

gaining more efficient access to World Wide Web sites on the Internet. In addition, the high speed access means faster downloading of video clips offered by CBS and Home Box Office over Prodigy.

- ▲ **THE MICROSOFT NETWORK (MSN)**—No online service has received as much advance publicity as the Microsoft Network. Launched in 1995, with cable operator TCI as a major partner and hundreds of companies as information providers, the Microsoft Network is included in Windows 95, an operating system for many PCs. This ensures that a large number of potential subscribers will have access to the service. The Microsoft Network is similar to other online services in terms of content but it has a different pricing strategy—one that allows each information service provider to set its own price.

MSN also offers a few different pricing packages for its basic service, including a low-cost package for those who will use it only occasionally. Subscribers can access the service through the telephone network, and through selected cable systems at much higher speeds. MSN has a powerful server and software tools, called Blackbird, that can provide seamless access to the Internet.

- ▲ **THE INTERNET AS A SUPERHIGHWAY**—The Internet has grown at a very fast rate, both in usage and in the number of businesses and organizations creat-

ing home pages on the World Wide Web, a part of the Internet with an easy-to-use graphical interface. Many businesses have established Web sites in the hope of selling traditional merchandise or services to consumers who log onto the Internet each day. Some companies have even established “virtual shopping malls” providing access to hundreds of retailers and cataloguers. In addition to those selling merchandise on the Web, some companies are trying to make a profit by charging a subscription or usage fee to those accessing their site. For example, some newspapers will allow you to access their main Web page at no cost, but charge a monthly fee and ask for an established password to gain entrance to their features and articles.

A majority of commercial sites on the World Wide Web are using their site to advertise, promote an image or simply to join the “Web Fever” while searching for a niche on the “information superhighway.” While the number of Web users has grown rapidly, it is less clear how businesses will earn a profit on the Web. The fact remains, though, that the Internet has captured the imagination and interest of a lot of people.

Nearly every type of business, institution or organization can be found in some capacity on the World Wide Web. Some businesses, however, have embraced the Internet in a very conspicuous manner. Some of the most common types of businesses found on the Web are banks, newspapers and magazines, TV and radio, and retailers and cataloguers.

#### Cable Services and Activities

Cable companies are exploring many new services including telephone service, CD-ROMs, online services, interactive television and direct broadcast satellite. They are competing in new arenas, e.g., against local telephone companies, and hedging their bets by becoming partners in new services that compete with cable such as direct broadcast satellites.



PROJECTED GROWTH OF ONLINE SERVICES IN HOUSEHOLDS (MILLIONS OF HOUSEHOLDS)	
Year	Onlines Service Subscribers
1995	8
1996	11
1997	15
1998	18
1999	20

Source: Multimedia PC Marketing Council

With the promise of very large capacity cable systems in the near future, many groups have launched or announced new cable channels. However, the reality is that until digital compression is implemented on a large scale, there will continue to be very little channel availability on cable systems.

Gaining access to cable systems often involves striking marketing deals with cable operators. This is clear in the negotiations that have taken place between electronic program guides (EPGs) and cable operators. The EPG companies that now stand firmly in position to test the market include StarSight, Gemstar, Prevue Interactive and TV Guide On Screen. Each has been negotiating relationships with major cable operators. These arrangements will make it very difficult for any newcomers to enter the market. StarSight, for example, has agreements with Viacom Cable, KBLCOM, Colony Com-

munications (*Providence Journal*), Cox Cable Communications and Times Mirror Cable TV.

Prevue and TV Guide On Screen, likewise, have established relationships with MSOs representing a large share of the nation's cable households.

Cable is moving ahead in ways that are important to public television. For example, Cable in the Classroom (CIC), an industry trade group that represents cable system operators and a consortium of program suppliers (including PBS), has successfully wired over two-thirds of classrooms in the U.S. It also provides a package of noncommercial programming to classrooms. Public television is the largest program supplier for Cable in the Classroom. Further, CIC research shows that public television is the most heavily used CIC service—69 percent of teachers surveyed indicated that they use public television programs regularly.

#### NEW CABLE NETWORKS COMPETING FOR CHANNEL SPACE

Access Television Network	The Ecology Channel	Parent Television
The American West Network	The Enrichment Channel	Parenting Satellite Network
America's Health Network	ESPN 3, 4 & 5 and ESPNol	The Parents Channel
The Applause Network	FAD TV	Planet Central TV
The Art & Craft Network	FXTV, Fitness and Exercise TV	The Popcorn Channel
Arts & Antiques Network	Gaming & Entertainment TV	Premier Horse Network
The Auto Channel (TACH)	Golden American TV	The Real Estate Network
BBC World Channel	Good Health Channel	Recovery Net/The Wellness Channel
BET On Jazz: The Cable Jazz Chl.	The Health Channel	Romance Classics
The Boating Channel	The History Network	Shop At Home
Booknet	Hobby Craft Network	The Singles Network
Car & Driver Channel	Horizons Cable Network	Speedvision
Catalog 1	Interactive Channel	Sundance Film Channel
Celtic Vision: The Irish Channel	Int'l. Cable Channel Partners	TCI-Microsoft Computer Channel
The GEO Channel	Infomall Cable Network	TMZ, The Music Zone
Children's Cable Network	Kaleidoscope	TRAX: High Performance TV
Cine Latino	Merchandise Entertainment TV	TRIO
Classic Arts Showcase	The Military Channel	TV Guide On Screen
Classic Music Channel	Music Video Service (Unnamed)	TV Macy's
Classic Sports Network	National Health Network	TV Shopping Mall
C/Net: The Computer Network	New Culture Network	VIA TV Network
Collector's Channel	Newsworld International	Video Catalog Channel
Conservative Television Network	The 90s Channel	WEB Sports Network
Consumer Resource Network	The Outdoor Channel	Wingspan
Crime Channel	Outdoor Life Channel	Women's Sports Channel (Unnamed)
C-Span 3, 4 & 5	Outdoors, Motorsports & Collectibles Network	Women's Sports Network
Deviance Time & Space	Ovation: The Fine Arts Network	World African Network
Discovery's Four New Networks		XTV

Source: Cablevision

Number of Available Channels	Percentage of Systems
1	8
2	18
3	21
4	10
5-9	16
10-14	11
15-19	10
20+	7

Source: Beta Survey

Other cable activities include:

- ▲ **CNN AND CNBC DESKTOP VIDEO.** Both CNN and CNBC have launched desktop video services. They provide video feeds of their news services to businesses and other organizations. CNN's service, "CNN At Work," is a partnership with Intel. They charge \$150 per user per year for the service, which delivers video at 12 frames per second (compared to 30 frames per second for normal video over cable or broadcast). It does not provide true video-on-demand but a user can store the incoming video feed and view it later with near-video-on-demand control.
- ▲ **DISCOVERY CHANNEL.** Discovery Channel is very active in developing applications for new technologies. It has developed a video-on-demand service, Your Choice TV, that has been tested in a few markets. It offers television programs to users for prices ranging from less than \$1 to a few dollars. It is also participating in a trial of interactive television with Microsoft in Seattle. Discovery Channel's multimedia group has also created PC software and CD-ROMs, including the CD-ROM *Sharks! An Interactive Journey*.

After launching modest services on Prodigy and America Online, Discovery Channel launched an ambitious World Wide Web site with monthly fea-

tures about science, nature and history. These are supplemented by daily news reports, bulletin boards and live chat about specific topics. Revenue is derived from an online store, advertising and a planned subscription fee of \$24 per year.

- ▲ **VIACOM ONLINE DATA ACCESS.** Viacom is providing online access to Prodigy, America Online and the Internet to a group of trial households in Castro Valley, California. Viacom is testing the system from both technical and marketing perspectives. Cox Cable also is testing data delivery over cable on their systems in Omaha, Phoenix and San Diego. Data can be sent over cable at much higher speeds than over a standard telephone line. However, cable modems are expensive compared to telephone modems. Most cable modems cost \$500 or more, compared to \$50-\$200 for telephone modems. Zenith recently introduced a cable modem for \$300.
- ▲ **TIME WARNER'S FULL SERVICE NETWORK.** Time Warner's high-end interactive television service in Orlando, Florida—The Full Service Network—was announced with great fanfare in 1993. It was to be launched in early 1994 and was scheduled to provide video-on-demand, home banking and shopping, telephone service, video conferencing, and video games played between households, among other services, to 4,000 households. It was launched and installed in late 1994 in just a few households. The number of services and users grew slowly in 1995; a full service network is not expected to be in place until 1996. The delays experienced by Time Warner are not unusual. New technologies and services invariably take longer to implement than planned.

#### Telephone Company Activities

Telephone companies have announced many plans to offer video services to consumers. They also have changed their plans many times. A few important trends are now becoming clear.

First, telephone companies have put high-end interactive TV on a much slower path of development. Several trials have been canceled; others have been postponed. The reasons for this are the high cost of the technology, the equally high cost of creating new content, and uncertain demand by consumers.

Secondly, telephone companies are exploring alternative ways to deliver video to homes, including wireless cable (transmission of video by microwave to small dishes on homes), ADSL (transmission of VCR-quality video over ordinary telephone lines), and hybrid fiber-coaxial cable systems that are similar to the systems used by cable TV operators. A high-end system that utilizes fiber throughout the entire system is simply too expensive in the near term.

Third, telephone companies are forming new partnerships to create or acquire content. Bell Atlantic, NYNEX and Pacific Tele- sis have formed a \$300 million partnership to acquire and produce programs. The partnership is called Tele-TV. SBC Communications (formerly Southwestern Bell), Bell South, GTE and Ameritech have formed a \$500 million partnership with Disney to create a national program service.

- ▲ BELL ATLANTIC is pursuing many different paths simultaneously. It has formed a partnership with two other large telephone companies to acquire and produce programs. It also has formed a partnership with NYNEX to buy a large wireless cable company. Using wireless cable's over-the-air microwave transmission and digital compression, it will be able to offer 100+ channels of TV. Bell Atlantic believes that wireless cable is a less expensive first step into the video business, to be followed by higher-end fiber systems when the costs to build those systems come down. At the same time, Bell Atlantic is experimenting with a high-end fiber optic system in Northern New Jersey and conducting a trial with low-end ADSL technology (i.e., video sent over regular telephone lines) in Northern Virginia.
- ▲ AMERITECH is pursuing a relatively simple strategy. It is "overbuilding" cable systems in its five-state territory. This means that it is building new cable sys-

tems in direct competition with existing cable operators. The Ameritech systems mix fiber and coaxial cable. They can provide hundreds of channels through the use of digital compression and can evolve over time to provide advanced services such as interactive TV. In the short term, however, it is becoming a regular cable TV operator. At the same time, it has formed a programming alliance with three other large telephone companies and the Disney company.

- ▲ SNET (SOUTHERN NEW ENGLAND TELEPHONE) has a very ambitious plan to completely replace its own copper infrastructure with a sophisticated high-capacity fiber broadband network. By 1998, SNET plans to reach approximately 500,000 customers in Connecticut (one-third of its overall customer base) with a broadband network called I-SNET. It hopes to complete the network by 2009. This would place Connecticut among the first states to have a broadband fiber optic network that is widely available to homes, schools and businesses. SNET has reported positive results from its 1995 video-on-demand trial that was designed to test service appeal prior to a large-scale service launch.
- ▲ US WEST is pursuing a strategy with many components. It also has changed direction from an earlier strategy. Like some other large telephone companies, it submitted an ambitious plan to the FCC to build high-end video dialtone systems throughout its territory. It then withdrew the video dialtone applications and announced a more modest approach. This includes a market test of a high-end fiber system in Omaha to help it determine what path to pursue. It is also evaluating wireless cable, ADSL and direct broadcast satellite as alternative delivery systems for video. In addition, it has invested in one large cable company (Time Warner Entertainment) and purchased a regular cable system in Atlanta. It is rebuilding this cable system in order to offer more

## PROJECTED CUMULATIVE 1996-2000 DISTRIBUTION COMPETITORS

Millions of Subscribing Households

System	1996	1997	1998	1999	2000
Cable TV	61.5	62.5	63.4	64.2	65.0
Telco Cable	0.8	1.5	2.5	4.5	7.0
DBS	3.5	4.0	4.5	4.8	5.1
Wireless Cable	1.9	2.3	2.6	3.0	3.3

Source: Paul Kagan Associates & Cable World

video services and to provide telephone service over cable in competition with the local telephone company.

#### Direct Broadcast Satellite Services

Direct broadcast satellite services must compete with cable TV, new telephone fiber optic and coaxial cable systems, and wireless cable systems. Many analysts believe that DBS will be adopted by a modest share of U.S. households. After competing with these alternative systems, however, DBS operators must then compete among themselves for DBS customers. The field is crowded and growing more crowded.



- ▲ PRIMESTAR is a medium-powered direct broadcast satellite service that was begun by six cable operators and General Electric to head off the onslaught by high-power DBS operators. Primestar uses a Ku-band satellite that can deliver TV signals to a three-foot dish. This is much smaller than the 10-foot TVRO dishes but larger than the 18-to-20-inch dishes for high-power DBS. Primestar began with a 10-channel service but quickly moved to digital compression, increasing its capacity to 73 channels. It also has attempted to overcome the barrier of high equipment costs by leasing the satellite dish to consumers. A subscriber can lease the equipment and receive a package of channels for approximately \$30 per month. Like its competitors, Primestar also offers pay-per-view movie channels and special sports packages, e.g., the NFL, NBA and NHL offer packages of 200 to 400 games for seasonal fees ranging from \$69 to \$149. Primestar

hopes to purchase additional satellite transponders and switch to smaller dishes in 1996, pending FCC approval.

- ▲ DIRECT TV is a high-powered DBS service that is owned by Hughes Electronics, a subsidiary of General Motors. DirecTV owns the satellite that supports its service of 150 channels (50 of these are pay-per-view). It also leases space on its satellite to a competitive DBS service—U.S. Satellite Broadcasting. DirecTV is the most ambitious DBS service to date. It invested significant funds in the high-powered satellite as well as ground operations and marketing. In spite of these high investment costs, it claims that it can be profitable with three million subscribers. Towards this goal, it has forged an important alliance with the National Rural Telecommunications Cooperative to market the service in rural areas. After finding some resistance to the high cost of hardware, DirecTV also has begun to offer a monthly price that includes lease of equipment.
- ▲ GALAXY INSTITUTE is a DBS education project funded by Hughes' DirecTV. It uses the DirecTV satellite to transmit 15-minute course-related segments to schools. In its pilot phase it is free to schools, but the fully operational service will charge \$6,000 per school for three courses (two science courses and one English course). The programming is taped, but it lets students send faxes which may be read or displayed in subsequent course segments.

There are other operating and planned DBS services, including U.S. Satellite Broadcasting (owned by Hubbard Broadcasting and a consortium of private companies), EchoStar and AlphaStar. It is unclear how many DBS services the marketplace can support. In Europe, where DBS services were launched prior to those in the U.S., there has been a consolidation of services because multiple DBS providers could not compete profitably. The same type of shakeout may occur in the U.S.

QUESTIONS FOR PUBLIC TELEVISION

What do these commercial sector trends and activities mean for public television? It is important to assess the implications of commercial trends for individual stations and public television generally. Are new opportunities emerging for public television as a result of commercial sector activities? Do any of the new services pose a competitive threat? More fundamentally, which of the new services are viable in the marketplace and which are public relations hype?

Among the many issues that are relevant to public TV, there are six noteworthy questions that this section will examine:

- ▲ Do homes and schools have the necessary equipment and means of access to utilize these new services?
- ▲ What do these new technologies or services cost, are people willing to pay for them, and do they work?

- ▲ Will commercial groups shape the development of new technology services?
- ▲ Will public television have access to the 500-channel cable environment and the video dialtone environment of telephone companies?
- ▲ Should stations participate in technology trials with telephone companies, cable operators and computer organizations?
- ▲ What are the missing pieces in the new technology environment and can public television supply any of these missing pieces?

DO HOMES AND SCHOOLS HAVE THE NECESSARY EQUIPMENT AND MEANS OF ACCESS TO UTILIZE THESE NEW SERVICES?

Ownership of equipment and access vary a great deal based in part upon financial resources, need and interest. In mid-1995, 64 percent of U.S. households had cable service, 40 percent owned a personal computer, eight percent used online services and five percent had a satellite dish. However, these percentages change when there is a strong need. For example, in Montana and other rural states with relatively few cable systems, more than 20 percent of households have a satellite dish. For this reason, a station must evaluate ownership of equipment in its local market and among the target group of users.

For schools, there are also many variations in ownership and access based upon the location of the school district, the financial

ACCESS TO TECHNOLOGIES BY K-12 PUBLIC SCHOOLS	
Technology	Percentage of Schools With Access
• Computer With Telecommunications Capability	75
• Cable TV	74
• Broadcast TV	70
• Online Services (Commercial, Public or Internet)	49
• Internet	35
• Closed Circuit TV	25
• One-Way Video/Return Audio On Computer	10
• Two-Way Video Service/Two-Way Audio	6

Source: U.S. Dept of Education, National Center for Educational Statistics

resources of the local community, and the commitment of each state to technology as a resource for education. In general, there is a reasonably high level of ownership and access for many new services. A survey of K-12 schools by the U.S. Department of Education in late 1994 found that approximately half of schools were connected to an online service or the Internet but only three percent of instructional rooms were hooked up. Teachers were the primary users of these services.

WHAT DO THESE NEW TECHNOLOGIES OR SERVICES COST, ARE PEOPLE WILLING TO PAY FOR THEM, AND DO THEY WORK?

Technologies are often very expensive when they are first introduced. When black and white TVs were introduced in the late 1940s, they cost the average household the equivalent of six weeks' salary. Over time, economies of scale bring the costs of technology down. Today, mature technologies like TVs are relatively inexpensive, more recent technologies such as personal computers are much cheaper than five or six years ago, and new technologies such as HDTV are very expensive. In planning to offer a new service, it is important to consider who the likely user groups will be in years 1-3, 4-6 and 7-10 of the service.

Many new technologies and services are plagued with technical problems. Some problems are eliminated through de-bugging but some are fundamental flaws. It is important to rely on the expertise of your station's engineering staff and reports from reliable industry sources—not the press releases of those marketing a service or technology.

WILL COMMERCIAL GROUPS SHAPE THE DEVELOPMENT OF NEW TECHNOLOGY SERVICES?

The interests of commercial groups can shape the development of new technology services either because they develop them first or because they can put enormous resources behind marketing. In this sense, public television should be aware of what technologies commercial groups are developing and which audiences they are targeting. The tough decision that follows is whether to join the direction of commercial groups or move in a different direction. For example, commercial groups may develop new technology services for consumers and businesses, while ignoring education.

The importance of innovation should not be overlooked. Public television has a strong track record in developing innovative uses for new technologies. The use of satellite to distribute programming is just one example. Here, commercial groups followed the lead of public television. In other cases, however, public television has developed innovative uses for a new technology but the lack of interest by commercial groups doomed the chances for the innovation. Teletext (an on-demand text service that piggybacks on a regular broadcast signal) provides an example. Public television developed a number of innovative applications for teletext but commercial groups showed little interest in the technology. As a result, the technology was never marketed to consumers and the innovative applications never had a chance to be developed.

WILL PUBLIC TELEVISION HAVE ACCESS TO THE 500-CHANNEL CABLE ENVIRONMENT AND THE VIDEO DIALTONE ENVIRONMENT OF TELEPHONE COMPANIES?

This is a crucial issue, with regulatory and marketing components. On the regulatory side, the Association of America's Public Television Stations (APTS) has waged an intensive campaign at the national level to secure access for public television in the new mega-channel environments. However, the national effort must be supplemented at the state and local levels.

It is equally important to show cable and telephone companies that public television is a vital asset in the new technology environment. Developing innovative new services is one way to demonstrate the value of public television. Audience research also supports public TV's case. For example, PBS research shows that cable subscribers who watch public television regularly have a more positive attitude about cable TV than cable subscribers who do not watch public TV regularly. In other words, public television adds value to cable.

SHOULD STATIONS PARTICIPATE IN TECHNOLOGY TRIALS WITH TELEPHONE COMPANIES, CABLE OPERATORS AND COMPUTER ORGANIZATIONS?

Each station has to weigh the pros and cons of participating in trials based upon its resources and the potential benefits. Assuming that it does not drain resources significantly, there are a number of potential benefits associated with participation in trials. First, a station



gains firsthand experience in creating new services, and adds to the skill-set of its employees. Second, there is much to be learned from the reactions of those who use the service in homes or schools: do they like the service, how do they use it, and are they willing to pay for it? Third, a station can position itself to move into the marketplace quickly when and if the trial becomes a regular service. There is also an intangible value in being recognized as a "significant player" by the cable, telephone and computing industries.

WHAT ARE THE MISSING PIECES IN THE NEW TECHNOLOGY ENVIRONMENT AND CAN PUBLIC TELEVISION SUPPLY ANY OF THESE MISSING PIECES?

There are many missing pieces in the new technology environment. For example, where will the content come from, especially local content? This is clearly a missing piece in proposed interactive television systems. Second, do we really know what end users in homes and schools want? And, who do end users trust to bring truly valuable services into the marketplace? Third, what social benefits or negative effects will be derived from new technology services? And, who will assure that new services bring positive social benefits?

These are missing pieces that public television can supply. Public TV has both a solid track record in each area as well as the trust of the public. Public television is a major producer of content, especially local programming and services. It has placed a strong emphasis on the end user and there has been a demonstrated trust in public television by its viewers. In addition, public TV has an established history of using technology to benefit all components of society—individuals, schools, government and social organizations.

## C H A P T



## C TELEVISION TRENDS AND ACTIVITIES

Press coverage about new media activities has missed an important story: public television is a major innovator of advanced telecommunication technologies and services. While cable operators and telephone companies have made headlines based upon promised services, public television has been implementing a broad variety of new services. These include direct broadcast satellite services, multichannel services, interactive programming, multimedia and online computer services, among others. The future communication environment will be very exciting and public television is leading the way to make it a reality.

What are some of the areas where public television can point with pride to its leadership role? There are several technologies and services. For example, public TV is a leading provider of direct broadcast satellite services: Georgia, Louisiana, Kentucky, Nebraska, South Carolina and more than 20 states that participate in the Satellite Educational Resources Consortium (SERC) all provide DBS services. At a national level, PBS provides multiple channels of direct broadcast satellite services. No com-

mercial broadcasters, cable operators or telephone companies can match public television's record of achievements in DBS.

Public television also leads in providing multiple channels of service. More than three dozen stations provide second and third channels of programming in their service areas, e.g., many program a second channel on their local cable system. PBS also feeds multiple channels to local stations.

In addition, public television leads commercial broadcasters, cable and telephone companies in providing online services, through PBS Online, Learning Link, Community-Wide Education and Information Service (CWEIS) sites, and dozens of Internet sites. The same holds true for interactive content: public television has been creating interactive content for more than a decade, including interactive telecourses, videodiscs and (more recently) CD-ROMs. Public television's leadership role also has included digital compression and multimedia as well as important participation in testing HDTV and video-on-demand.

SELECTED TELECOMMUNICATION ACTIVITIES BY PUBLIC TV STATIONS

Activity	Percentage of Stations
Have existing two-way link to local, state or regional fiber optic network or plan link	56
Plan to purchase digital equipment in 1995	57
Provide locally generated content on the Internet for local community or plan to provide service	49
Provide PBS online services to local community	65
Program extra cable channel	18
Manage programming on cable for public, educational, or government access channel	22

Source: CPB 1995 Annual Station Activity Survey (204 Respondents)

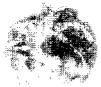
All of these innovations have been implemented without diminishing public television's core broadcasting services. Further, they have been developed with exceptional efficiency and productivity by a talent pool that is second to none.

To help you better understand public television's role in exploring new technologies and innovating new services, this chapter will explore:

## TELECOMMUNICATION TRENDS IN PUBLIC TELEVISION

This section reviews several telecommunication trends that are changing the ways that your station's services can be provided and accessed in the near future, including national and state satellite networks, hybrid satellite and fiber networks, digital compression, online computer services, *re-versioning of content and producing for multiple distribution outlets.*

### *National and State Satellite Networks*



Satellite distribution of programming is not new. PBS has been using satellite technology to distribute programming to local stations for more than 15 years. What is new is the proliferation of organizations—both public television and related educational distributors of programming—that are using satellites. At the national level, PBS has become a distributor of multiple channels of programming as well as a host for the distribution of services by many other organizations on the PBS satellite. Other national satellite networks include the Satellite Educational Resources Consortium (SERC), Ag\*Sat, National Technology University and Oklahoma State University. SERC is a consortium of public television organizations in more than 20 states. Ag\*Sat links more than 40 colleges and universities throughout the U.S. that have agriculture departments. Each of these groups has found satellite technology to be a cost-effective way to distribute programming and telecourses as well as to link groups for teleconferences.

It is not surprising that satellites would provide an economical way to distribute programming at a national level. Additionally, many state public television organizations have found satellites to be an efficient way to distribute programming within their states. Georgia,

Kentucky, Louisiana, Nebraska and South Carolina are among the state PTV networks that use satellites for the distribution of programming to their local broadcast transmitters as well as to provide some services directly to schools and other institutions that have satellite receiving equipment.

### Hybrid State Networks

Many state public TV organizations have examined how they could best distribute programming and other services. They analyzed many alternatives, including satellite, microwave, fiber optic cable, high-capacity telephone circuits and coaxial cable. Often, the choice has been to use a hybrid combination of distribution alternatives. Indiana, Kentucky, Maine, Nebraska, South Carolina and Wisconsin are among the states that have built or are planning hybrid networks.

There are a few reasons for this trend toward hybrid networks. First, a public TV organization may have an existing distribution system that serves them effectively in parts of the state, e.g., a microwave network that links several local broadcast transmitters. In this instance, they may decide to supplement the existing distribution system with one or more additional distribution alternatives to extend the reach of services, add capacity and lower costs. Second, some distribution alternatives may be available only in parts of the state or they may be cost-effective in one part of the state but not another. This is often the case with fiber optics.

Third, many state networks are being built in partnership with other state agencies. These agencies may have different needs such as telephone and data services. Further, they may bring existing distribution capacity to the partnership. Politics also can enter into the situation as different telecommunication organizations lobby for part or all of a large state network.

This trend suggests that there is no single best technology for new networks. It also indicates that public television is forming partnerships with other government and education agencies in creating new networks. In some cases, public television has taken the lead in forming the partnership and designing the network. In other cases, the motivation for creating a new state network has come from other government or education groups, and public television joined the partnership to take advantage of cost savings that would result from a shared network.

### Moving into the Digital Age

Public television is moving into the digital age in two important ways. First, PBS and many other public TV organizations are using digital compression to squeeze more signals into available satellite pipelines. This effectively increases capacity and reduces cost. The amount of compression varies with the type of service. For the regular programming schedule that is transmitted by satellite to local transmitters for broadcast into homes, stations may compress two to four channels into the space that used to carry only one signal in order to maintain very high picture quality. For instructional television programming and other content that does not require very high picture quality, they may compress six or more channels into the space that used to carry one signal.

Over the next few years, compression technology will improve and the cost of devices to decompress signals at receiving sites such as schools or homes will decrease. This will mean that more channels may be compressed into distribution pipelines and more people will be able to receive compressed signals directly.

A second important trend is the conversion of public television equipment and facilities from analog to digital. PBS has installed one of the largest, fully automated systems for distribution of multiple services anywhere in the world. A wide range of new video and data services can now be shared among the stations as a result of this system, but many more are sure to follow. The PBS system incorporates several different file server technologies which should help to pave the way for more cost-effective access to the large library of programming as well as supporting higher levels of automation at the stations. A CPB survey found that 57 percent of stations planned to purchase some digital equipment in 1995. For some stations this involves a modest commitment such as the purchase of digital graphics equipment and digital storage devices that can automatically insert program announcements. For others, such as KCTS in Seattle, it involves a major commitment to digital high definition television (HDTV) equipment. Whether at a moderate pace or a rapid pace, public television stations are becoming digital.

### Online Computer Services

One of the most active areas for public television has been the development of online computer services. Initially, the services were developed for schools, libraries and other education agencies that had the necessary computers and modems to access the services. Learning Link and PBS Online services have been targeted primarily for education users. In addition, some computer online services have been established on the Internet for public TV professionals to share information, e.g., information exchange services for public TV station managers, engineers, producers, etc. More recently, many individual stations as well as national organizations such as APTS, CPB, and PBS have developed Internet services that are available to everyone. Over time, public TV online services will evolve to provide more services for the general public, as more homes acquire computers and modems.

Computer online services are a natural extension of the outreach efforts that public television has provided for decades. In the past, outreach consisted of print materials distributed to schools, libraries and individuals to help them make better use of programming. Outreach also included work by individuals at stations who communicated with all of these groups. Today, computer online services are an additional tool for distributing information to public TV constituents as well as maintaining communication links with them.

It is also important to keep an eye on computer networks that are being developed for the future. Some of these will provide multimedia and video content. It is possible that online computer networks over the next several years will become an additional distribution outlet for public TV programming. In this sense, current work with online networks is building valuable experience within the public television community that may lead to the development of important future video services.

### Producing for Multiple Distribution Outlets

Public television began as an over-the-air broadcast service. Later, cable became an important additional distribution outlet. Today, more people receive public television through cable than over-the-air broadcast. People also receive public television programming through videocassettes, direct broadcast satellite and

microwave. For a long time, public television simply transmitted or copied the same programming in each new distribution medium. However, many of the emerging technologies have different capabilities and characteristics. In order to be effective with the new media, it is important to adapt programming and use the capabilities of the media. In creating original programs, this is called "multiversioning" or producing multiple versions of the program. For example, a broadcast version of an educational program may contain regular video with supplementary print materials, while a CD-ROM version of the program might integrate the print materials into the CD-ROM, including interactive quizzes. It is also possible to take programs that already have been produced for television broadcast and adapt them to the new media, e.g., by adding new elements for a videocassette or online content that will be used after a person views the program. This is called "reversioning" or reworking existing content so that it can be used effectively in a new medium.

#### The Emergence of Telecommunications Centers and Teleplexes

A number of public television stations and state networks, including public TV groups in Maryland, Nebraska, Ohio and other states, have changed their organizational names, replacing "television" with "telecommunications" or describing themselves as a teleplex, e.g., Nebraska Educational Telecommunications—The Nebraska Teleplex, Ohio University Telecommunications Center, and Maryland Public Television Teleplex. The use of these new terms is more than symbolic. It represents a genuine change in how public television organizations conduct business in the new technology environment.

The terms "telecommunications" and "teleplex" represent a broader scope of technologies that includes, but is not limited to, television. Public television organizations not only are creating content for many different telecommunications media, they are working more closely with cable, computer, telephone and other telecommunications companies.

Telecommunication centers and teleplexes work in many new ways. For example, they are breaking the mold of traditional one-way broadcast services by creating two-way interactive services. This requires not only new equipment but also new skills such as multi-

media design, computer programming and human factors testing of consumers to determine if the design of an interactive program is clear. The latter recognizes that while people watch television programs, they must navigate through and use interactive programs.

The use of the terms "telecommunications" and "teleplex" also send an important signal to the outside world that new telecommunications technologies are an appropriate part of public television's turf. We are not just broadcast television. We are multimedia producers of content that is distributed through a broad range of telecommunications technologies.

#### TELECOMMUNICATION ACTIVITIES BY PUBLIC TELEVISION

This section describes selected public TV activities in five areas—national satellite systems, state satellite networks, online services, multimedia services and multichannel services.

The case examples in this section provide a sample of the telecommunication activities by public television organizations. Many additional activities are underway—too many to be reported here—and many more are planned. APTS maintains information on these activities that is available to its members. APTS also reports on these activities in its quarterly newsletter, *Transition*, which appears in print and on the World Wide Web.

The activities vary in scope from building hybrid state networks with satellite, microwave and fiber components, to creating interactive multimedia programming, to offering new digitally compressed DBS services. They reflect the needs of end users in each specific context as well as technological costs and feasibility, and each public television organization's mission.

While there are many differences in the activities, a few common themes emerge from a review of these new services. First, no single technology dominates the new technology environment. There are many valuable technologies in the emerging environment and often it is a combination of technologies that serves best. Second, computer technology is becoming a growing component in public television offerings including online services for personal computers, interactive services that make use of computer programming



and digital compression that relies on complex computer algorithms to squeeze more content into a distribution pipeline. Third, public television organizations are becoming multichannel distributors of programming and services.

### National and State Satellite Networks

#### ▲ PBS NATIONAL SATELLITE

PBS owns seven transponders on Telstar 401 (1 C-Band and 6 Ku-Band). Some regional PTV organizations and state networks lease space on the PBS transponders; others lease or own additional transponders on Telstar 401. In 1995, the transponders used some traditional analog transmission and some digital compression (which effectively increases the capacity of the transponders). By mid-1997, PBS and other public TV organizations expect to convert to an advanced digital compression system (DigiCipher II/MPEG-2 compatible compression). This will significantly increase the effective capacity of the transponders. At that time, additional capacity should be available for lease by other public TV organizations.

#### ▲ KET STAR CHANNELS SATELLITE SYSTEM

Kentucky was an early innovator of state satellite networks. KET's Star Channels Satellite System was launched in 1989 to address a critical shortage of courses in math, science and foreign languages in Kentucky schools. The state provided major support for the satellite network and for receiving equipment at schools and libraries throughout the state. Every public school, vocational school, state park, community college and university in Kentucky has been equipped with a satellite dish.

KET Star Channel courses and seminars originate at the KET studios. From there, they are uplinked to the satellite and transmitted to sites throughout Kentucky and 19 other states that participate in Star Channel's live interactive courses. The Star Channel system utilizes a unique interactive keypad response technology developed by KET. It allows students to respond to questions posed by the instructor and to signal the instructor if they need help. They also can speak to the instructor over a telephone line. Responses are relayed by computer and telephone lines back to KET and tabulated in graphic form for the instructor within a few seconds. Students can also access remote databases

**WHAT'S ON THE PBS SATELLITE**

**PBS-Peacock Services**

- ▲ National Program Service
- ▲ Adult Learning Service
- ▲ The Business Channel
- ▲ Ready to Learn Service
- ▲ Program Lineup Information

**PBS-USAT SERVICES**

- ▲ E-mail & computer conferencing among public TV stations
- ▲ **NOTELINE**

**LOCAL, STATE & REGIONAL PUBLIC TV SERVICES\***

- ▲ Local station uplink/downlink feeds to other stations
- ▲ Regional public TV feeds
- ▲ SERC distance learning & staff development services
- ▲ Georgia public TV interconnection of state transmitters and direct-to-school distance learning feeds
- ▲ Louisiana public TV interconnection of state transmitters and direct-to-school distance learning feeds
- ▲ South Carolina public TV state services and multiple distance learning feeds

**OTHER SERVICE PROVIDERS**

- ▲ National Technology University postgraduate distance learning for engineers at universities and companies.

*Source: PBS*

\* Florida PTV licensees will begin services in 1996.

such as KET-Net.

Starting with advanced high school courses, the Star Channel System has expanded to include professional development seminars for educators, attorneys, extension agents and other professional groups. The satellite network also is changing to digital compression technology that will significantly increase capacity. The achievements of KET Star Channels have been recognized through the prestigious Innovations in State and Local Government Award by the Ford Foundation and Harvard University's John F. Kennedy School of Government.

#### ▲ NEB\*SAT

NEB\*SAT is a model hybrid network with major satellite components that are linked to local distribution via broadcast TV, fiber optics, cable TV and microwave. NEB\*SAT is supported by a broad consortium of education organizations throughout Nebraska. It serves Nebraska public television and radio, state agencies, colleges and K-12 schools. NEB\*SAT began in 1990 as a satellite service for local broadcast and microwave distribution of services and has since expanded to include fiber optic and coaxial cable TV distribution of services. The fiber optic service is being developed with Nebraska telephone companies to provide regional interactive networks of elementary, secondary and post-secondary schools. The cable service is being developed in cooperation with local cable TV operators that distribute a special cable TV channel to their subscribers.

NEB\*SAT provides five distinct services: Network 1, a broadcast-quality channel that interconnects Nebraska ETV's nine broadcast transmitters and nine Nebraska Public Radio transmitters; Network 2, a second broadcast-quality channel that provides statewide distribution of distance learning, continuing education and in-service training programming; Network 3, a compressed-video service that supports 16 simultaneous one-way or eight two-way interconnections throughout the state; Network 4, a regional fiber optic service developed in conjunction with telephone companies in Nebraska for two-way instruction between K-12 schools or colleges; and Network 5, EduCable, a compressed-video service to cable TV operators throughout the state, offering gavel-to-gavel coverage of the state legislature along with education and general interest programming.

NEB\*SAT is supported by a major satellite uplink and downlink facility with digital compression receivers/transmitters the Nebraska Teleport. NEB\*SAT programming is complemented by online computer services and an experienced multimedia production unit.

#### ▲ SOUTH CAROLINA ETV MULTI-CHANNEL DIGITAL SATELLITE NETWORK

South Carolina ETV's digital satellite network was launched in late 1993 onboard the PBS satellite and began digital transmission of services in early 1994. It links satellite transmission with an extensive ground network of broadcast transmitters, ITFS and cable TV

distribution. As fiber optic distribution expands in South Carolina, it will be added to the network. By interconnecting the satellite network with existing statewide microwave distribution, the network can accommodate origination from many sites throughout the state as well as multiple local networks that can operate simultaneously. In addition to serving South Carolina, the satellite services reach throughout the country to serve users in other states.

Using digital compression, the South Carolina ETV Satellite Network can provide up to 32 channels of services. It provides live interactive programming through two-way audio links between teachers and students or among sites participating in a teleconference. The video and audio services are complemented by South Carolina's online Learning Link service. The network is developing separate channels for business, law, medicine and higher education as well as multiple channels for K-12 services. It also offers two master's degree programs and an extensive range of in-service training seminars for state workers and professionals who require continuing education services.

South Carolina has undertaken a rapid program to install satellite dishes at virtually all K-12 schools as well as colleges, state offices, libraries and other end-user sites. South Carolina ETV has been very effective in managing costs, e.g., minimizing the cost of satellite receive dishes, and in demonstrating the cost-effective alternative provided by satellite service. For example, it has demonstrated that satellite teleconferences can save the state millions of dollars compared with alternative ways of providing services. In addition, it markets the network by showing costs per student or costs per trainee, e.g., it was able to provide a training seminar for law enforcement personnel at a cost of 39 cents per person.

The PBS Satellite, KET's Star Channels, NEB\*SAT and South Carolina ETV's Digital Satellite Network share a few important characteristics:

- ▲ They are hybrid networks that add a new technology—satellite—to existing broadcast, cable and microwave distribution.
- ▲ They all use or plan to use digital compression in order to significantly



increase capacity and reduce the cost of transmission per channel.

- ▲ They provide multiple services to multiple user groups and have significant interactive capabilities.
- ▲ They represent cost efficiencies, ways to save money versus alternative ways of delivering services.
- ▲ They address real needs in education, like shortages of courses in such critical areas as math, science and foreign languages.

In addition, each of the state networks represents broad partnerships between public television and state agencies, colleges, school systems and other groups.

## ONLINE SERVICES

### ▲ PUBLIC TELEVISION ON THE INTERNET

There has been an explosion of activity by public television groups on the Internet. At the national level, PBS has become a major Internet service provider (described below). APTS and CPB also have established sites on the World Wide Web. APTS provides updates on congressional activities in Washington, action alerts about impending legislation, summaries of political and grassroots activities, fact sheets and position papers, press releases and speeches, background information about the organization, and information about available publications. It also provides links to other public broadcasting resources on the Internet. In addition, CPB has funded a Community-Wide Education and Information initiative (CWEIS) (discussed below), and K-12 Internet Testbed Projects that pair public television and radio stations with schools, colleges and museums for projects that range from exploring local science and environmental issues to disseminating arts education.

Among state and local stations, some of the early innovators on the Internet have included:

- ▲ KUHT, Houston, one of the earliest Web service providers, has set up a series of forums for public television personnel to share information and enhance professional development.

- ▲ KUSM, Bozeman, another early innovator on the Web, provides an up-to-the-minute program guide, viewer feedback and detailed PBS program descriptions.
- ▲ KAET, Phoenix, lets viewers communicate with program producers via the Internet.
- ▲ Iowa PTV provides a broad range of state information as well as a newsletter covering K-12 programming on Iowa PTV.
- ▲ WGBH, Boston, is exploring new techniques to deliver interactive video and audio on the Web.
- ▲ PBS ONLINE

PBS Online is an evolving nationwide electronic and communication network established by PBS. The strategy of PBS Online is to combine national and local content such as education resources, program schedules, discussion forums, special events and merchandising of products, e.g., ordering videotapes. The Internet is the primary, but not exclusive, distribution outlet. Many services are provided at a local level by individual PTV stations.

In order to support these new services and build a premier site on the World Wide Web, PBS has created an Internet Publishing Group and formed a large advisory panel that represents a broad range of public broadcasting groups. It has established a central site on the WWW with a magazine format that includes program features, discussion groups, searchable press releases and activities linked to PBS programming. The site also acts as a central hub that links users to all PTV sites on the Web through an easy-to-use graphical interface. PBS Online has set a goal of bringing all stations onto the Web and is assisting them in this process.

PBS Online will serve as a central online resource with support materials and interactive content for the Ready to Learn Service, Adult Learning Service, primetime programming and other PBS services. In addition, PBS Online is working with many local services such as Learning Link sites, described below.

One of the most successful early online applications by PBS has been its online component of MATHLINE. MATHLINE is an

## SELECTED PUBLIC TV ADDRESSES ON THE WORLD WIDE WEB

APTS	<a href="http://www.universe.digex.net/~apts/">http://www.universe.digex.net/~apts/</a>
CPB	<a href="http://www.cpb.org">http://www.cpb.org</a>
PBS	<a href="http://www.pbs.org">http://www.pbs.org</a>
KAET, Tempe	<a href="http://www-kaet.pp.asu.edu">http://www-kaet.pp.asu.edu</a>
KQED, San Francisco	<a href="http://www.kqed.org">http://www.kqed.org</a>
KRMA, Denver	<a href="http://www.intel-edge.com/krma/home.html">http://www.intel-edge.com/krma/home.html</a>
KUAC, Fairbanks	<a href="http://zorba.uafadm.alaska.edu/KUAC/index.html">http://zorba.uafadm.alaska.edu/KUAC/index.html</a>
KUHT, Houston	<a href="http://www.kuht.uh.edu/kuht.html">http://www.kuht.uh.edu/kuht.html</a>
WBGU, Bowling Green	<a href="http://www-wbgu.bgsu.edu">http://www-wbgu.bgsu.edu</a>
WCET, Cincinnati	<a href="http://www.iglou.com/wcet">http://www.iglou.com/wcet</a>
WETA, Washington	<a href="http://www.weta.org">http://www.weta.org</a>
WFSU, Tallahassee	<a href="http://www.fsu.edu:80/~wfsu/tv/">http://www.fsu.edu:80/~wfsu/tv/</a>
WGBH, Boston	<a href="http://www.wgbh.org">http://www.wgbh.org</a>
WHA, Madison	<a href="http://www.vilas.uwex.edu">http://www.vilas.uwex.edu</a>
WHRO, Norfolk	<a href="http://www.whro-pbs.org">http://www.whro-pbs.org</a>
WHYY, Philadelphia	<a href="http://libertynet.org/community/why/why.html">http://libertynet.org/community/why/why.html</a>
WKAR, East Lansing	<a href="http://www.wkar.msu.edu/tv/index.htm">http://www.wkar.msu.edu/tv/index.htm</a>
WOUB, Athens	<a href="http://www.tcom.ohiou.edu/tv.html">http://www.tcom.ohiou.edu/tv.html</a>
WSBE, Providence	<a href="http://www.wsbe.org">http://www.wsbe.org</a>
Arkansas ETV Net	<a href="http://www.aetn.orh">http://www.aetn.orh</a>
Idaho Public TV	<a href="http://suux.isu.edu/~Kisu">http://suux.isu.edu/~Kisu</a>
NYLINK	<a href="http://www.nylink.org">http://www.nylink.org</a>
South Carolina ETV	<a href="http://www.scetv.state.sc/scetv">http://www.scetv.state.sc/scetv</a>
UNC Public TV	<a href="http://www.unctv.org">http://www.unctv.org</a>

education service that uses the power of telecommunications to provide quality resources and services for teachers and others who seek to improve mathematics education. During 1994-95, MATHLINE offered a year-long professional development project for teachers of grades 5-8. The service included access to 25 videotapes for teachers, two national interactive videoconferences and an online service offered through 20 local public television stations or state networks. The online component of MATHLINE created virtual teaching and learning communities of 20 to 30 teacher-participants facilitated by an experienced classroom teacher. Stations reported high usage and positive responses by teachers. Teachers noted that many in-service training programs take place over a day, a week or a few weeks and then contact with fellow teachers and expert facilitators ends. With MATHLINE's online service, the contact with these resources continued throughout the year. In 1995-96, MATHLINE will expand its service offerings and grow to more than 50 participating public TV stations.

In addition, PBS has formed a major alliance with MCI to create content for the Internet and other interactive media. This multimillion dollar project offers an opportunity to set the standard for quality content on the Web.

It also represents an important alliance between public television and a large telecommunication organization. Such alliances may become more common in the future.

#### ▲ LEARNING LINK

Learning Link is a consortium of more than 20 public TV stations throughout the country. It was created in 1985 by WNET, New York, developed in coordination with Central Education Network and later affiliated with PBS Online. While Learning Link is national in scope, each station creates its own local service and functions independently. Many Learning Link stations, e.g., WHRO, Norfolk, have developed significant World Wide Web sites in addition to their local access services. This expands their reach and allows them to provide even more services to Learning Link users through links on the Web to other content that may be on computers anywhere in the world.

Learning Link provides curricular materials for teachers associated with public television broadcasts, as well as many forums for teachers, librarians and other educators. It also provides a gateway for users into national databases such as Curriculum Connection and communication services such as e-mail to other Learning Link users and anyone on the Inter-



net. Other popular features include instructional television updates, information about grants, and the Learning Link Library. A national survey conducted by the Center for Technology in Education at Bank Street College of Education found that Learning Link has grown to become the number one telecommunications network for professional activities by teachers as well as a major network for student learning activities.

A key component of Learning Link is the way each station customizes services for local users and provides original local content. For example:

- ▲ KMOS, Sedalia, Missouri, facilitates open interaction among educators across the state of Missouri and across the nation. It also allows students to interact with students in other classrooms locally, nationally and internationally. Among the teaching tools it provides is Creative Writing Online, a middle school language arts project for the classroom.
- ▲ Idaho PTV provides extensive news groups, lesson plans, fax listings, teacher training schedules and CNN Newsroom, a daily classroom guide for CNN News. It has built a following of more than 8,000 user accounts, including teachers and members of the general public.
- ▲ North Carolina Public TV offers a wide variety of forums, discussion groups and other tools tailored to support the specific educational needs of North Carolinians. Usage has been enhanced by toll-free access for educators supported by a special state appropriation.
- ▲ Wisconsin Learning Link offers its online service free to K-12 educators. In addition to national Learning Link services, it offers local content and databases as well as several forums for special interest groups, e.g., the Wisconsin Science Teachers Forum, Wisconsin Math Council Forum and a forum for library media specialists.

#### ▲ COMMUNITY-WIDE EDUCATION AND INFORMATION SERVICES (CWEIS)

The CWEIS initiative on the Internet is organized and funded by CPB and the US West Foundation. The CWEIS projects are designed to extend public TV's values and educational mission by providing quality Internet sites tailored to the community in the form of interactive "town squares." Online CWEIS Internet pages allow people to use their PCs to reach into a wide variety of educational and community-related services provided by local institutions and organizations with public TV serving as the nucleus. Some of the features provided include access to public notices, college courses, library resource material and communication with local politicians. In addition, each network is developing an interactive math homework service that ties in with the local school's mathematics curriculum for grades 1-12.

Twelve groups around the country operate in a CWEIS partnership. The groups typically involve a cooperative effort between a public TV station and local universities, hospitals, libraries, museums and other key community organizations. Each partnership is organized locally. The groups decide how their resources, content and specific expertise should be pooled to best serve the community.

The CWEIS partners view their new Internet strategy as a way to strengthen their commitment to the local community. The Internet has experienced enormous growth over the past few years with many new services for large audiences. CWEIS, alternatively, allows stations to create content with a local flavor. Online access also provides public TV licensees with the opportunity to take a greater leadership role in education by working with the local community. With funding for new projects becoming tighter, station managers say that CWEIS partnerships provide a way for each participating group to share their resources and create a stronger whole. The large number and broad scope of groups working in partnership with public TV organizations is noteworthy (see charts next page).

In creating the structure necessary to establish a successful Internet site, station management has found that dealing with technical logistics is not always the most difficult chore. Organizing people and ideas from several inde-

pendent partners into a new group is often mentioned as a principal challenge. In some cases, however, the partnership represents a natural growth from an existing community alliance. MN Online/CitiTalk in Minnesota and FAIR-NET in Alaska are examples of CWEIS partnerships that were strengthened by the fact that the management from each group already had a solid working relationship.

MULTIMEDIA

Multimedia services combine video, audio, text and/or graphics in new ways. They include personal computer software with audio, CD-ROMs, interactive videodiscs and interactive television, among other multimedia. Public television organizations are leading players in the design and development of these new services.

▲ PBS VIDEO

PBS Video is active in a range of multimedia projects. It is working with KTEH, San Jose to develop a set of three CD-ROMs to accompany the public television series *Real Science*. It also is working with Turner Home Entertainment to develop a CD-ROM based upon the public television series *Magic*. In addition, PBS Video has developed a product line of enhanced interactive videodiscs, including educator enhanced versions of *The Civil War* and

PUBLIC TELEVISION AND ITS PARTNERSHIPS	
Type of Organization Working With PTU on CWEIS	Number
K-12 Schools	11
Colleges & Universities	27
Public Libraries	13
Non-Profit Education Organizations	67
State Educational Organizations	15
Telephone & Cable Companies	6
Private Sector Businesses	16
Public Radio & other PBC Groups	17
Medical Centers	5
Museums & Arts Groups	10
State & Local Government	17
Church & Religious Organizations	7
Online Services	4
Newspapers	4

Source: CPB

*Eyes on the Prize*. The enhanced disc package combines laserdisc and bar code technology that allows educators to quickly access video segments, lesson plans and an extensive archive of supporting materials.

PBS also has been very active in trials of interactive television and video-on-demand (VOD). These have included: Viewer's Choice TV, a video-on-demand trial in Denver sponsored by TCI; Southern New England Telephone's (SNET) video dialtone trial in Connecticut with VOD and enhanced pay-per-view of public TV and other programming; and Your Choice TV, a one-year test of enhanced pay-per-view which featured a "PBS KidsBlock" with preschool series and a *Nature/NOVA* channel.

▲ WGBH INTERACTIVE PROJECTS GROUP

WGBH, Boston established a Special Telecommunications Services group in 1980. The group has a long series of accomplishment in multimedia ranging from computer software and games to videodiscs and CD-ROMS. It has produced four interactive videodiscs based upon NOVA, a CD-ROM *This Old House-Kitchens* based upon the popular series about renovating old houses; two history CD-ROMs produced in association with Prentice Hall; and a multimedia dictionary for children produced in association with MacMillan. In addition, WGBH has received a grant from CPB for a math and science project that includes a CD-ROM called *The Big Dig*. It deals with math, science, arch

CURRENT PTU CWEIS PARTNERSHIPS

Service Name & PBS Organization	Location
COMMUNITY LINE, WHAO	Norfolk, Va.
CONNECT, KRMA	Boulder, Colo.
FAIRNET, KUAC	Fairbanks, Alaska
METROBOSTON CWEIS, WGBH	Boston, Mass.
METRO DETROIT COMNET, WTUS	Detroit, Mich.
MIDNET, SCETV	Columbia, S.C.
MN ONLINE/CITITALK, TWIN CITIES PTU	Minneapolis, Minn.
NEBRASKA CWEIS, NETC	Lincoln, Neb.
PUGET SOUNDINGS, KCTS	Seattle, Wash.
S.F. CITYLINK BRIDGE, KQED	San Francisco, Calif.
WNIN ONLINE, WNIN	Evansville, Ind.



ology and history in the context of an underground highway project in Boston.

#### ▲ NEBRASKA INTERACTIVE MEDIA

Nebraska Educational Telecommunications can proudly claim to be among the oldest multimedia design groups in the U.S. Founded in 1978 as the Nebraska Videodisc Design/Production Group, it developed an international reputation for interactive research and training. The group has produced more than 200 interactive videodiscs and trained over 1,000 multimedia designers.

The group recently was reorganized as a new interactive media unit with greatly expanded facilities, including a complete CD-ROM production capability, digital conversion in real time and non-linear editing—the ability to produce for any digital environment. It has produced a series of CD-ROMs for public kiosks and is developing other CD-ROMs for a textbook publisher. In addition, it has produced a multimedia satellite course on pre-college math.

#### ▲ WNET KRAVIS MULTIMEDIA EDUCATION CENTER

The Kravis Multimedia Education Center at WNET, New York includes a multimedia design group, a rapid prototyping and testing facility, and a library/laboratory for experimenting with new multimedia technologies. Started with a five-year, \$5 million grant, the center rapidly set up shop and developed a half dozen prototypes in its first 18 months. One of its first releases was a CD-ROM, *Stephen J. Gould: On Evolution*, co-produced with Voyager Publishing. The Center also is developing applications for interactive television.

#### ▲ QED INTERACTIVE

WQED, Pittsburgh has developed a small-scale but direct course into multimedia publishing. It formed a group from station staff and developed a relationship with IVI Publishing. The first product of this relationship is a CD-ROM based upon the *Space Age* series. It is planning a second CD-ROM based upon the series. WQED also has developed a working relationship with Carnegie Mellon University in order to draw upon its expertise in computer science and technology.

#### ▲ KUED MEDIA SOLUTIONS

KUED's Media Solutions Department was created to serve the University of Utah's media needs as well as to create multimedia products for broader audiences. It has produced a videodisc encyclopedia of medical images—*A Slice of Life*—and is working on a CD-ROM about Utah and the intermountain West for general education audiences. It also is producing a CD-ROM for medical students on recognizing abnormalities in the brain, and is planning to create a CD-ROM-based information kiosk for the University of Utah campus.

#### ▲ WISCONSIN COMMUNITY INFORMATION PARTNERSHIP (WiCIP)

The Wisconsin Educational Communications Board (ECB) and its University of Wisconsin partners have taken a unique approach to the concept of multimedia. While most multimedia efforts involve new combinations of media such as video and text in a single product or service such as a CD-ROM, the Wisconsin Community Information Partnership (WiCIP) is developing a prototype information service that uses several different media in parallel to meet the information needs of individuals and organizations. It is developing local community information networks with many different information providers and many different users. The multiple media component involves six levels of access. Based upon need, availability of technology and/or ability to pay, users can access needed information at any one of six different levels: audiotext, fax back, community bulletin boards with public access sites, a frenet (i.e., a local online bulletin board with no charges), the Internet, or audio and video teleconferencing.

### TELECOMMUNICATIONS CENTERS

For some time, APTS and other public broadcasting organizations have encouraged public television licensees to think of themselves not as "broadcasters" but as "local telecommunications centers." The concept is rooted as much in new attitudes and definition of mission as it is in the use of telecommunication technologies. This becomes clear in reviewing how a number of stations have implemented telecommunications centers.

▲ OHIO UNIVERSITY  
TELECOMMUNICATIONS CENTER

Ohio University's WOUB/WOUC-TV was one of the earliest groups to recognize the importance of seeing themselves as more than a broadcast station. In the early 1970s, WOUB recast itself as a telecommunications center, changed its name and refocused its mission. Its new name helped to reinforce its broad contributions to its parent university as well as to the general community. The broader focus was reinforced in its management structure, advisory groups and board members.

The Ohio University Telecommunications Center has a strong record of developing telecommunications projects to supplement or complement its broadcast activities. It has played a key role in developing two-way fiber optic instruction between schools and supplementing this with links to international computer networks. The center also has developed *The Writing Project*, a multimedia project to improve the writing skills of seventh and eighth graders. Another project, *Take Me to Your Leaders*, was a live interactive TV series that linked students at more than 60 area schools to government officials. It also has produced a radio series, *Family Health*, which is distributed to 400 commercial licensees via compact disc, uplinked to National Public Radio and fed worldwide over the Armed Forces short wave radio network.

▲ KVIE, SACRAMENTO

KVIE's transition into a local telecommunications center has included new partnerships with cable, a change in strategic direction and experiments with interactive television. In the early 1980s, KVIE management read all the reports about the potential threat of cable and decided to join the fray rather than sit and wait for something to happen. It developed a second program service for cable through an arrangement with the city cable commission and Sacramento Cable. KVIE also made a change in its strategic direction to support new ventures. This included an emphasis on localness in new technology services and a priority on generating revenue from new services in order to make them self-sustaining. This led to a decision to join PBS Datacast, a service that leases the vertical blanking interval (VBI) on PBS satellite feeds and local broadcast signals to commercial

groups for a fee. KVIE also has participated in experiments with interactive television to better understand the potential of the technology.

▲ WSIU-SOUTHERN ILLINOIS  
UNIVERSITY AT CARBONDALE (SIUC)  
BROADCASTING SERVICE

For WSIU, Carbondale, the path to becoming a local telecommunications center has involved close links to its parent university and the local community. WSIU-SIUC Broadcasting Service has become a telecommunications hub for new services and an advisor on the development of new services. First, WSIU helped position Southern Illinois University to take advantage of emerging technologies. It formed a partnership with the library, computer and telecommunication groups on campus to help the university develop technologically based instruction. It also became a hub for a campus-based cable system. By routing the system through WSIU's downlinks and control room, it put in place a large pipeline for future instructional purposes. The SIUC Broadcasting Service also provides video teleconferencing services for the university and local community groups. Other telecommunication activities include involvement with two local educational consortia that use T-1 (high-capacity telephone) lines and participation in the PBS pilot MATHLINE service.

TELECOMMUNICATIONS TO SUPPORT  
MERGERS AND JOINT VENTURES

In an era of mergers and joint ventures between public television organizations, telecommunications can play a vital role in forging or maintaining relationships between groups that are physically separated. For example, when Maine Public TV stations MPBN and WCBB decided to merge, the new organization had two headquarters 100 miles apart. The problem of coordinating departments that were physically separated and maintaining a cohesive organization was helped by a high-capacity T-1 telephone circuit. With this circuit, they created a Wide Area Network (WAN) linking the two operations with seamless data, telephone and video teleconferencing. In effect, they have the same communication links as if the two groups



were on different floors of the same building.

Similarly, when WTVS, Detroit and KCTS, Seattle decided to form a joint venture they found that members of the joint venture team were over 1,000 miles apart. To coordinate the work between team members who were physically separated, they initiated regular teleconferences and established e-mail/fax links. They found, however, that it was necessary to have some meetings in person. This helped cement the relationship and made the telecommunication links more effective.

▲ TELECOMMUNICATIONS INFORMATION INFRASTRUCTURE ASSISTANCE PROGRAM (TIAP)

The National Telecommunications and Information Administration (NTIA) at the U.S. Department of Commerce has awarded a series of federal grants to public television organizations to help put citizens on the information superhighway. Winning TIAP proposals by 12 public TV organizations put an emphasis on the information needs of citizens and low-cost solutions to meeting those needs. This is a bottom-up approach based upon real needs and cost-effective technology solutions rather than a top-down approach that pushes expensive technology into an uncertain market.

▲ KBDI, DENVER

KBDI's new media center is located in an ethnically diverse community that experiences common urban problems, including poverty, unemployment and crime. Its TIAP grant is directed towards the creation of a model access system for people who are likely to be left out of the information future. Instead of creating the model and then testing it, however, KBDI will start with the community and investigate its information needs and wants through an intensive program of research. Based upon this research, they will develop and test a model, affordable information delivery system.

▲ NATIVE AMERICAN PUBLIC BROADCASTING CONSORTIUM (NAPBC)

The NAPBC project begins with an understanding of a significant problem on many Native reservations and rural communities: access to telecommunications is limited or nonexistent. When access is available, it may be difficult to use. NAPBC's national project will assess ten tribal groups to understand how they

PUBLIC TV PARTICIPANTS IN TIAP

KUAC, Fairbanks, Alaska  
 Arkansas Educational Television Commission  
 CPB/WGBH National Center for Accessible Media  
 KBDI, Denver, Colorado  
 Maine Public Broadcasting Corporation  
 KCTA/KTCI, St. Paul/Minneapolis, Minnesota  
 Native American Public Broadcasting Consortium, Lincoln, Nebraska  
 Nebraska Educational Telecommunications Commission  
 WTUI, Charlotte, North Carolina  
 Rhode Island Network  
 South Carolina Educational Television Commission  
 WMUS, Milwaukee, Wisconsin

Source: NTIA

currently are using technology and accessing information, then it will recommend how to develop technologies to fit community needs. The coalition of Native American organizations later will propose a pilot project to demonstrate how the tribes can interlink. The project will create a plan to provide social services, preserve language and culture, and increase citizen access to government. It also will work closely with tribal colleges to help apply computer technology and use the Internet.

▲ ARKANSAS EDUCATIONAL TELEVISION COMMISSION (AETN)

The Arkansas Educational Television Network (AETN) and its partners will expand an existing computer network that connects all K-12 public schools to each other and to online services such as the Internet. A key element in the project is to set up a wide area network (WAN) at a demonstration site that links a county seat with a small neighboring community. AETN's model integrated computing system contains a school information center, a teleconference center and public access computers in several locations. The WAN will act as a host and file server to the 12 computers and printers located throughout the two communities.

▲ RHODE ISLAND NETWORK (RINET)

The Rhode Island Network (RINET) is a partnership involving WSBE, Providence. It was created to allow teachers and students throughout the state to access the Internet. Its TIAP project will expand the service to municipalities, nonprofits and state agencies, and schools in districts with high minority and/or

low-income populations as well as to the general population. The project will encourage community groups and agencies to disseminate information in electronic formats and to become access points for the public to reach network-based services. It also will make available a freenet so that parents and the schools where their children attend can communicate with each other.

### MULTICHANNEL CABLE AND BROADCAST SERVICES

A recent CPB survey of station activities found that 18 percent of stations program a second cable channel in addition to their regular channel carried on local cable systems. An earlier PBS survey found that 11 percent of stations program and transmit a second broadcast channel in addition to their primary over-the-air signal. Some of these second broadcast or cable channels carry a heavy schedule of instructional programs, some emphasize children's programs, and some use the channel to carry extra coverage of government activities such as the state legislature. These additional distribution venues for public television did not happen by chance. In most cases, they were initiated by the local public television organization and required extensive negotiations with the municipal franchise authority, local cable operator and other partners.

#### ▲ KCSM SAMNET

KCSM, San Mateo, California, has a partnership with nine cities in San Mateo County and TCI to provide a new community cable network that will grow into a four-channel service. The partnership began with a general dissatisfaction with the quality of cable access channels and the poor production quality for coverage of government meetings. This led the cities and TCI to hire KCSM to operate the new network of public access, education and government channels. Network operations and new equipment/facilities are funded from public access fees paid by the local cable operator.

#### ▲ NEBRASKA ETV-EDUCABLE

Nebraska ETV has a dedicated second cable channel in two markets, Lincoln and Omaha. It programs the channel, EduCable, with educational programming, gavel-to-gavel

coverage of the state legislature and some special services such as Radio Talking Books that uses the Second Audio Program (SAP) signal on the channel. Using NEB\*SAT, its dedicated satellite service, it transmits EduCable in digitally compressed form to cable operators throughout the state.

#### ▲ OETA-THE LITERACY CHANNEL

OETA, The Oklahoma Network, acquired a second broadcast channel in one of its major markets—Oklahoma City. It named the second channel "The Literacy Channel" and uses it to provide a heavy schedule of educational programming as well as to cross-promote its main broadcast service. The Literacy Channel is carried on the cable system in Oklahoma City and on select cable systems outside Oklahoma City. OETA is investigating options to make The Literacy Channel available statewide to local cable operators.

#### ▲ WTVS, DETROIT-COLLEGE CABLE CHANNEL

WTVS has operated The College Cable Channel for 12 years. It offers 24 hours of telecourses daily. Fourteen colleges and universities participate in the Southeastern Michigan Television Education Consortium that makes the educational service available. Since students receive courses through the cable channel, participating colleges and universities help to fund the channel's operations. Eleven cable systems carry the channel. WTVS says the cable operation is a break-even proposition financially, but a very valuable contribution to the community.

#### ▲ KVIE, SACRAMENTO-CHANNEL 7

KVIE's second cable channel provides instructional television, time shifting of popular PBS programs and gives additional TV time to public service announcements of local organizations. The channel has had an important side benefit—a very positive working relationship with Sacramento Cable. Sacramento Cable provides KVIE with promotional spots 100 to 300 times per week on other cable channels. It has also referred outside contract work to KVIE and uses KVIE to produce a regular half-hour program for Sacramento Cable.

#### ▲ WXXI, ROCHESTER-CABLE CITY 12

WXXI, Rochester operates Rochester's government access cable channel. The partner-



ship developed a few years ago when station management convinced local government that City 12 was underutilized. After a year of negotiations, they developed a contract and partnership. Under the arrangement, the city pays WXXI an annual fee that covers operating costs. The money comes from the local franchise fee the cable company pays the city. In addition, the local cable company provided money to buy automated transmission equipment.

## ADVANCED TELEVISION

Advanced television includes high definition TV (HDTV) and other services made possible by the adoption of a digital television standard, e.g., the transmission of several digital channels of current NTSC quality video and/or other data services such as airline schedules or the yellow pages in the same spectrum space that is now required to transmit one regular NTSC channel.

High definition television has been under development in the U.S. since 1987 when PBS helped to arrange a demonstration in Washington, DC to prove to Congress and the FCC that additional broadcast channels should not be transferred to the cellular telephone industry. The result was the appointment of an Advisory Committee on Advanced Television by the FCC. The president of PBS was appointed to this committee along with other selected leaders from the major TV broadcast, cable, satellite, computer, telephone and consumer products industries.

Public television has been very active in the development of HDTV both in terms of testing alternative standards and in the production of prototype programming. The first long-distance HDTV transmission took place in 1992 at public television station WMVT in Milwaukee. Additional broadcast demonstrations have been carried out by WETA, Washington, DC and at WMVT, Goldvein, VA. PBS performed the official over-the-air broadcast tests using facilities arranged by WTVI, Charlotte, NC. PBS, in conjunction with WMVT, Milwaukee and WKNO, Memphis, has analyzed both station and transmission system costs along with engineering issues associated with converting stations to HDTV.

A number of public TV stations have produced HDTV programs, including KCTS,

Seattle; WTTW, Chicago; WETA, Washington, DC; WGBH, Boston; and Thirteen/WNET, New York. KCTS has taken a leadership role in HDTV productions. It was the first station in the U.S. to purchase HDTV production gear and has developed considerable expertise in HDTV production.

Much remains uncertain about the timetable for implementing HDTV at stations and the adoption rate for HDTV sets by consumers. Similarly, there is uncertainty surrounding which of the advanced television options stations will be allowed to develop. Public television has the experience and expertise to implement HDTV at stations and create excellent HDTV programming. However, the costs associated with conversion to HDTV and other forms of digital production and broadcasting by stations will be considerable. Nonetheless, the transition to digital systems associated with ATV offer promises for better quality for all viewers, better coverage within the broadcast service area, the capacity to add new services, more video distribution channels, better operating efficiencies and even the possible opportunity to generate revenue by leasing extra digital channels to commercial groups.

## ISSUES FOR PUBLIC TELEVISION

Changes in the telecommunications and regulatory environments, along with activities by commercial groups and public TV groups, raise a number of important issues that public television must address.

### Public Television and the Information Superhighway

The "information superhighway" is an often-used phrase to describe an important change in our society. We are moving from an agricultural and manufacturing economy that dominated most of the 20th century to a service economy in which information is a vital commodity that moves along large electronic highways, much as trucks move manufactured goods over concrete highways. Companies—from banks to fast food chains to local hardware stores—have recognized that information is a vital part of their business. Information is the core of public television's business as well. We provide services to citizens, schools and other groups

through our programming and related information or communication activities. Broadcasting transmitters and other hardware are current means of creating and distributing information services. As the technologies for creating and distributing our services change, we must change with them. And, public television is changing, as the previous section of this Guide demonstrates. However, it is a continuous process of monitoring changes in technology, the competitive environment and government initiatives, and then planning new strategies, creating new partnerships and implementing new services or new ways to distribute existing services.

One of the important government initiatives in the past few years has been the National Information Infrastructure initiative (NII). The NII is a strategic attempt to interconnect many computer networks and other means of distributing services electronically. It seeks to provide a diverse range of telecommunications services to the public. One component of the NII initiative is the Telecommunications and Information Infrastructure Assistance Program (TIAAP) described earlier in the Guide. Public television is an active player in the TIAAP grants program.

Public broadcasting is represented on the Advisory Council to the NII by Delano Lewis, president of National Public Radio. He is also co-chair of the Advisory Council. The NII initiative has raised a series of critical issues relevant to the information superhighway. For example, who will have access to the new telecommunications environment as providers

and receivers of services? APTS has waged a long and hard campaign to guarantee access for public television as a provider of services as well as access by all citizens to receive them. Second, will the new environment be exclusively commercial or will space in the new delivery environment be reserved for noncommercial service providers much as spectrum space was set aside by the FCC more than four decades ago for noncommercial educational broadcasters? Third, will noncommercial groups receive favorable rates in the new environment? These issues are sometimes linked under the phrase "public right-of-way on the information superhighway." Unless public television participates actively and vigorously in this debate, there may not be a public right-of-way on the information superhighway.

It is important for public television organizations at all levels—national, regional, state and local—to become active players in the new telecommunications environment. We need to make our case that public TV already operates several lanes on the information superhighway through satellite, broadcast, cable, ITFS, online and multimedia distribution of services. Further, public television has existing relationships with schools, colleges, state agencies and the general public—relationships that can grow in the new technology environment. In order to make our case and claim telecommunications as part of public TV's turf, stations need to assign personnel to develop new media services, educate users of the services, talk to legislators, and form partnerships with both commercial and nonprofit organizations. Nothing is guaranteed and many other groups are competing to become the PTS (Public Telecommunications Service) of the 21st century.

#### THINKING ABOUT AND PLANNING FOR THE FUTURE

Maynard Orme of Oregon Public Television likes to say, "If you're not confused, you're not thinking." It is a particularly appropriate comment about the future of new media technologies. So much is happening so quickly that it is easy to become confused. One purpose of this Guide has been to reduce some of the

US THROUGH 1990: 1900-2000			
Job Categories for All Workers (Percentage in Each Category)			
	Agricultural	Industrial	Services
1900	42	28	30
1970	5	31	64
1980	4	27	69
1990	3	23	74
2000*	2	21	77

Source: U.S. Department of Commerce  
\* projected



uncertainty and confusion surrounding new technologies. However, tomorrow's newspaper will bring a story about another new technology that will "revolutionize" the media industry—just when you thought you had everything clear in your mind.

Here then are a few tips for tomorrow: things to keep in mind as you think about and plan for the future:

- ▲ **DISTINGUISH WHAT IS REAL AND WHAT IS NOT.** The computer industry uses the term "vaporware" to describe software products that have been announced but do not really exist or are not ready to be used. There is a great deal of new media vaporware. To distinguish what is real, reliable and available for you to use, talk to your station engineers, read trade magazines that provide objective reviews, contact other stations that have tried a new technology (APTS maintains information about station activities with new technologies). Also, seek guidance at industry conferences from PBS engineers and others who have expertise in the area you want to understand.
- ▲ **THINK OUT OF THE BOX.** Innovative new ideas generally emerge in a creative environment where people are free to think in new ways, unencumbered by traditional rules and roles. There are many ways to encourage "thinking out of the box" that normally surrounds us in day-to-day work. For example, a portion of a meeting can be set aside for everyone to brainstorm with explicit instructions to put aside all the practical obstacles and traditional ways of thinking. Sometimes, groups go off-site to another location in order to break away from the assumptions and rules that are associated with their regular place of work. After thinking out of the box and proposing new alternatives, it is then important to...
- ▲ **THINK LIKE A BUSINESS PERSON.** In order for creative new applications of technology to become reality, they must pass a rigorous process of business analysis, planning and marketing. What will it cost to develop a new service? Is there a need for the service and do people recognize the need? Who are the intended users of the service and who will pay for it? How long will it require to create the service and to build a sufficient audience or user group to justify it? What is the best way to market the service, who will do the marketing and what will it cost?
- ▲ **COMPETE.** Public television has many competitors in the new technology environment. Some nonprofit groups such as colleges and state agencies want to create many of the same services we now provide and seek to provide. Some commercial organizations believe that they can provide similar services on a for-profit basis. We need to compete with all of these groups, demonstrating our expertise in content design, engineering and knowledge of user needs—a combination that few nonprofit groups can match. We also need to demonstrate the high quality and educational/social effectiveness of our services—a combination that few commercially driven products can match.
- ▲ **FORM PARTNERSHIPS.** In an earlier and simpler time, public television's services, technologies and end users were clearly distinguished from other nonprofit groups and commercial organizations. The convergence of technologies has brought increased competition in some areas and a greater need for partnerships in others. It makes little sense for public television, state agencies and schools to build separate pipelines to move video, audio and data throughout a state. A partnership in a joint state network reduces costs for all and increases the likelihood that a state legislature will fund it. Similarly, public television partnerships with commercial organizations are becoming increasingly common as each group brings its skills and resources to a new service.