The second important basic conflict is that both "sides" of the debate, whether asserting the need to protect children and others or the need to allow access to important information, are disingenuous. Critics of open access to the Internet emphasize pornographic images, chat sites, and other material, with

| | |
|---|---|
| # of library outlets with publicly accessible Internet computers | 73.1% |
| (urban 84%, suburban 76.7%, rural 67.6%) | |
| # of these library outlets with no Internet filters | 85.3% |
| # of these library outlets with an acceptable use policy | 84.8% |
| # of these libraries with either Internet filters, an AUP, or a developing an AUP | 97.1% |
| # of these libraries with only one publicly accessible Internet machine | 42.7% |

These figures were generated by a sample of several thousand public libraries across the U.S. (from Bertot, John Carlo, & McClure, Charles R. (1998). The 1998 national survey of U.S. public library outlet Internet connectivity: Final Report. Washington, DC: U.S. National Commission on Libraries and Information Science.)

a passion that seems to ignore the valuable material that is there and to equate seeing "inappropriate material" with the end of hyper-innocent childhood. Critics of Internet filtering, on the other hand, emphasize the research materials available and the need of children and others to have access to materials that others regard as inappropriate. This perspective downplays the relatively easy availability of pornographic, hate speech, and other material the access to which reasonable people can disagree about, especially in public institutions.

**% Texas Internet Users Accessing Internet at Public Library (by Age )**
**(Source June 1998 Texas Poll)**




Many public libraries and society at large have been presented with a false dichotomy, the need to choose between protection of children and others and the need to adhere to Constitutional guarantees of free speech, free association, and open communication. The most reasonable choices in such a politically charged atmosphere are very difficult to identify, implement, and defend.

The American Library Association (ALA) asserts that no one, including children, should be denied access to information no matter what its format. Citing the reliance of the economically disadvantaged on access to the Internet in public libraries and other public institutions, ALA contends that Internet filtering also systematically disadvantages poor individuals and communities. The well to do can rely on open access and/or parental supervision to guide Internet use at home; the poor have no such alternatives.

The Texas Library Association (TLA) has developed an Internet access policy that emphasizes the need for local control and decision-making, relying on coalitions of parents, librarians, businesses, teachers, local government officials, and interested citizens. What such an even-handed policy ensures, as its proponents realize, is that the socially disadvantaged individuals and communities will enjoy greater access to digital information than those dependent on public institutions and public money.

From a professional point of view, li-

brarians and other information professionals face some real challenges with regard to Internet filtering. The development of collections in libraries of information in all formats demands analysis, evaluation, and specificity, the kinds of characteristics that the Internet does not lend itself to easily. Additionally, public libraries, like the courts, must reflect community standards and challenge them. Internet filtering can frustrate both these goals. Finally, Internet filtering poses threats to public libraries' imperative to protect the privacy of patron including children and users' ability to associate with their peers locally and remotely. Yet political necessity, protection of those too young to defend themselves, and concerns about a sexually hostile work environment seem to demand Internet filtering in public libraries.

There are many public interest groups that provide middle ground between absolute open access and filtered access to the Internet. For example, KIDSNET, the Media Literacy Online Project, and the National Parent Teachers Association provide guiding principles for net use, links, and other "appropriate" material. Like most public issues that involve the clash of apparently irreconcilable values, questions about Internet filtering in public libraries have the potential to tear communities apart and to flood the courts with litigation. National standards, whether propagated by government or professional organizations, cannot provide "the answer" either – they, too, are consistently challenged both in the work place and in the courts. Like the related question of controversies about the purchase of books made politically volatile by sexual, political, or other measures, Internet filtering seems to be a divisive issue that promises to be with us for some time.

For more information, see:
American Library Association: http://www.ala.org/
LINK 4 PARENTS: www.bltg.com/link4par.html
Internet Guide for Parents: www.mtb.mtlib.org/Parents.htm
Censorship resources: www.ala.org/oif.html

# WIRELESS SERVICES

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The world has witnessed an explosion in wireless telecommunications over the past few years. The term "wireless" is very expansive, including everything from radio to microwave to satellite communication, narrowband and broadband. Each technology has rapidly developed over the past few years, providing a wealth of telecommunication options while also challenging some long-held policy conceptions.

**Cellular Telephones**

In the United States alone, over 122 million wireless phones are in service for both personal and business use. Wireless telephone service is now available in all areas of Texas with most areas having multiple carriers. The three main buzzwords in this area are "cellular," "digital cellular," and "PCS." "Cellular" simply means the transmission of information (generally voice) using radio cell technology. "Digital Cellular" is the transmission of digitally encoded signals, either voice or data, via a cellular connection. "PCS" (Personal Communications System) is the hottest trend today, and it allows users to access voice mail, faxes, e-mail and a wide range of other options using their digital telephones that operating at different frequencies than cellular phones use. Digital Cellular is available throughout most of Texas, while PCS services are in the major metropolitan areas. It is important to note that each of these technologies requires separate equipment. Thus, a traditional cellular phone will not be able to transmit digital cellular messages, unless it is what is known as a "dual band" phone.

**Data**

Although Internet lingo talks about the world becoming "wired," consumer demand is sparking innovations in "unwired" technology. In simpler terms, businesses are seeking new ways to access data using wireless technology.

Pagers have been widely used in some professions for more than a decade. With the dramatic reduction of price, both for the paging equipment and the monthly service fees, a general numeric pager is within the budget of most households. High school students

across Texas have been spotted with their own pagers, while college students are being given free pagers as part of promotional packages for soft drinks, clothing stores, and more. More and more Americans are choosing to carry the "electronic leash" so that they will never miss a call.

Alphanumeric pagers, which are pagers that can receive text as well as numeric messages, are still relatively expensive compared to their numeric counterpart. One advantage of the alphanumeric pager is that many companies offer e-mail paging services, which allow a person to send a short email which is displayed directly on the pager screen. A rival to the alphanumeric pager is the SMS or Short Message Service. SMS messages can be typed using the keypad of a digital cellular phone and the message instantly sent to the display screen of the recipient. Although the digital cellular company must make special arrangements to provide SMS services (not all do), SMS is generally not limited to PCS customers only. With the prices of digital cellular dropping rapidly, the SMS feature, which can also be transmitted via email, may replace the alphanumeric pager.

**As the cost of wireless services decreases, the world will see dramatic changes in both personal and business communications.**

New advances in technology are allowing for wireless data transmissions well beyond the services offered by PCS. The "wireless IP" era has begun, with national digital cellular companies offering unlimited wireless data transmission at reasonable rates. Wireless IP allows the user to access the Internet directly through a wireless modem. Standard voice transmissions are not part of the package, although Internet telephony (placing a voice call through the Internet instead of through phone lines) may be allowed. One unique feature of some Wireless IP services is that prices are sometimes based on the amount of data transmitted, not the actual time of the connection.

As hand-held computer technology improves, more consumers will have the ability to connect directly to the Internet using computers that are no larger than their checkbooks. US Robotics, the makers

of the Palm Pilot and an industry leader in hand-held computing, has announced its intention to release the Palm VII in 1999 which would combine the modem and computer into a device smaller than the average portable CD player. Nokia, a key manufacturer of wireless phones, has already launched a combination telephone/computer in 1998, which allows the user to web browse and check email from anywhere on the digital cellular network. Many other manufacturers and Internet Service Providers are teaming up to create similar packages of their own, and America Online has hinted at its intention to join the fray. With so many options in hand-held, fully Internet-accessible, wireless computing, this new trend could have significant impact on the future of the Internet.

**Satellite**

Cellular radio technologies are not the only players in the wireless markets. Satellite systems are providing many new and exciting options for wireless telecommunications. Global Positioning Systems (GPS) allow people to determine their exact latitude and longitude with the touch of a button. With GPS systems costing only a few hundred dollars, they have been widely used by wilderness explorers and casual city roamers alike.

New, lower-orbit satellites (sometimes called LEOS, low earth orbiting satellites) have been positioned in space, greatly increasing the viability of direct satellite telephone connections. Because these satellites are closer to Earth, the equipment needed to utilize them can be much smaller and lower power. Although rapid advances in the equipment are expected, it is anticipated that satellite telephony will not compete directly with cellular telephony, but will instead supplement it in areas where it is not economically feasible to build cellular radio towers. However, the usage costs for the satellite telephone is reasonable, with most connections costing $0.50-$2 per minute. The main disadvantage to satellite telephony is that the bandwidth is very low. Data transmissions can only go up to 9600 bits per second, a very slow speed in to-

**If wireless can be shown to be a complete alternative to the standard local exchange system, the local carriers may be in a position to begin to offer long-distance services.**

day's terms.

The most prominent satellite telecommunication is the Direct Video Service (DVS). Years ago, in order to get television stations directly from satellites, the consumer was required to have a large and expensive satellite dish. Now, with many companies offering DVS dishes that are approximately eighteen inches in diameter, and cost only a few hundred dollars, DVS is available to a much wider range of consumers. Because of their small size, the dishes are available to renters, a constituency that never could have used the larger dishes.

**Policy Implications for Wireless Technologies**

The increase in wireless telecommunications has sparked many policy and regulatory debates. Three main areas of controversy are in long-distance access charges, competition at the local exchange, and continuing validity of spectrum scarcity as a justification for content regulation.

Many of the traditional pricing methods are being challenged by new wireless services. For example, several national digital cellular companies have been advertising a uniform rate of ten cents per minute for all local and long distance calls. However, because of the current twelve cents per minute access charges that are paid to the local exchange carriers, in-state long distance calls in Texas are throwing a kink in that pricing scheme. The wireless carriers have to choose between making exceptions for intra-Texas calls (and pricing them at a higher rate), or taking a loss on intra-Texas calls. The added pressure from wireless companies may eventually result in a change in the Texas access rates, reducing the cost of calls for all Texas consumers. Further, wireless IP services are priced per kilobyte of data, and this new pricing system may be adopted by other companies offering data transmission services. In such cases, the traditional access charges based on time may need to be redesigned to reflect transmission-based pricing.

Another key controversy surrounds the viability of a "wireless local loop" (a wireless replacement to the local, wired central office system). If wireless can be shown to be a complete alternative to the standard local exchange system, the local carriers may be in a position to begin to offer long-distance services (see the article on Texas Deregulation in Section 1). In an effort to prove this theory,

AT&T is currently running a test in Plano, Texas, offering unlimited local phone calls and reasonably priced long-distance calls for customers in that city. The results of this test may affect the FCC's determinations on whether wireless is truly an effective competition to the wired exchange system.

Finally, one long-standing concept in telecommunications policy is being strongly challenged as a result of the emerging technologies. The FCC, in line with other nation's telecom regulators, has closely regulated the content of television and radio stations. The justification for this regulation has been that the spectrum is a scarce resource, and that it is a governmental duty to ensure that the spectrum is used efficiently. Efficient use has been interpreted to mean providing a variety of content while also preserving community standards. With digital technologies dramatically increasing the use that can be made of the existing spectrum, and increasing options from satellites, the spectrum no longer seems like such a limited and scarce resource. The next few years will see challenges to the underlying policies of content regulation, and indeed the onset of spectrum auctions is symptomatic of a diminished public trustee concept for spectrum management overall.

Wireless technologies are revolutionizing the way we communicate. America is a much more mobile society, and current technologies give us the options of eliminating many wire connections at the personal level. As the cost of wireless services decreases, the world will see dramatic changes in both personal and business communications. How regulators will respond to these changes will determine the future of many significant areas in telecommunications.

For more information, see:
World of Wireless Communications: http://www.wow-com.com/consumer/
How do Cell Phones Work? http://www.iit.edu/~diazrob/cell/intro.html
PCS Data Home Page: http://www.pcsdata.com/
Personal Communications Industry Association: http://www.pcia.com/
Mobile Satellite Users Association: http://www.msua.org/mobile.htm

# GLOSSARY OF TELECOMMUNICATION TERMS

**Analog**
A method of transmitting information over wave-lengths. The data is converted into waves and transmitted via radio or light frequencies.

**Bandwidth**
The range between the highest and lowest frequencies on a channel; more commonly, the amount of data that can flow through a channel at the same time. In either case, the capacity of a telecommunications channel is measured by its bandwidth.

**Bottleneck**
Any point in a network where traffic gets backed up because of insufficient bandwidth.

**Broadcast**
Transmission to two or more receivers via a single signal. Also called point-to-multipoint transmission.
Examples of broadcast are television, radio, and cable programming.

**Cable Modem**
A device that allows a computer to send data via the cable network, where such service is available. Cable modems are capable of providing greatly increased bandwidth over dial-up connections; however, the bandwidth available to each cable modem user is determined by the number of users on the system at the time.

**Cellular Radio**
Low-power radio transmissions that convey messages to specific receivers. These transmissions are analog, and can only be received within the transmission range of the radio emitter or tower. This is the basic technology behind cellular telephones.

**Central Office**
A local telephone company facility that houses the switching system and related equipment to interconnect phone calls for customers in the immediate area. Every LATA must have at least one.

**CLEC**
Competitive Local Exchange Carrier. A company which is trying to compete with the existing telephone company to provide local telephone service.

**Dial-up**
Using a computer, modem and a standard telephone line to connect to another computer, network, or internet service provider.

**Digital**
A process by which all information (data, sound, etc.) is converted into a series of zeros and ones. This sequence can be represented by light, sound, or magnetic coding. Digital transmissions provide a greater clarity of signal, and allow greater amounts of information to be passed through a channel.

**Digital Cellular**
Using cellular radio technology to transmit information which has been converted into digital format.

**Divestiture**
The court-ordered break-up of AT&T in 1984. AT&T was split off from the local telephone providers, who became the RBOCs.

**Downlink**
The path or link from a satellite to an earth station that receives its signal. The term is frequently applied to an antenna that receives signals from a satellite. It is often referred to as a dish, a terminal, an earth station, or a TVRO (television receive-only).

**Ethernet**
A process which allows the transmission of 10 megabytes per second over copper wires. Ethernet is generally used only in local area networks (LANs) for connecting computers that are separated by a short physical distance. A network that uses Ethernet may or may not be connected

to the internet; Ethernet links do not automatically imply internet connection.

Exchange
: The switch in the local telephone company's central office that routes traffic to and from individual phone lines.

Fiber Optic
: A transmission technology where light signals (sequenced to carry information in a digital format) are send down compressed optical fibers. These fibers, made of glass, allow light to be transmitted without interference from other channels.

Network
: A telecommunications network comprised of physical wires laid in the ground. As opposed to a wireless or mobile network.

GSM
: Global System for Mobile communication service. GSM is the European standard for cellular telephones, and is currently in place throughout most of the world outside of North America. GSM phones do not function on US cellular telephone networks.

ILEC
: Incumbent Local Exchange Carrier. The company that currently provides local telephone service to a region, generally an RBOC.

Independent phone company
: A local exchange carrier that is not part of the Bell system of operating companies (BOCs). In rural areas, many independent phone companies are cooperatives.

Internet Telephony
: The transmission of two-way voice messages over the internet in real time. The internet can be used for voice communications between people who are connected to the internet, or one person may use the internet to dial up the other person's regular phone.

ISDN
: Integrated Services Digital Network A system which allows for high-speed data transmission (128 kilobytes per second). ISDN lines require special digital modems, but are capable of providing twice the bandwidth of current analog modems (modems which use regular telephone lines).

ISP
: Internet Service Provider. A company that provides access to the internet for companies and/or individuals.

IXC
: Inter-eXchange Carrier. A telephone company that carries transmissions that cross LATA boundaries. Generally referred to as a "Long Distance Carrier".

Hosting
: A "host" is a machine that houses data or software for another entity. For instance, the computer on which a web page is available is called the "host" or "web host" for that page.

LAN
: Local Area Network. A technique by which many computers in the same physical location can be linked together to communicate or share common resources. LANs may be linked to the internet, or they may be self-contained.

LATA
: Local Access and Transport Area. The geographical area served by a local exchange carrier. The local exchange carrier may provide service only within a LATA; calls that cross LATA boundaries must be carried by an Inter-eXchange Carrier (IXC).

Local Loop
: The network of individual telephone lines that connect to businesses and residences in a particular area. Also includes the exchanges and switches used to route the calls to and from the individual lines.

Modem
: A modulator/demodulator. This device converts digital information into analog form for transmission over a telecommunications channel and reconverts it to digital forms at the point of reception.

Packet Switching
: When information is in digital form, it may be broken up into small portions, called "packets." These packets may be individually encoded so that they may travel independently along the communication channel. Transmitting information via a packet-switched system does not require that a single circuit be maintained throughout transmission.

Personal Communications Service (PCS)
: A cellular telephone that can provide many functions, such as fax, voice mail, and paging as well as voice telephone service.

POP
: Point of presence. Long distance company switching centers which connect to LEC networks.

POTS
: Plain old telephone service.

Protocol
: The rules governing the transmission of messages. When the appropriate protocols are used, computers are able to process messages of that certain type. Popular protocols today are TCP/IP (for packet switching), HTTP (for web pages) and FTP (for file transfers).

Public network
: A public network is operated by communications companies that serve the general public. Private networks are owned and utilized by a single entity.

RBOC
: Regional Bell Operating Company. After the Divestiture of AT&T, the local Bell companies (also known as "Baby Bells") were those former portions of AT&T that continued to provide local telephone service. Southwestern Bell is the RBOC in Texas.

Switching
: Routing calls or packets to the intended destination. Voice calls are switched in telephone exchanges; data is switched by a device called a router.

T1
: T-1 (also known as DSl) refers to a digital transmission service capable of transmitting 1.544 megabits per second. It is the general term for a digital carrier available for high volume voice, data, or compressed video traffic. T-1 is a standard for transmission that is accepted in North America. Fractional T-1 tariffs are rates for bandwidths between 56 Kbps or ½ of a T-1.

Tariff
: The published prices that telephone companies charge to their customers. These rates are filed with the appropriate regulatory agencies and in many cases may be subject to the review and approval of that agency.

TCP/IP
: Transport Control Protocol/Internet Protocol. TCP/IP is the basic protocol that allows computers over the internet to communicate via switched packets.

Telco
: Telephone company. Generally, this refers to the company providing local telephone service.

Tower Siting
: The physical location of the microwave and radio towers used to provide wireless communication. This term also applies to the process by which these tower locations are selected and approved.

Trunk
: The high bandwidth connections between the central offices and exchanges in a telecommunications network. Trunks are generally made of fiber optic cable.

Twisted pair
: Cable made of a pair of insulated copper wires wrapped around each other to cancel the effects of electrical noise. It can transmit voice, data, and in some cases low-grade video. It is the most prevalent type of medium in the public switched network's local loops.

Uplink
: The path, or link, from a transmitting earth station to a satellite. The term is frequently applied to the transmitting earth station.