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THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

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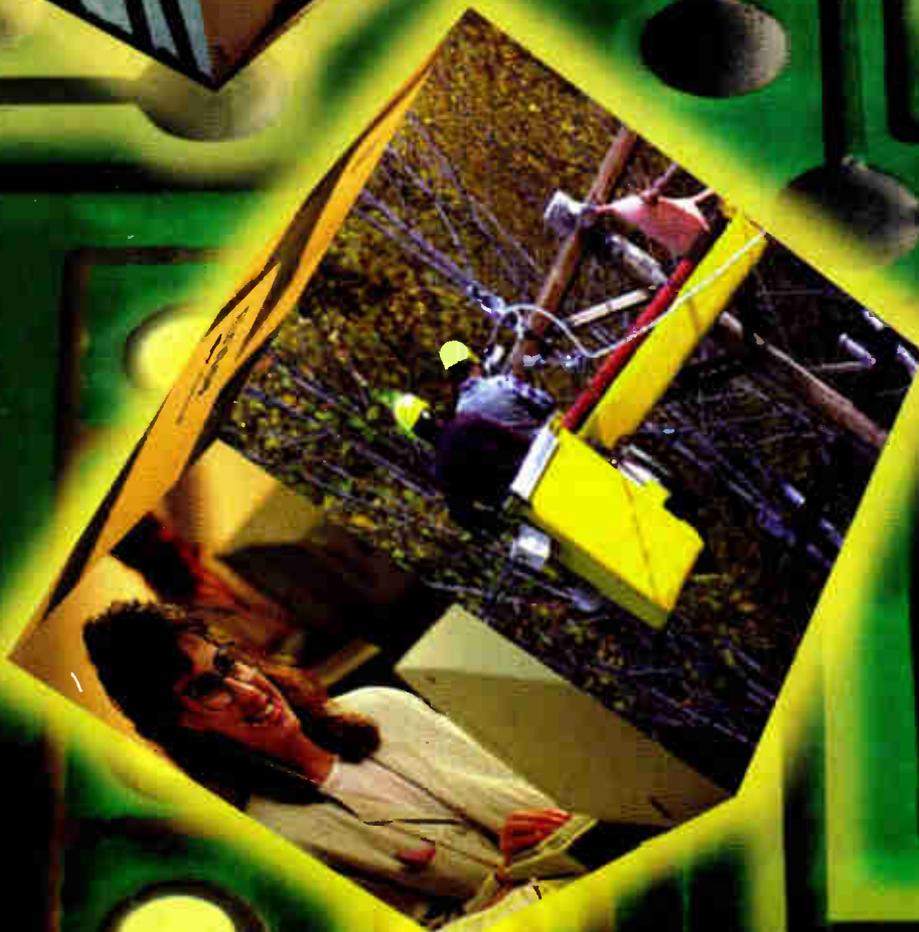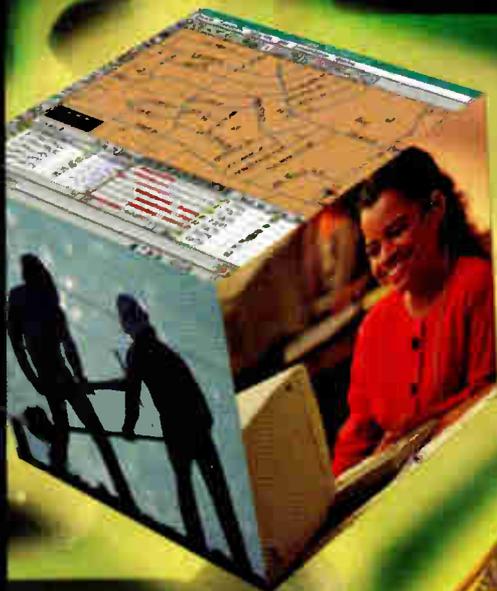
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You know the shock you feel when the best player on your favorite team is unexpectedly traded? That sense of disbelief that's followed by denial before realization finally sets in? Remember how the sinking feeling overcomes you as you realize your team will never be the same?

Reaction throughout the highest levels within the cable industry's technical community might have been similar last month when Wendell Bailey, the National Cable Television Association's venerable VP of science and technology, parted from the Washington-based lobbying organization after 16-plus years.

Since 1981, Bailey has arguably been the industry's most valuable player, working in conjunction with engineers and CEOs alike to develop techno-political strategies in the face of growing competition, increasing governmental scrutiny and interference from more special-interest groups than ever.

Wendell, as he is known to nearly everyone, will forever be known as the dynamic, diplomatic force that helped guide the technical community through the industry's largest growth phase. He was there when the industry was regulated, then deregulated, re-regulated and deregulated again. He was the key figure who hammered out technical standards with representatives of the cities. He, along with Dr. Walt Ciciora, worked tirelessly to improve the oft-strained relationship with the Electronic Industries Association. He attended countless meetings with the Federal Communications Commission as well as members of Congress, arguing the MSOs' viewpoint on complex, and contentious, technical issues.

Suddenly, the team doesn't feel the same

And if that wasn't enough, Wendell's leadership was invaluable to the success of this magazine. He was already chairman of *CED's* Board of Consulting Engineers when I came to this publication 11 years ago, and since then, has worked tirelessly to improve the product. Never one to sugar-coat anything, Wendell didn't always tell you what you wanted to hear, but he always had the guts to tell you what you needed to know.

I still recall some tough meetings several years ago, when it was Wendell's opinion that some of our stories were missing the mark. Those are tough words to take, but they were delivered in the spirit of constructive criticism. Wendell took his role of chairman quite seriously, urging us to inquire, understand and get the facts straight.

No, Wendell didn't bat 1.000, but he finished his long career with more homers than strike-outs. Not even the Babe can boast that. Wendell, we'll miss your wit, your wisdom and your vigor. It may sound cliche, but I'll risk it: You might be replaced, but you'll never be equaled.

Roger J. Brown

Roger Brown
Editor

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By Leo A. Wrobel, Premiere Network Services Inc.

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By Van Macatee, WTCI Inc.; and Mitch Matteau, Arris Interactive

While few would dispute the growing necessity of network management, many are still in the dark about how to implement a system to achieve the greatest effect. For nearly a year, TCI has deployed and operated advanced two-way plant and services in several of its markets. Here, the operator shares lessons learned in testing new technologies, processes and organizational paradigms. How to make a network management program more efficient. and cost-effective.

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What started out as a network upgrade has become a successful distance learning business for Galaxy Cablevision. This article describes how the operator designed its system; what is so appealing about the service to its customers; and how Galaxy stiff-armed the competition.

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Suddenly, IP telephony has moved from being just an interesting topic of conversation to an area of serious technological and market exploration for cable operators. Adding to the energy surrounding IP telephony, CableLabs has undertaken two important initiatives which could have an impact on using the technology to deliver voice on a mass scale.
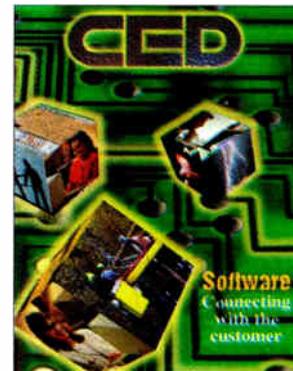
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Photo illustration by Don Ruth. Screen shot courtesy of MDSI.

36 Software proves to be powerful tool

By Craig Kuhl

Leading-edge software tools are not only helping cable operators run their systems more efficiently, but are also providing marketers and customer care representatives with unique insight into the minds of their customers. From dispatching, to billing, to marketing and plant management, these unique tools are changing the face of the cable industry.

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Wavetek does more than just put you in the neighborhood. The hardest part of fixing a return path problem has always been finding it. Wavetek can help. No company works harder to help you find and fix system problems. And we do it with systems and technology that saves you time and money. Count on Wavetek for: • Complete partnership through every phase of system problem diagnosis. • Diagnostic equipment for Installers to Technicians to System Engineers. • Full forward and reverse path testing, from

RCN teams with Washington utility to offer bundled cable, telephony

While the trend toward convergence has taken a decidedly divergent path in recent years, there are still pockets where the "one wire" approach is being pursued. The latest is in Washington, D.C., where a subsidiary of local utility Potomac Electric Power Company (PEPCO), is teaming with RCN Corporation (RCN) to provide area residents and businesses local and long-distance telephone, cable television and Internet services as a package from a single source.

The joint venture will be equally owned by PCI and RCN, and each will invest up to $150 million over the next three years to provide the "bundled" services over an advanced fiber optic network, said company executives. Initial network construction will begin in the District of Columbia and portions of Maryland and Northern Virginia. Within three years, the new company plans to offer services to more than 40 major communities. The joint venture, which will be headquartered in the District of Columbia and will have more than 200 employees, could ultimately expand to more than 200 communities.

PEPCO President John M. Derrick Jr., said, "Through this venture, PEPCO is responding to the desires of our technology-savvy customers who want many communication options, yet simplicity of service. By becoming an integrated provider of energy and telecommunications services in the Washington metropolitan area, PEPCO will be better able to successfully compete in a deregulated environment."

RCN is already offering bundled telecommunication services in portions of New York City and Boston. The company's success in those two markets allowed it to push into Washington as well, said David C. McCourt, chairman and CEO of RCN Corporation. "But the overwhelming demand for our bundled telecommunications services in New York City and Boston encouraged us to enter this market earlier than we had originally anticipated," he said.

RCN is the nation's first and largest facilities-based telecommunications company to offer a package of competitive local and long-distance telephone, cable television and high-speed Internet access to residential and commercial customers over fiber optic networks. PCI is a wholly-owned subsidiary of PEPCO, which provides electric service to 682,000 businesses and households in the Washington, D.C. and Maryland suburbs.

In an unrelated deal, RCN International Holdings Inc., a subsidiary of C-TEC Corporation, struck an accord with Megacable S.A. de C.V., Mexico's second-largest cable company, to offer local telephone service in the country's three largest cities, including Mexico City, Guadalajara and Monterrey.

C-TEC owns 40 percent of Megacable through its RCN International subsidiary.

Megacable's new Mexican telephone operation, which will be centered in Mexico City and expects to begin offering service in the next six months, will consist of a new local exchange network with nine advanced fiber optic collector rings and a high-capacity fiber optic backbone. Megacable plans to expand this network to Guadalajara, Monterrey and other cities in which it has existing cable television operations. Megacable's television system passes more than 600,000 homes in Mexico, more than 200,000 of which are located in Guadalajara.

RCN and Megacable will be offering the first local telephone alternative to Telmex, the formerly state-owned telephone monopoly.

Separately, RCN announced that Megacable in June began to offer Internet access to its customers in Guadalajara over high-speed cable modems.

Sinclair Group intends to multi-cast

While Congressmen in Washington intend to hold hearings and attempt to "force" broadcasters to use their new frequency assignments for digital HDTV, some broadcasters are instead planning to use that spectrum to broadcast multiple channels of digital, standard-definition TV as well as data services.

Sinclair Broadcast Group said recently it plans to "multi-cast" its signals, a decision the company said is based on the available technology already employed by the direct-to-home satellite industry, as well as several European countries that already are proceeding with multi-cast through terrestrial TV transmitters.

Multi-casting, which permits a number of TV channels to be broadcast over one of today's standard TV channels, is permitted under the new FCC rules for digital television adopted in April of this year. In accordance with those rules, Sinclair plans to provide its current TV program channel for free. Other TV programs, like those found on cable, will be available on a subscription basis. Sinclair will group several TV stations' digital channels together to permit the delivery of a large number of free and subscription-based channels.

David Smith, president of Sinclair, said, "The multi-cast business model can produce an additional revenue stream to our company while also providing the public with a superior TV service at a competitive cost. We didn't see that to be the case if we chose to broadcast a single channel of high definition television."

Nat Ostroff, VP of New Technology for Sinclair, stated, "The over-the-air multi-casting business will also include high-speed data transmissions to home and business computers. We view the high-speed data capacity of the over-the-air signal as the ideal vehicle for implementing Internet "push" technology and finally creating a true "broadcast" service from the Internet.

Sinclair plans to roll out a first demonstration of multi-casting in its headquarters market of Baltimore in January 1998. The first demonstration will use at least two television stations' digital channels. Later in 1998, at the annual broadcasting convention in Las Vegas, where Sinclair also owns a station, multi-casting will also be demonstrated.

Sinclair owns and/or provides programming services to 29 television stations in 21 separate markets. The television group reaches approximately 15 percent of U.S. television households and includes ABC, CBS, FOX, WB and UPN affiliates.

AlphaStar goes dark; DirecTV picks up

After a half-year of intense competition between direct broadcast satellite providers, the first casualty has occurred. As of August 7, AlphaStar went dark as a result of being unable to find funding to keep the service going.

Ernst & Young Inc., the court-appointed receiver and manager of Tee-Comm Electronics Inc. and AlphaStar Canada Inc., said it did not receive any acceptable bids to acquire the business. As a result, Loral SpaceCom Corporation will have the transponders on Telstar 402R and Telstar 5 returned to it.

Tee-Comm Electronics Inc., its Canadian direct-to-home broadcasting subsidiary, AlphaStar Canada Inc., and AlphaStar Television Network Inc., a U.S. subsidiary of Tee-Comm, have been operating under bankruptcy protection since last May. The remaining assets of AlphaStar Canada and AlphaStar U.S., including the Milton, Ontario and Oxford, Conn. uplink stations and real estate, manufacturing facilities and the inventory of set-top decoders and antennas, will continue to

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CNR	52	dB
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CTB	-65	dBc
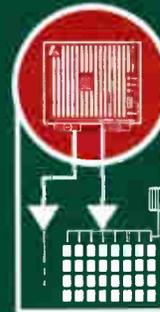
1550-to-the-Node with Digital Narrowcast

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80 Ch. Analog
200 MHz Digital

40 km

HLE 3700

CNR	55	dB
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be offered for sale over the next several weeks.

Already, one of AlphaStar's competitors has swooped in to replace the service. DirecTV reached an agreement with Skylink America Inc. to provide free-to-guest programming to more than 200 hotel properties in the United States that previously received satellite television programming from AlphaStar.

Skylink, which has concentrated on marketing its video programming services to hotels with fewer than 150 rooms, is the third-largest provider of video programming to hotels in the United States.

Swiss test shows cellular TV works

For those who might be skeptical about the viability of high-frequency local multipoint distribution service (LMDS) technology in this country, a Swiss Telecom 10-month pilot of a 42-GHz multipoint video distribution system (MVDS) involving 50 households in six Swiss alpine villages has been so successful that the technology is being launched as a commercial product, according to Swiss Telecom North America (STNA).

"The tests prove that 42 GHz MVDS is ideally suited to provide signals into alpine valleys and other hard-to-reach areas," said STNA's Managing Director, Konnie Schaefer. "It's tailor-made to provide broadband local loop technology on short order both for established telcos and new market entrants."

Schaefer said that the tests were conducted using equipment provided by Philips. The pilot project involved 24 analog channels brought by fiber to a mountain transmitter where signals were demodulated and retransmitted in two separate beams aimed at different ends of a narrow valley. A digital upgrade is planned later this year, Schaefer said.

While it was thought that signals at 42 GHz would degrade in inclement weather, an acceptable signal quality was delivered 99.7 percent of the time, including during heavy snowstorms and light-to-medium rainstorms, Schaefer said. The only noticeable degradation was at signal margins during summer thundershowers with heavy downpour. "In these instances, most residents unplug their TV sets to avoid lightning damage," Schaefer said.

Navio's software found to be seamless

Navio Communications and Interactive Cable Communications Inc. (ICC) announced they have successfully finished initial field

tests of Navio's TV Navigator–which provides viewers access to the Internet without personal computers–in ICC's cable TV Internet Service Network in Yokohama City, Japan. The test proved Navio's open architecture operates seamlessly within ICC's existing cable TV environment, and that deployment requires no changes to ICC's existing network or two-way configurations, said company officials.

Navio officials said they designed the Navigator software to be compatible with the wide range of set-top platforms and network infrastructures that are presently in place all over the globe. "Navio designed its TV Navigator software to integrate seamlessly with a network operator's existing equipment and network infrastructure," said Wei Yen, president and CEO of Navio Communications.

Currently, only about 10 percent of Japanese consumers have a personal computer with Internet access, according to ICC executives.

ICC plans to expand the field tests by deploying the Navio software to several hundred additional homes. Full Internet service was slated to start last month. ICC also plans to expand the Navio-enabled Internet service model to the 1.7 million subscribers to Marubeni's (one of the parent companies of ICC) cable television networks in Japan.

Barco acquires digital video company

As part of its effort to expand its digital video and audio transport product line, Barco acquired Denmark-based RE Group, a manufacturer of digital video and audio codecs for broadcast and telecommunications applications. The RE Group will become a division of Barco's Communications Systems.

The RE Group offers digital video and audio signal transmission products for the worldwide television, radio and communications markets. The company's digital codecs allow signals to be compressed and reformatted without any perceivable loss of quality before being transmitted over telecommunications networks.

According to George Walter, Barco product group manager, "Using the most advanced compression technology, the RE Group has succeeded in reducing bandwidth requirements dramatically with virtually no loss of signal quality. The key is their expertise in pre-processing the digital video signals."

For Barco Communication Systems, the merging of the two product lines creates a complete range of products for transport of video images from the TV studio to the living room.

The RE Group's video codec line encompasses ETSI and ANSI compliant codecs, including a 34 Mbps ETSI video codec for transmission of contribution quality TV program material in a cost-effective package. Recent product developments also include a new family of MPEG-2 video codecs using 4:2:0 and 4:2:2 compression which yield high picture quality. Established in 1935, the RE Group employs 235 people worldwide. Fiscal 1996 sales were $38 million.

Ameritech launches against Jones in Elgin

Who says there isn't competition for cable operators in America? Ameritech began offering its americast cable television service in Elgin, Ill. recently, touting it as having more channels, better service and greater value than what was previously available to area residents.

The enhanced cable service offered by Ameritech New Media contains more than 80 channels of video programming, including local broadcast, expanded basic, premium, pay-per-view and interactive games. The service, which will be offered to the city's 31,000 households over the next several months, competes with cable TV service provided by Jones Intercable.

Ameritech comes to Elgin with services such as the Cartoon Network, The Learning Channel, History Channel, Golf Channel, Classic Sports Network, Turner Classic Movies and Home & Garden Television (HGTV). In addition, Ameritech's expanded basic package includes at no extra charge The Disney Channel, the Golf Channel and SportsChannel.

The americast service also offers an on-screen program guide that features one-touch VCR recording, a customized channel guide and parental control of the programming watched by children in the household. Ameritech's competitive cable TV service also features improved picture resolution, sound quality and service reliability, and 24-hour, 7-day customer service.

Ameritech New Media offers installation appointments in two-hour windows, and installers wear plastic shoe covers and carry handheld vacuum cleaners to minimize dust inside customers' homes.

Residents in portions of Elgin may now choose the americast service. Ameritech New Media now offers its cable TV service in 30 cities and towns in Illinois, Michigan and Ohio, including Arlington Heights, Glendale

Heights, Glen Ellyn and Naperville in the Chicago metropolitan area. The subsidiary of Ameritech has cable television franchises with 50 cities, with more than 930,000 households and a total population of 2 million.

MediaOne unveils national backbone

MediaOne, the broadband services division of US West Media Group (and formerly known as Continental Cablevision), has activated a new national data network to ensure high reliability and performance for the company's MediaOne Express high-speed data customers.

The new network already stretches coast-to-coast and features multiple rings and diverse routing to ensure high reliability. The link will eventually connect networked resources nationwide, bringing new content and service options to customers in 19 states, according to MediaOne executives.

The network, in the future, will boast top speeds of 620 Mbps, easily outperforming the more-common T-1 lines that most telephone companies offer. The new backbone also links six new regional data centers that provide data customers with e-mail, World Wide Web, news, and Internet audio and video services. Advanced services such as Internet video, IP telephony and multicast audio/video are also included.

The new infrastructure will also allow MediaOne to manage the distribution of new content and media, with advanced caching and replication systems that will speed Web access for customers of the service, as well as enable video-rich interactive content.

MediaOne expects the single platform to be attractive to content providers as well, allowing creative firms to minimize content development effort and offer their services to every Express customer.

The new infrastructure will also allow MediaOne to enhance its public and private interconnection with other content and service providers, such as @Home or RoadRunner. In fact, MediaOne has already negotiated several partnerships, the details of which will be announced later, officials said.

Vyvx upgrades to digital platform

Vyvx Advertising Distribution Services, the nation's largest distributor of video and audio commercials, has converted its extensive satellite network to the digital platform. Utilizing the latest digital technology, the Vyvx ADS digital network offers higher broadcast quality and faster transmission to advertisers and their agencies.

Nearly 600 television stations and cable systems across the nation which currently receive commercials by satellite from Vyvx have installed digital receivers to decode transmissions for onsite storage and playback. The new units are "plug-and-play" compatible for easy integration with stations' existing satellite, audio, video, printer and VTR interfaces.

The digital conversion of the advertising distribution network lays the foundation for Vyvx's plans to build a nationwide store-and-forward network of digital video servers. This technology will enable Vyvx to deliver an expanded range of content to broadcasters in addition to commercials–including news, sports and syndicated programming. Digital video file servers will be deployed to Vyvx ADS affiliate stations by the end of the year.

"Vyvx is investing in the technology to create the premier digital distribution network. This is being supported by the newly completed digital technical operations center at our Tulsa headquarters. In our position as the industry benchmark, the Vyvx digital network will provide unparalleled capacity, accuracy, signal quality and speed," said a Vyvx executive.

A leading international provider of integrated fiber-optic and satellite video transmission services, Vyvx became the nation's largest advertising distributor this year after it acquired Cycle Sat Inc. from Winnebago in November 1996 and MGS Services from Viacom in January 1997.

Jones purchases modems from Hybrid

Jones Intercable has signed an agreement to purchase Hybrid Networks' Series 2000 headend systems and cable modems as part of the Jones Internet Channel high-speed Internet access service.

Jones Internet Channel is an Internet programming network which offers high-speed connections to the Internet via fiber and coaxial cable. In March of 1996, Jones Internet Channel became one of the first companies in the world to launch high-speed Internet access commercially over cable through Jones Communications in Alexandria, Va. The service features electronic mail, newsgroups and World Wide Web access, as well as local information on government, schools, restaurants and entertainment, among other topics.

Hybrid's cable modem/routers allow cable operators to provide each business subscriber with Internet connectivity, supporting up to 20 PCs per modem/router. Hybrid's products offer aggregate downstream bandwidth of 30 Mbps per 6 MHz video channel, and upstream telephone return up to 33.6 Kbps, or router return via ISDN, frame relay or T-1.

Jottings

Integrated chip manufacturer **LSI Logic** will develop a modified version of PowerTV's Eagle multimedia ASIC, and will market it to makers of set-top boxes under the name of Falcon. The Eagle chip was specifically developed for video multimedia applications over televisions, and features high-quality text and graphics renderings . . . Speaking of set-tops, Zenith has been selected to supply digital set-tops for Sky Latin America, a direct broadcast satellite service. Zenith is scheduled to design and manufacture integrated receiver/decoders and deliver them in early 1998 . . . And speaking of digital, **NextLevel Systems Broadband Networks Group** shipped its 250th digital headend. The equipment went into **TCI Communications'** system in Belvidere, Ill. NextLevel also said it had shipped more than 400,000 digital set-tops . . . **Cox Communications** officially launched Cox Digital Telephone service in Rancho Santa Margarita. The service will initially be offered to 1,500 households in Trabuco Canyon and made available to 265,000 others in Orange County by late next year . . . Meanwhile, Belgium-based **Telenet Operaties** has chosen to use **Motorola's** CableComm telephony-over-cable product for its deployment of 10,000 lines. Telenet's network will pass up to 2.4 million homes . . . **Marcus Cable** isn't waiting for MCNS-compliant high-speed data modems before pushing into the market–the MSO is deploying Bay Networks' modems to customers in Fort Worth and Park Cities, Texas. And neither is **Cable Co-op** of Palo Alto, Calif., which last month launched service using modems from **Com21**. The Co-op reports that 60 customers signed up in the first two weeks, and the revenue generated is triple that of regular monthly cable TV fees . . . **Prime Cable** Senior VP of Engineering and Technology **Dan Pike** has been named chairman of the SCTE's Engineering Committee, succeeding Steve Johnson of Time Warner, who recently became chairman of the SCTE board of directors . . . . **CED**

Telco guy finds a home in cable

Mark Davis

Imagine the frustration of an entrepreneur caged in the bureaucracy of a large telephone company. That was the level of angst felt by Mark Davis, in his former life.

Davis, who is now Cox Communications' director of engineering for telephony technology, spent nearly a decade working for Contel Telephone Operations in various engineering positions. But in 1991, when the much larger GTE acquired Contel, Davis decided that he had had enough of a "big, bureaucratic nightmare," and began searching for a more entrepreneurial environment where he could put his knowledge of fiber optics to good use.

After finding out, via a magazine article, about Cox's early trail-blazing efforts in deploying fiber, the enterprising Davis sent the cable operator a resume, theorizing that he could save Cox some money with the lessons in fiber deployment he'd learned at Contel. As it turns out, his overture was a timely one, because Cox was considering investing in competitive access provider Teleport Communications Group. Initially acting as the technical go-between for Cox in dealings with Teleport, Davis used his entrepreneurial nature to help the CAP extend its reach into three of the MSO's major markets.

While TCG was focusing on major U.S. markets, Cox's management felt that it could also offer competitive access services to smaller markets. "We convinced the management here at Cox to give us a shot at building out Hampton Roads, Va.; New Orleans; and Oklahoma City into Cox 'Fibernet' cities," explains Davis. The Fibernet service provides customers like large businesses, long distance and cellular carriers with high-speed, reliable connections such as DS-1s and DS-3s.

The birth of ring-in-ring

During the course of deploying more and more fiber for hauling traditional video, while at the same time, deploying fiber to serve its CAP business, the cross functional engineering team at Cox came up with the idea to meld the two approaches into a highly reliable architecture: "ring-in-ring." Davis and Albert Young conducted an in-depth analysis showing how a ring-in-ring network could be built for about the same price as a star network, while offering a higher level of reliability by decreasing the odds of suffering a catastrophic cable cut.

At the same time that Cox was upgrading to a redundant fiber architecture, Davis was driving a several-million-dollar program to upgrade all of the MSO's headends and hubs to NEBS-compliant facilities, to reliably support advanced services such as digital TV, data and telephony.

Davis also led the project team to design, build and staff the new Cox Network Operations Center (NOC), which is now fully operational in Atlanta and providing 7 x 24 network surveillance and management.

And then, convinced that Cox could make the leap from offering business telephony services to residential telephony, Davis and the Cox team put together the plan to engineer, purchase and install seven switches this year, with more on the way.

Davis recently hopped a plane to Rancho Santa Margarita, Calif. to celebrate another milestone for Cox–the launch of digital, residential telephony service to single family homes there. That comes on the heels of the operator's launch of service at the Sonterra and Aventine apartment complexes in southern California earlier this year. "We are currently near 100 percent penetration with telephone and cable at both complexes. We now have several more sites under construction that will be ready to launch in upcoming weeks," adds Davis.

In the process of rolling out telephony for a cable operator, Davis has had to endure good-natured jibes about his former life. "Sometimes, we hear comments like, 'you Bell Heads want to gold-plate everything.' We don't have that approach at Cox," he says. "Our motto is: 'Galvanized, never gold-plated'."

Davis has come full-circle from his beginnings in telecom. In 1983, fresh out of Georgia Southern University, he went to work for Contel Telephone Operations in outside plant engineering. As a rural telco, Contel had acquired a number of smaller telephone companies which needed plant upgrades, and Davis participated in designing new networks for the small towns, using the latest fiber and copper technology. "We interconnected the central offices using a host-remote architecture, taking one small town and hooking three or four adjacent towns together using fiber," he remembers. "And we put in some of the first multimode fiber in '83."

Moving to the present, Davis is a member of the SCTE, and also serves on the Cable Labs Enhanced Services Deployment Committee, which is putting together manuals on methods, procedures and overall guidelines for rolling out new, enhanced services.

While he puts in long hours during the work-week, Davis tries to reserve his weekends to spend time with his family: his wife, Kitty, whom he met while still in college; and their two children, Marcus, 9, and Diana, 6.

Often, the Davis clan heads to the mountains of Georgia and North Carolina on mini-camping excursions or for the occasional rafting trip. "And occasionally, I get to play golf. Otherwise, it's snow-skiing in the winter, water-skiing in the summer," he says. Having done the latter since the age of 11, sometimes Davis ditches the skis and goes one-on-one (barefoot) with the lake.

As for cable going one-on-one with telephony, Davis believes that Cox's success will pull other cable operators back to the fold. "I think we are going to show the rest of the industry that there is a huge business opportunity in telephony, if it's done well," says Davis. "After all, everyone has a telephone, and a lot of people are ready to change service providers." **CED**

Signing off as NCTA VP, looking to the future

By Wendell Bailey,
VP of Science
and Technology, NCTA

Have a comment?
Contact Wendell
via e-mail at:
wbailey@prodigy.com

Well by now, the news must be out. I have decided to leave the NCTA. I take this step with truly mixed emotions. After sixteen-and-a-half years, it's hard to imagine getting up on a weekday morning and NOT driving to Massachusetts Avenue N.W. to go to work. Habits die hard, and I'm sure that the first few days after my official departure, I'll be on the South Capital Street Bridge before I realize that I don't work at the NCTA anymore. If you will indulge me, I need to say a few things.

Best and brightest
First, I have spent 31 years in the telecommunications world, and by far, the best, most competent and brightest people that I know are the ones in the cable television industry. You all make me proud that my last decade-and-a-half was spent in the big leagues. The friends that I have made in the world of television cannot be replaced.

Second, the staff at the NCTA is like a family to me. Many of them have been at the NCTA as long as I have, and have been a part of many milestones in my life, just as I have been a part of their families as well.

Third, the NCTA engineering committee is the cornerstone of my career. This group is truly outstanding. They are completely selfless, honest, hard-working and as smart as any group that anyone could put together. Once every eight weeks or so, they come to Washington, D.C. or some other place, and for two days, they listen, talk, debate, discuss and argue over hundreds of technical issues that are important to the future of the industry. The list of past chairmen contains the stars of the technical community. When I first joined the NCTA, the chairman of the group was Frank Bias, then vice president of engineering for Viacom–the same man who brought me to the NCTA in 1981. Others followed: Gary Tjaden from Cox; Walt Ciciora, then of Time Warner; Bob Luff, who was with Jones; Tom Jokerst, then of Continental; Joe Van Loan; and currently, Alex Best from Cox. These guys gave of their time and talent, and in return, they can also claim that they were the leaders of the single best group of engineers that were ever brought together in one room.

Since the announcement was made (the afternoon of September 8, 1997), I have received more than 200 calls from friends and colleagues. The words of encouragement and support from my peers and friends have been wonderful.

I have told everyone who would listen that I have two goals. First, I want to make sure that nothing that I do in the month of October could be mistaken for work. Second, after a restful month, I intend to look for a job. It's been a long time since I have engaged in this activity, and I admit to more than a little trepidation.

Quiet contemplation
It is important in life to spend some time sitting quietly in an empty room and asking yourself really tough questions. If you can find the strength to do this, make sure that the answers that you mutter back to yourself are the absolute, ruthless truth. I have done this several times in the past year, and I can tell you that it helps to focus your energy on the things that you really want to do with your life.

The first thought that I had when I asked myself what I really wanted to do in my next job was quite revealing. The best job that I could imagine for someone with my particular skill set was one in which I could spend my day being officially nosey about anything and everything that was going on, and then tell my boss what I thought about the intelligence I had received, and he/she would listen! The bad thing about figuring this out was that I realized that this is pretty much the job that I have had for the last 17 years. Oh well, back to the quiet room for more contemplation.

To be serious for a moment, I do think that it is worthwhile to make a fair and honest assessment of your skills and sort them into those that you like to use, and those that you wish you didn't have. For instance, I am good at understanding technical and scientific things and explaining them in meaningful ways to non-technical people. I like doing this. I am also good at the nuances that make political maneuvering possible in the context of Washington policy debates, but I like the former, more than the latter.

The plain truth is (always be suspicious of anyone who offers the "plain truth") that I believe that I have helped the technical community in the cable industry in a variety of ways over the years. I represented their interests in the political world and before the CEOs of their companies. I also worked to make new things possible by helping to lay the groundwork that would be needed in the future. I believe that these things have made it possible for many exciting developments to occur as we go forward, and it's time to see if there is a place for me to use my talents to help move those things forward.

New adventures
So this is the end of my time as a vice president of the National Cable Television Association. I have been an executive at the NCTA longer than anyone else in its history. That should make me feel old, but all it does is make me feel exhilarated at the chance to use those experiences as the basis of a new adventure. I, for one, am looking forward to it–but not until November! **CED**

The effect of bits on baud demystified
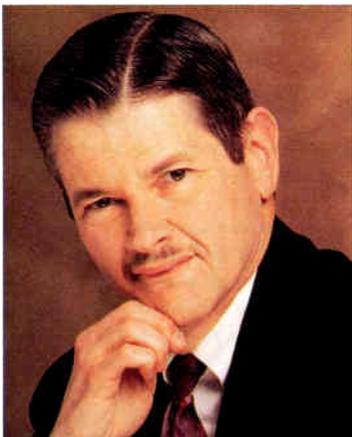
*By Jim Farmer,
Chief Technical Officer,
Antec*

You folks are great! I thought the English language was dead among cable engineers, but I was wrong. Last July, I promised an "attaboy" to anyone who could send me an e-mail which correctly used "affect" and "effect." The confusion of the two words is one of my pet peeves. I was hoping that *someone* out there would know the answer, but I doubted that there were two people who were sufficiently schooled in the King's English. Boy, was I wrong! I gave away so many attaboys that I had to re-order twice.

The correct answer: "affect" is usually a verb, so use that word when you mean to do something. "Affect" can also be a noun, if you are referring to someone's "emotional affect," or the conscious subjective aspect of an emotion, separate and distinct from bodily changes. "Effect" is usually a noun, so use it when you are talking about something. However, if you want to talk about bringing something about, "effect" can be a verb, as in, effecting an improvement in your vocabulary (thanks to Lucent's Mark Rivecco for reminding me of that usage).

The best example of how to use the words came from my good friend Mike Wolcott at Scientific-Atlanta. I particularly liked his salutation, at least until I recalled that he is given to extreme hyperbole.

Mike wrote:

*"O wise and all-knowing one,
Grand Poobah of knowledge and
light, dispenser of great things, Greetings!
As Brunswick should know, you put 'possum roadkill
in the stew for effect, then step back to see how it
affects the customers."*

Mike is one of those guys who has a way with words. I have never been able to top him, and I won't try this time. But it will be a long time before I eat at his house.

Technical precision

Let's try a much misused technical term this month. Breeds there a man in the industry who knows the difference between a bit-per-second and a baud? If I have a cable modem, or even one of those old-fashioned things that are hooked to the phone line, I can get so many bits from my end to your end every second. That number of bits is the bit rate, or the speed at which the modem operates. Low-speed modems tend to use modulation techniques that transmit only one bit at a time. These modulation formats, which are also used extensively in cable work, are (usually) frequency shift keying (FSK) and biphase shift keying (BPSK). In FSK, you transmit 1s and 0s by shifting an oscillator between two frequencies. In BPSK, you change the phase of a carrier 180 degrees to indicate the two states.

The problem is that, if you transmit just one bit at a time, you don't make very good use of the spectrum. That is, your bandwidth efficiency (expressed as the number of bits-per-second for each hertz of bandwidth you use–bits-per-hertz) is not very good. To remedy this, you have to take baby steps back toward the analog domain, by transmitting more than one bit at a time. The more bits you transmit at a time, the more discrete states you have in your transmitted signal, and the more you start looking similar to an analog signal, which has an infinite number of states infinitely close together. It's not analog, and the spectrum doesn't look like analog, but with more states, you start approaching the continuous nature of analog.

When you are transmitting more than one state at a time, we can't talk **just** about the bits you are transmitting: we also need to talk about the collection of bits (two or more) you transmit at one time. We call this collection of bits a *symbol*. If you are using a modulation format such as QPSK, which transmits two bits at a time, the number of symbols transmitted per second is one-half the number of bits transmitted per second. Engineers, being the creative types we are, invented a new term for the number of symbols transmitted per second. Instead of the bit rate (number of bits transmitted per second), the number of symbols transmitted per second is called the *baud* rate. Where did the term "baud" come from? I haven't the foggiest notion, but I'm sure someone out there will tell me, and when he or she does, I'll tell you.

Thus, if we are transmitting QPSK, which puts two bits in a symbol, we have a baud rate of one-half the bit rate. A 19.2 kbps system is a 9.6 kbaud system if it uses QPSK. A 9.6 kbps system is also a 9.6 kbaud system if it uses BPSK, where only one bit is transmitted at a time.

In both cases, the same baud rate is used, but the number of bits transmitted per second varies by a factor of two. The bandwidth required is essentially the same, being a function of the baud rate, not the bit rate. In 64 QAM transmission, six bits are transmitted at a time, so a bit rate of, say, 30 Mbps works out to 30/6=5 Mbaud. If we are transmitting 256 QAM, we transmit eight bits in a symbol, so 5 Mbaud would be a bit rate of 40 Mbps. (Notice that you don't use a plural of baud, with an "s" at the end.)

You're right; they're wrong

Now that you know the difference between bits-per-second and baud, you are probably in the top one percent of telecommunications engineers, at least so far as that one fact goes. Now, how do you convince your co-workers that you are right, and they are wrong? The only way I know to do it is to cite an authority, so try mine: the *IEEE Dictionary of Electrical and Electronic Terms.* **CED**

Have a comment?

Contact Jim via e-mail at:
jofarmer@mindspring.com

LMDS auctions next: Place your bets
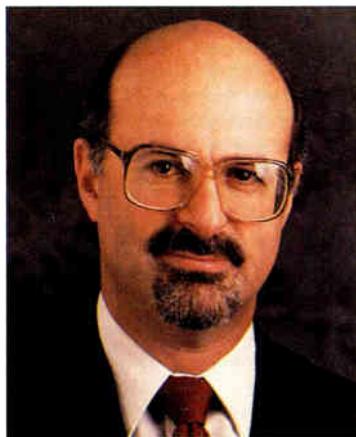
By Jeffrey Krauss, spectrum auction strategist and President of Telecommunications and Technology Policy

Have a comment?
Contact Jeff via e-mail at:
jkrauss@cpcug.org

The FCC has just released the schedule of upcoming spectrum auctions. According to the schedule, the betting for LMDS channels should start December 10. But there are two problems—telephone company eligibility and installment payments for small businesses—that could delay the auctions until next spring. Here's an update on LMDS.

Background

In 1991, the FCC granted a license for 1000 MHz of spectrum in the 27.5-28.5 GHz band in New York City to a company that is now known as CellularVision of New York (CVNY). CVNY proposed to use the spectrum to offer 49 channels of analog video, in a network configuration that reused the 1000 MHz of spectrum in cells only a few miles in radius. This differs from the more traditional 2 GHz wireless cable in several respects. It uses FM rather than AM modulation. The propagation distance at 28 GHz is much shorter. But CVNY asked for and got a lot more spectrum than 2 GHz wireless cable has.

In 1993, the FCC proposed to allocate the 28 GHz spectrum for a new cellular wireless cable service called Local Multipoint Distribution Service (LMDS), but satellite interests objected because the band is allocated for satellite service as well as terrestrial microwave service. After a failed attempt to negotiate spectrum sharing procedures between LMDS and satellite interests (see Capital Currents, November 1994, "Negotiated Rulemakings"), the FCC segmented the 28 GHz band so that, for the most part, LMDS and satellite users would not have to share frequencies. But it wasn't until March of this year that the FCC decided on a final spectrum plan for LMDS.

The LMDS allocation now consists of 1150 MHz in spectrum block A and 150 MHz in block B. Blocks A and B will be auctioned separately. Block A consists of three pieces: 27.50-28.35 GHz (850 MHz bandwidth), 29.10-29.25 GHz (150 MHz bandwidth) and 31.075-31.225 GHz (150 MHz bandwidth). The 29.10-29.25 GHz piece is shared with a few satellite earth stations. Block B is 31.000-31.075 GHz and 31.225-31.300 GHz. Why is Block A so complicated? It was the result of complex negotiations between LMDS interests and satellite interests, numerous compromises, and in the end, all the major participants were less unhappy with this plan than with others that were floated.

LMDS service areas will be the same Rand McNally Basic Trading Areas (BTAs) that the FCC has used for PCS auctions and other spectrum auctions. So there will be about 500 Block A licenses and 500 Block B licenses auctioned.

LMDS services and auction problems

What will LMDS service consist of? Right now, CVNY is mainly offering video distribution and data distribution services, but CVNY has not yet converted from its 27.5-28.5 GHz license to the new frequency plan. I'd guess that some LMDS operators will use the two 150 MHz pieces for two-way voice and data services, and the 850 MHz piece for wireless cable video distribution.

But others may decide to forego video and jump fully into the two-way voice and data business. Remember, this is a huge amount of spectrum being auctioned, more than in any other band. Because the spectrum can be reused from one cell to the next, it may just be enough spectrum to "wire" a full city for local telephone service. And that's where one of the problems has emerged.

When the FCC laid out the final channel plan and the auction rules, it also decided who would be eligible to bid, and who would not. In order to promote competition, incumbent local exchange telephone companies and cable companies are not eligible to bid for the Block A licenses in their service areas. The telephone companies were not happy about that decision at all. Some filed court appeals. They could now go to the courts and ask for a stay of the auctions, on the grounds that they will be irreparably harmed if the auctions take place and the courts later overturn the eligibility restrictions—they will have lost the opportunity to bid for the LMDS spectrum.

On the other hand, maybe someone will argue that if they are found eligible to own LMDS licenses, they can just as easily buy out the auction winner later, as they can bid and win in the auction itself. It's only money, after all.

The other problem facing the LMDS auctions is that the PCS "C block" auctions didn't work out as well as the A and B block auctions. The C block bidders got special treatment because they were small businesses, and this special treatment led them to overbid. For example, they were allowed to stretch out their payments by making installment payments. Now that it has become clear to Wall Street that they overbid, no one is willing to lend them the money for the first installments. At least one company has filed for bankruptcy, and others are on the edge.

The FCC Chairman recently said that "We need to eliminate installment payments now and forever." But the LMDS auction rules, as they were adopted in March 1997, explicitly include installment payment options for small businesses. If the ability to use installment payments was one cause of the overbidding, and if the Chairman is serious about eliminating installment payments, the LMDS rules will have to be changed. I doubt that can be done in time to hold the auctions in December.

So I'm betting on spring of next year for LMDS auctions. Am I betting IN the auctions? I won't tell. But if you see an authoritative name like Genghis Khan Holdings, a name intended to scare off the wimps with all the money, it might just be me. **CED**

Cable and horizontal resolution

To Jim Farmer:

I have a question for you regarding horizontal resolution. One of our service technicians is taking a Community College night-school course in the repair of consumer electronics. The course instructor made a statement that "cable television systems are not capable of providing good horizontal picture resolution. Satellite and VCR tapes have a much higher horizontal resolution."

As far as I know, there are only four items that can limit or impede the horizontal resolution:

1. The headend modulator (if it's of low quality or mis-aligned)
2. A baseband convertor or descrambler
3. A baseband scrambling encoder
4. The channels that are adjacent to the amplifier's diplex filter cut-off frequency may exhibit some high frequency roll-off in the transitions.

I am assuming that any other item in the cable system that would cause a reduction in the horizontal resolution would be causing many other worse picture impairments.

Am I correct in these assumptions?

Bruce Marshall
Technical Director
Mountain Cablevision
Hamilton, Ontario

To Bruce Marshall:

Theoretically, analog satellite channels have a bit more bandwidth than does an NTSC channel, though consumer equipment would be hard pressed to use that bandwidth. Digitally compressed signals may have more or less resolution than cable (NTSC), depending on how the signal is compressed. The main level main profile of MPEG compression typically does have somewhat more resolution than does a modulated NTSC signal, but not much more.

Consumer VCRs generally have significantly LESS resolution than does an NTSC signal (whether delivered by cable or over-the-air). This is due to the processing used. (Maybe that would make a useful column sometime?) The exception is super VHS, or S-VHS. This has never caught on as a consumer format, though it is used semi-professionally. The magic in SVHS is really that it does not combine the chroma and luminance information, so it is not necessary to separate the two, and the format yields slightly more

bandwidth than does an NTSC signal.

When properly maintained, there is no reason that cable should be capable of less resolution than a broadcast signal is.

You are correct on the first two items. I don't feel a baseband scrambler is per se a limitation on resolution, though you are correct that resolution may be slightly limited by a baseband set-top.

Further, baseband set-tops can introduce other artifacts, such as differential gain and phase, and extra group delay. However, as a practical matter, the degradation is small enough that the market has spoken: it wants volume control and improved scrambling security, which means baseband convertors . . . .

My bias is that picture quality in cable is most often limited by the carrier-to-noise ratio, and sometimes by distortion. I have seen individual channels where modulation quality or band edge group delay have been the limitations.

Jim Farmer

HDTV is not doomed

To Jeff Krauss:

I read your item, "Is HDTV doomed from the beginning?," in August 1997 *CED*. As usual, you speak loudly and clearly on an issue that will haunt us for several years and could give HDTV reception a black-eye as far as the viewing public is concerned.

It's difficult enough connecting television receivers to cable as it is, and the complications from DTV could make it worse. Your analysis of the HBO scenario makes sense, but I fear for the worst, with so many conversions taking place–several in the headend, set-top convertor, VCR and TV set. Late next year, hundreds, maybe thousands, of new DTV receivers will be connected to cable systems. If the new HDTV signals from broadcasters and cable services such as HBO, Discovery and Turner cannot be received, who will be getting the phone call? Cable systems must be proactive now if they are to avoid reacting negatively to viewer complaints about DTV reception next year. If consumer receivers are compatible with both QAM and 8-VSB, then cable could carry HBO and others as QAM, and the local DTV stations as 8-VSB. How either gets around the set-top box, other than an antenna for local broadcasts, I don't know,

either. But I understand some of the new boxes may have the ability to bypass certain signals. Planning ahead can avoid "finger-pointing" in the future. Let's work now to get HDTV off to a good, clean start.

Ed Williams
Senior Manager for Advanced Television Systems Engineering
Public Broadcasting Service

To the Editor:

I am writing in response to the "In Perspective" column on DBS competition and the "smoke screen." As an 18-year veteran field technician and contractor of CATV/SMATV/DSS/MMDS/DBS and TVRO, I cannot see where the DSS smoke screen is coming from.

I have had the opportunity to speak with many dissatisfied cable TV customers who were converting from cable to DSS. Many of the comments were: the customer service response time is very bad, the reasons for poor service are inadequate, the selectivity of what the customer wants is poor, the quantity of service problems with cable compared to the DSS system (are many), the quality of installation of cable over DSS. . . .

On the other hand, I have heard the complaints and have converted DSS customers back over to cable due to "the rain fade" problem, too many PPV channels and a few complaints on certain companies' quality of service and installation.

I have also heard from certain city officials who are more in favor of small dishes in towns/cities than all the cable hung all over the poles, or going underground and having to deal with the issues of "rights-of-way," tearing through consumers' flower beds, gardens and grass, not caring about total quality restoration.

In the field, I see TVRO systems still going in at commercial sites and rural areas. I also see many Primestar dishes going in, and also many DSS systems going in to replace a lot of C-band, Primestar and cable.

Who is actually beating whom? From my point-of-view, DSS and Primestar are booming! Cable TV seems to be losing ground. But I sure would like to see an official survey to see the bottom-line numbers.

Just to add to my credibility, I do not "sell" any of the products. I am strictly a contract installation/service company.

Mark A. Pickrell
MNM Satellite Communications
Birmingham, Ala.
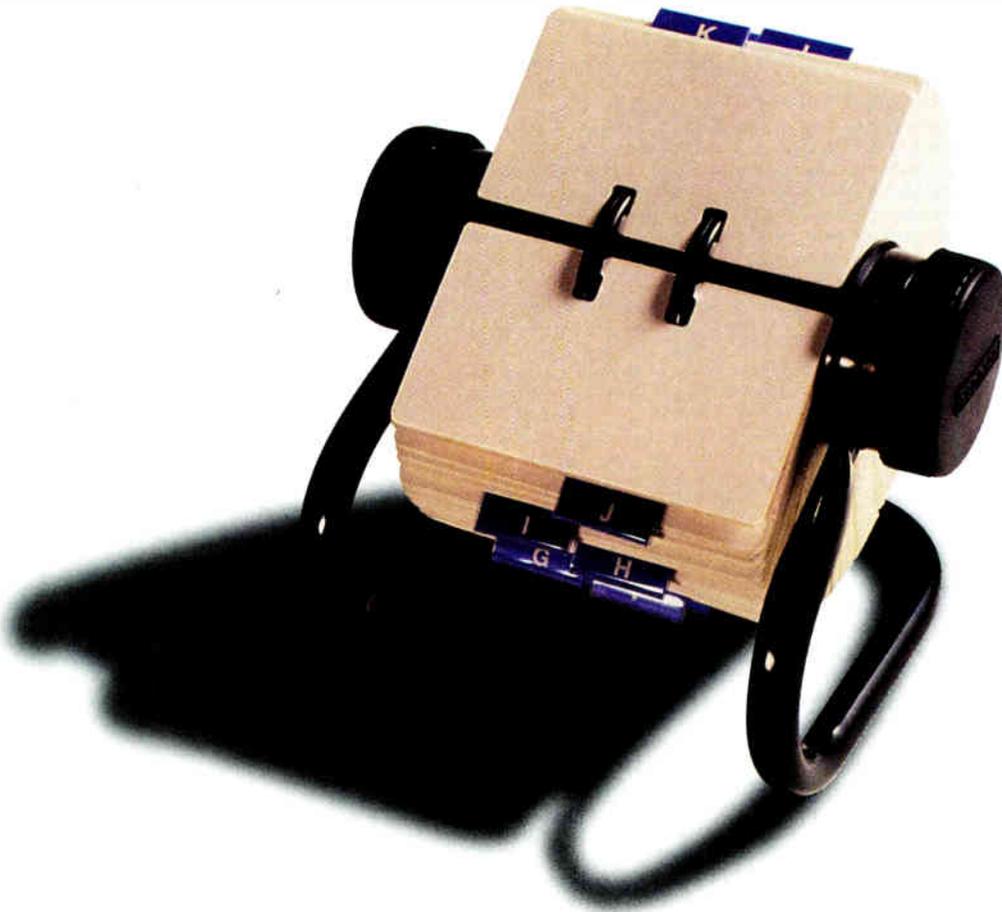
Who do you know?

Members of Women in Cable & Telecommunications know it's not only important who you know, but what you know.

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and request document number 1100. Or call WICT at 312-634-2357 and we'll be happy to tell you more.

WOMEN IN CABLE & TELECOMMUNICATIONS

Figure 3: NL BLASTER–migration. Downsizing can be accomplished by simply placing multiple nodes at the existing node location.

BTD	4 high output B.T.A. amp	——	Fiber network optical cable
▓	3 high output B.T.A. amp	——	Express network coaxial cable
D-H	2 high output mini-bridger amp	——	Distribution network coaxial cable
◤	4 output B.T.A. node	- -	Service area boundary
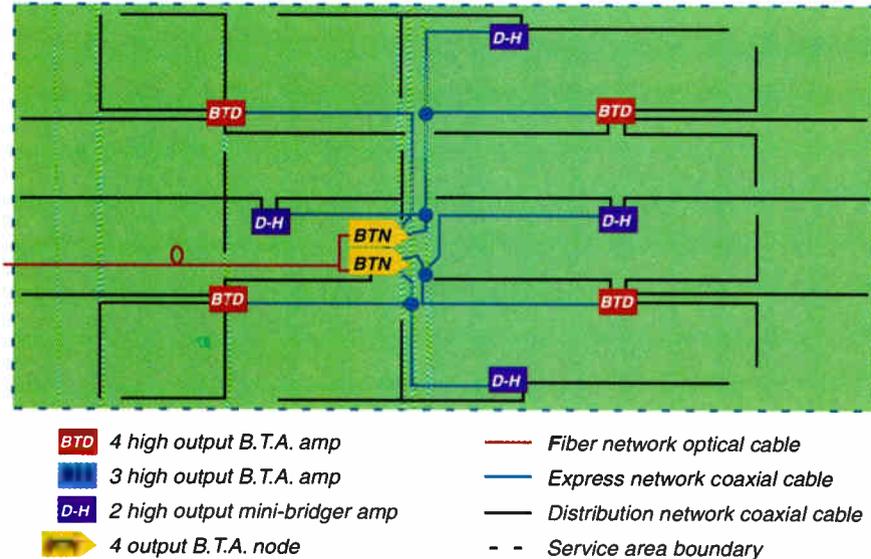
behind the development of alternative design methods. These new methods have produced more efficient results than the traditional design methods.

BLASTER

The BLASTER enhances the power of the HFC network. With it, a network has an inherent migration strategy, significantly fewer active devices, reduced power consumption, improved reliability, reduced active cascades, and lower maintenance and operating costs–for a lower capital investment than a traditional HFC network. Furthermore, in many instances, these results are attainable for both rebuild and upgrade applications.

BLASTER achieves three fundamental goals. It: 1) improves reliability; 2) reduces cost; and 3) provides a migration strategy. Successful implementation calls for

Figure 4: NL BLASTER–migration. If further downsizing is necessary, this architecture migrates to a fiber-to-the-last-active architecture, while the powering continuity remains intact through the express system.

BTD	4 high output B.T.A. amp	——	Fiber network optical cable
▓	3 high output B.T.A. amp	——	Express network coaxial cable
D-H	2 high output mini-bridger amp	——	Distribution network coaxial cable
◤	4 output B.T.A. node	- -	Service area boundary
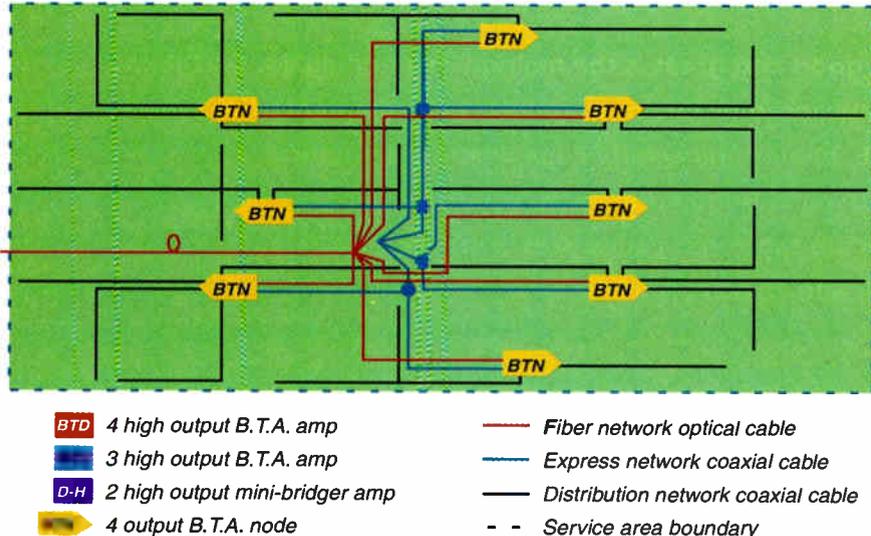
a combination of system analysis, design engineering and a tool kit full of the right products. However, once the recipe is developed for a particular system, the results are repeatable.

A key element is the BLASTER's micro-cell coaxial layer that addresses each amplifier as a system unique to itself. Based on system demographics, this layer enables operators to use various types of amplifier products in concert to maximize design and product efficiency. Therefore, it is optimized before any consideration is given to node size or location. In fact, node placement is one of the last steps. Figure 1 illustrates one example of the coaxial layer.

Once the micro-cell coaxial layer is completed, the challenge is to deploy the micro-cell network interconnect layer in a way that facilitates present node sizing requirements, while maintaining a future migration strategy. This procedure is not complicated, because all of the information needed to accomplish it has been pre-defined by the previous coaxial design layer via house counts per active device. Figure 2 shows the micro-cell interconnect and fiber layer working in conjunction to the coaxial layer.

If necessary, an initial fiber node size of 500 homes passed can facilitate a migration path to node sizes as small as fiber to the last active. It can also provide a selective migration path for areas of high interactive service growth, without having to deploy unnecessary fiber. Figure 3 illustrates a possible migration layer.

Figure 4 provides an extreme example of future migration, which takes fiber as deep as the last active device. The express coaxial cable acts as a power conductor to facilitate node activation without the need to re-power the network. Although possible, it probably would not be necessary to go to this extreme for most networks. More likely, migration fiber would only extend to those areas where service demands are high. Nevertheless, the flexibility of the network is a built-in safeguard.

Results and benefits

Naturally, the proof is in the results. BLASTER has been used for both rebuilds and upgrades, in a number of designs with densities ranging from 60 to 500 homes passed per mile. Table 1 compares the results of a conventional HFC network design vs. the BLASTER approach in a system upgrade. (Note: the table illustrates an upgrade, reflecting the fact that 85 percent of the market looks to upgrade, rather than rebuild.)

The results vary from system to system and can become even more dramatic in a rebuild application where there is less concern over the amount of cable replacement. Interesting items to note are the 18 percent reduction in active devices, 29 percent decrease in active device cascade to the customer and three percent reduction in power supplies.

There was, however, an increase in coaxial cable usage, which appears high at 91 percent. However, this is 91 percent of a very small footage per mile, amounting to an increase of only 511.9 feet per mile of P3-500 cable. The amount of new cable is well within the typical cable operator's goal of 20 percent cable replacement

Pirelli Would Like To Congratulate Our Award-Winning Customer Service Team

The Communications Division of Pirelli Cables North America was recognized recently by the International Customer Service Association (ICSA) as the 1997 Award of Excellence winner in manufacturing. This prestigious award honors outstanding customer service programs. We congratulate our dedicated customer service team, and we make this promise to our customers: whenever you call Pirelli, you can expect the best.

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Table 1: Conventional HFC network design vs. the BLASTER approach in a system upgrade.

Design method		HFC	BLASTER	Change
Type		Upgrade	Upgrade	–
Frequency forward		52-750	52-750	–
	Reverse	5-40	5-40	–
Homes/node		859	859	–
Homes/mile		145	145	–
Active cascade		TX+N+5	TX+N+3	(29%)
System performance	CNR	49 dB	49 dB	–
	CTB	53 dB	53 dB	–
Actives/mile		5.14	4.22	(18%)
Power supplies/mile		0.34	0.33	(3%)
New cable-feet/mile		563.5	1,075.4	91%
Cost/mile		$5,365	$4,870	(9%)

in an upgrade design effort.

Overall, the price per mile was reduced nine percent, based on inclusion of opto-electronics, RF actives, taps, passives, power supplies and coaxial cable. Items such as headend, set-top units, and fiber cable were not included, because quantities of these components would be equal in both designs. Installation costs were also excluded from the analysis as labor rates vary greatly.

The benefits can be far greater than those illustrated. Similar designs have been achieved utilizing the BLASTER concept that resulted in less than two active devices per mile. As stated previously, the BLASTER achieves these results based on a combination of the right products, an in-depth system analysis, and innovative design techniques. Often, several iterations may be required in order to develop the proper "system recipe." It is also advisable to maintain a trained design team that will guide the process until the system is completed. In addition, because the optimization requires some planning, it is important to allow adequate design planning time in the project schedule to do the job right.

Conclusion

Because the networks deployed today are more than video entertainment pipelines, reliability is a major concern. Today's networks are becoming full-service networks that can support analog and digital video, high-speed data access, telephony, security and a host of services that are still evolving. The only certainty is that customers will demand the highest level of quality and reliability and select from the increasing number of competitive network providers that exceed their expectations. In reality, this is not an unreasonable demand; customers deserve to receive the highest level of service available– nothing less will do for any business that wants to be successful. **CED**

Leading-edge software drives systems to new heights

Better customer care, improved system management

By Craig Kuhl

Software–from simple, off-the-shelf packages to the most sophisticated–has assumed a leading role in connecting cable operators to 21st century dispatching, billing, customer care, marketing, and overall plant management.

Leading-edge software packages from a veritable legion of companies are helping operators not only run their plants more efficiently with powerful, cutting-edge products, but also provide marketers and customer care representatives with enough detailed psychographic and demographic data to literally see the future through the eyes of its customers.

A recent study by Northern Business Information, a telecommunications market research firm, projects that service providers will increasingly invest more in the customer care and billing portions of their operations support systems (OSS) than in their operations, service provisioning and planning, and engineering. The study predicts that by 2001, more than 50 percent of OSS spending in the U.S. will be for customer care and billing, compared to 36 percent today. Outside the U.S., 29 percent of OSS spending will be for customer care and billing by 2001, compared to 19 percent today.

The competitive edge that software now offers the cable industry has been upgraded from "important" to "crucial" as deregulation, convergence and consolidation take hold. For most cable operators, seeing the future and the trends that lead there are now vital parts of the business plan. And it's software that will most likely get them there.

"MSOs need mission-critical, bullet-proof mainframe software and systems, and the trend is toward data warehousing. What's interesting is an operator taking infor-

mation from a transactional system and leveraging it with managerial information. This is how MSOs can develop a competitive advantage," says Gary Abbott, research analyst for Hanifen, Imhoff.

"The ultimate goal with data warehousing is to market one-to-one. Technology isn't mature enough to do that yet. It's complex, and the solutions are elusive. But cable has competition now from the telcos and others, so that's why they are marketing smarter," adds Abbott.

Whether operating from smarts or just plain fear, gone are the days of yellow stickers on CSR and dispatchers' computers, according to Keith Cutler, a sales consultant for CSG Systems Inc., a leading provider of software to the cable industry. "The older software and hardware were not customer- or CSR-friendly, and the training time was lengthy. There were lots of stickers on computers," he says.

That is changing with the advent of software like CSG's ACSR (Advanced Customer Service Representative), Cutler says. "ACSR allows an operator to add other services like telephone lines, Internet and data, and also allows them to be more reactive to the market, while printing bills on a true cycle billing basis, allowing for a smoother mailing of bills."

ACSR is an icon-based software which allows CSRs to point and click through workstation screens, with access to other modules for billing, program information and all the services a customer currently has. It can also log and follow-up with CSR reminders and track their interactions with customers by category.

Vantage Point, another CSG product, is a data warehouse that captures daily information for customer profiles and demographics, and identifies certain trends, while addressing potential problems. CSG's Market Analysis System, Campaign Management System and its new Rating Editor enable CSRs and marketers to search for trends among customers, create marketing

Brett Price

Keith Cutler

Source: Saxe Inc.

One-to-one marketing

Cable/telco TV

Internet services

Interactive services

Direct mail

ILLUSTRATION BY DON RUTH. SCREEN SHOT (TOP LEFT) COURTESY OF MDSI. TRUCK PHOTO COURTESY OF RTK CORPORATION.

'This has been a brilliant success'

By Michael Lafferty

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"We want to take all the information that's being collected by all these different network element management systems and pull that back into an operational data warehouse. That's where we'll be able to look at our availability statistics, look at our outage information, look at our repair histories."

The goal, says Ross, is 99.998 percent availability/reliability, which equates to approximately 10 minutes of down time per year. "We have various ways of measuring the success of operations in the center," says Ross. "There's obviously the old MTTR (mean time to repair). But we're also looking at the mean time to bypass, to restore service, even though you may not fix the original problem."

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One-to-one marketing

Cable/telco TV

Internet services

Interactive services

Direct mail

Islands of data: Stranded no more

Financials   Marketing   Customer
management system

Source: Saxe Inc.

The screen capture above is an element of MDSI's dispatch software, which helps track technicians.

Doug Bierschbach

campaigns with targeted packages to specific customers, and single-event bill. Each is designed to use the marketing information derived from software packages as marketing tools.

Show me the data

For Time Warner's Los Angeles division, it was the reduced training time of ACSR that sold them on the package. "Our previous training was very intensive and expensive. With ACSR, we've cut our training time from six weeks to three weeks and have reduced our work order errors from four percent to 2.5 percent. With 1,400 work orders a day, that means reducing the number of unhappy customers. That's what we're interested in," says Roger Workman, vice president of information technology at Time Warner, Los Angeles division.

Time Warner, Workman adds, allows great autonomy in its software decisions, which are made at the division level after input from each system. "Our goal is to continue growing our business, so we've got to have the tools which allow us to differentiate ourselves from the competition. We must anticipate our customers' needs and offer one-to-one service." The division plans to launch Roadrunner in 1998, and later in '98 will introduce a software package enabling the company to automatically schedule outgoing calls 24 hours a day, seven days a week.

Saxe Inc., another provider of software, offers cable operators its Empower package. The program integrates "data islands," or data locked up in multiple systems, platforms and locations. The challenge is to gather the data, integrate it and generate actionable information which is so valuable to marketers.

"We've found that cable operators want to develop relationships with their customers and build a marketing campaign around them. The key questions are: Why are they unique, and what is their transactional behavior? Once we find those answers, we segment them by files and store the information in a data warehouse, where we can track and flag certain records, while tracking campaigns," says Paul del Toro, vice president, marketing and product development for Saxe Inc.

Empower also allows for "data mining," where marketers can "drill" down through several layers of data for a more detailed view of a customer's profile, which is helpful in tracking trends that lead to successful marketing and promotional campaigns. Adds del Toro, "As competition enters the market, operators are asking for response and trends, and the strongest capability is data mining, which can identify a subset of people who have, say, churned in the last six months, and profiles of those who might churn in the future, and enables you to develop strategies to retain them."

Fully understanding a customer's purchasing patterns may not be possible, but with the available software, their profiles are becoming much better defined. "Do we truly understand our customers? No," says Rex Humsteon, vice president of information systems and technology for Jones Interactive. "But we're getting better, with more emphasis now on marketing. You can point to competition as the driving factor, but technology (and software) has always been the enabling tool to help your business succeed. As competition gets more aggressive, you realize you need better technology to service your customer. You don't have a choice."

Real issues, real time

Choice is the optimum word that affects not only marketing software, but dispatching as well. Digital boxes and Internet access contribute to new software issues facing dispatchers and field technicians. "They bring in a whole new level of complexity for the area of dispatch," according to Humsteon. "We need to pinpoint outages and service problems in real time, and bringing in those (software) tools will help take us into the next century."

For many cable operators, however, the next century is *now* when it comes to dispatch software. For instance, Superior Electronics' CheetahNet monitoring software will allow an operator to gather network status and performance which can be used by technicians, CSRs, dispatchers, marketers and others. If an amplifier, for example, fails in the field, an alarm alerts Cheetah, which notifies the dispatcher and the CSR, who in turn can immediately respond to customer inquiries.

"Our product manages the physical aspects of thou-

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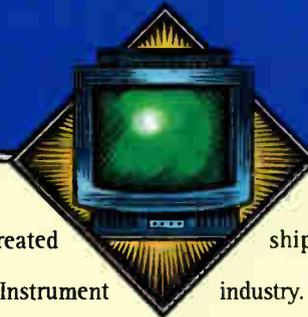
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Rob Strickland

Out here, two things consume your thoughts. Splicing cable. And your position in the food chain.

sands of components and aggregates together for one consolidated view of an operator's system. It interfaces with billing systems and dispatchers, and is typically tied into marketing software systems," explains Brett Price, vice president of Superior Electronics.

Superior, Price says, has integrated Cheetah into cable giant MediaOne's plant system. "MediaOne made the decision to use Cheetah because they had a history of network elements from several different cable providers. They asked us to integrate a very disparate system. It's imperative that you seamlessly integrate those elements to a customer care environment."

Cheetah, according to Price, can also detect "soft faults." "We all know when a cable is cut. Soft faults and plant noise are harder to detect, but they are critical if operators want to keep their plant running 24 hours a day."

MDSI's Advantex, which includes an automated dispatch module, is another leading product designed to increase efficiency in the field. The software allows field technicians to be notified within seconds of incoming provisioning requests or trouble reports, and by using map-based dispatching, can determine the most appropriate technician for a particular work order, while giving a clear geographic view of a dis-

patcher's "domain." Managers and dispatchers can then monitor the status of each work order, technician, or the entire fleet.

The advantages of a "workforce management" system such as Advantex, according to MDSI's Vice President of Telecommunications and Cable Bob Campbell, is more efficient maintenance and service. "Across the board, we've seen a 10-25 percent increase in efficiency gained by workforce management. And, on the dispatcher side, even greater efficiency because you're using one central location. The primary driver behind our software is fleet efficiency and customer service. Those are our goals."

Most cable operators and software providers have similar objectives with advanced software: Cost and management efficiency, marketing trends and actionable campaigns, and timely billing/customer data for CSRs. With software now aimed specifically at key operational disciplines such as marketing, billing, customer care and dispatch, MSOs are paying more attention to upgrading their software and systems and creating ways with which to use the data generated.

"In the past year, our discussions with operators have changed to what information can they get from systems to support their business, and what customers are providing profitability and less churn," according to Rob Deubell, director of outsourcing services and program

'The assumption is: If you can't provide data for your CSRs, you could lose customers'

CSG's VantagePoint program for data warehousing tracks customer trends.

The four key areas of software needs for the cable industry

1) Marketing and data warehousing to allow marketers and CSRs a detailed profile of their customers, leading to successful marketing campaigns.

2) Billing software which will allow operators an accurate, timely dissemination of statements, and merge valuable customer profile information.

3) Customer care software which allows CSRs access to detailed demographics, psychographics and customer history.

4) Dispatch software which allows immediate attention to outages, installs and seamless links between dispatch and field technicians, while gathering valuable data from customers on a daily basis.

management for CBIS, a global leader in billing and customer care software services for cable and other communications industries. Its CableMaster 2000 subscriber management system is being used by a number of cable operators.

"Operators are now relating more to marketing elements. The assumption is: If you can't provide data for your CSRs, you could lose customers, so they're looking to us for data warehousing. They want the best available, so it's up to vendors like us to figure it out," adds Deubell.

He notes that billing and customer care systems will be "blended" with in-bound and out-bound calls, using new software which will allow CSRs access to information to market directly to individual customers, and for "suggestive" selling through PCs and the Internet. "What's currently out there is computer/telephone integration, which pulls billing information and puts it against the database with critical data regarding previous calls. It automatically queues up out-bound calls, which maximizes a CSR's efficiency. However, only three percent of the call centers are currently using it," says Deubell.

Haves . . . or have-nots?

Sophisticated, leading-edge software is giving the now-competitive cable industry a set of valuable tools to better understand its customers, run its operations more efficiently, and generally improve its performance. Yet, for many small- to mid-size operators, the high-end world of marketing, billing and management solutions software is beyond their reach and resources, growing a veritable sub-culture of software users in the industry, whose software needs are simple, yet becoming more complex. Just the right environment for the entrepreneurial spirit to arise.

"Our most immediate need was niche marketing," says Skip Parcell, director of operations for Cablevision of Loudon, Va., a system serving 32,000 subs in northern Virginia. "We needed marketing software because our billing software couldn't do it. So, we converted off-the-shelf Microsoft software by stripping

down our CableData billing information every night, and downloading it to Microsoft. Now, we don't have to wait overnight for reports."

The result was a targeted group of people who received multiple campaigns called "Hurricanes" all at the same time. The company, according to Parcell, saw a five percent success rate. In fact, it was so successful, Showtime just completed a 90-day analysis and will do a case study on the campaign.

"In early 1996, we knew we needed to get into niche marketing, and our marketing department wanted numbers that MIS couldn't get to, or didn't know what to do with them when they did. Most important was sales and marketing. You must be niched, and you must have information NOW because marketing campaigns are planned months in advance. We have really benefited from our in-house campaigns and have significantly grown our business," says Parcell.

The numbers bear that out: From July 1996 to July 1997, Cablevision's system grew 10 percent; its "Value Package" grew 26 percent, and penetration was up 15 percent. Its total premium growth and penetration were up 44 and 31 percent, respectively. And, its total premium revenues were up 22 percent for the one-year period. "Software is math. If you can find the tools to reach people, you can do it," suggests Parcell.

For smaller cable operators, such as Satellite Cable's 9,500-subscriber system in Desmet, S.D., the software issue is growing in importance. The means to address it are simply different from the large MSOs. "In addition to our billing software, which is an Azar system, we wanted operations software to track installations, determine where junction points were, where the drop was, the last resident, the latest post office mailing needs and so on, and the Azar system does that," says Doug Bierschbach, vice president and general manager of Satellite Cable.

Though Bierschbach's system is small, its software requirements are similar to the largest MSOs, according to Bierschbach. "Our needs are: 1) Getting out accurate, timely customer statements and doing it well; 2) Software systems must be flexible, with no unreasonable costs, and progressive enough to see future needs like Internet and HITS; and 3) Costs. We don't want to devote five percent of our revenue just to get out a monthly statement."

Pooling data may be the only way small cable operators can compete in the battle for data, however. "The greatest hope for small operators may be pooling data. I wouldn't want to compete with a TCI for data, and data is gold," says Hanifen, Imhoff's Abbott.

With turnkey software packages from providers such as Cable Access America, which is designed to help cable and wireless operators offer Internet services; Proxima's Pro-Cable customer management and billing system (Proxima recently entered into a strategic partnership with London-based Logica); CNI's (Community Networks Inc.) Pulse; Contec's Closed Loop System, and others addressing nearly every conceivable cable system function, a cable operator's most pressing software needs could eventually be solved with a simple keystroke, and data, data, data. **CED**

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Cracking the
Part 2 commercial
of a series
telecom market

By Leo A. Wrobel, President and CEO, Premiere Network Services Inc.
premiere@dallas.net

Whether provided by telephone or cable companies, the networks of tomorrow will require close collaboration between carriers, equipment vendors and government regulatory authorities. Does your company simply wait for its equipment manufacturers to come in and dictate the direction of technology, running the risk of becoming road-kill on the information superhighway, or do you like to dabble and experiment with new ideas?

The best approach, of course, is to be proactive. Test technology. Stretch your customers' imaginations to the limit. In the process, you can leapfrog ordinary technology and your competitors at the same time.

In this article we will explore three such areas, and learn how to proactively drive the upcoming revolution in telecommunications. The first is essentially what "everybody else in cable will be doing;" namely, raiding the telephone company's markets. There are right and wrong ways to do this. The second is what forward-thinking cable companies will be doing to exploit the "SOHO" (small office, home office) market—one which they are uniquely positioned in many ways to serve. Lastly, we will tell you a little about what big companies need, and how a cable company can exploit this difficult to penetrate but highly profitable market segment by differentiating its services and solving pressing business problems.

The availability of unprecedented amounts of bandwidth in local and wide area networks afforded by cable companies will change the dynamics of how we do everything. How it is packaged, presented and perceived by the potential customer is paramount in importance. Hopefully this article will assist in deciding which markets hold the most promise for your particular company, and in crafting your strategy to profit from them.

For clarity, the three distinct opportunities for cable companies are illustrated as: The $2 window; the $5 window; and the $100 window. The analogy with the racetrack, however, stops there. Unlike a game of chance, if you craft the proper strategy and introduce it early in the game, these opportunities can be close to a sure thing.

POTS resale ($2 window)

Reselling plain old telephone service (POTS) is what just about everyone in cable is looking into doing. And why not? At least initially, the margins look appealing. Resale of residential and business telephone service will become a major part of the revenue stream of many cable companies. Already, some cable companies are deploying shared tenant services to major apartment and office buildings. While a cable company is building a market presence, it can also capitalize on certain "captive" markets such as apartment or condominium complexes. Many times, renters like the "all bills paid" convenience afforded by apart-
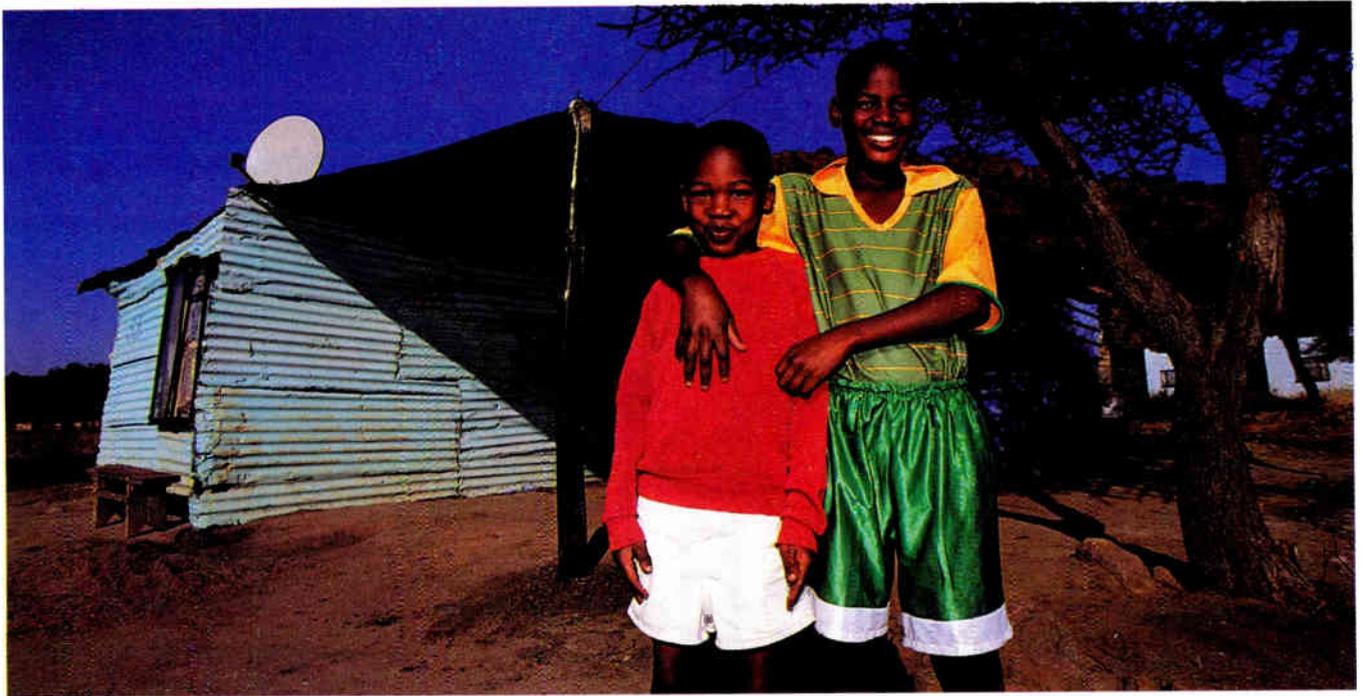
For David and John, Pace and MultiChoice are perfect partners

When MultiChoice Africa decided to launch digital satellite TV in 1995, it chose Pace as one of its partners to supply the set-top boxes - and keen soccer fans David and John didn't realise how lucky they were.

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But Pace, with its local partner, provided much more than set-top boxes - it built a distribution network and developed an installer accreditation program. That commitment to growing the market continues with dedicated local marketing support.

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ments. Items like electric bills are already billed in the monthly rent, so why not local telephone services, too?

A nominal monetary incentive to an apartment complex owner may even be used to secure a block of customers for not only cable TV services, but local telephone service, long distance and Internet services as well. Caution should be the operative word, however.

Already we have heard stories of a few cable companies locking in customers, then denying choices to long distance carriers and engaging in anti-competitive practices by virtue of their "monopoly" position in the apartment building. It can be expected that regulatory agencies will stand rather hard on this kind of behavior when the complaints start coming in.

So what is the best way to exploit these

kinds of markets? Unquestionably for the present it is through the purchase of unbundled components from the local telephone company. Your cable company will have to file for certification in the states it wishes to serve (if it has not already), and once approved, it will negotiate an interconnection agreement with the local telephone company in the service area desired. This company is now called an ILEC, or incumbent local exchange company. Your company will technically become a CLEC, or competitive local exchange company.

A CLEC can buy unbundled components from the ILEC to build and market whatever kinds of services it desires. For example, you can lease a copper "loop" from the ILEC and

connect it to your own switch. Your company can also lease T-1 services, interoffice switching, billing and collection services, operator services and myriad other services under terms and conditions negotiated with the ILEC in the interconnection agreement. Specifics of exactly how to do this are far too complicated to be included in this article. Suffice it to say, that if your company is astute enough to assemble unbundled telephone components and combine them with other services, the margins are good, and prospects for profit exceptional.

Enhanced SOHO services ($5 window)

Next to consider are more emerging technology-based services such as Internet access and advanced telecommuting services for the

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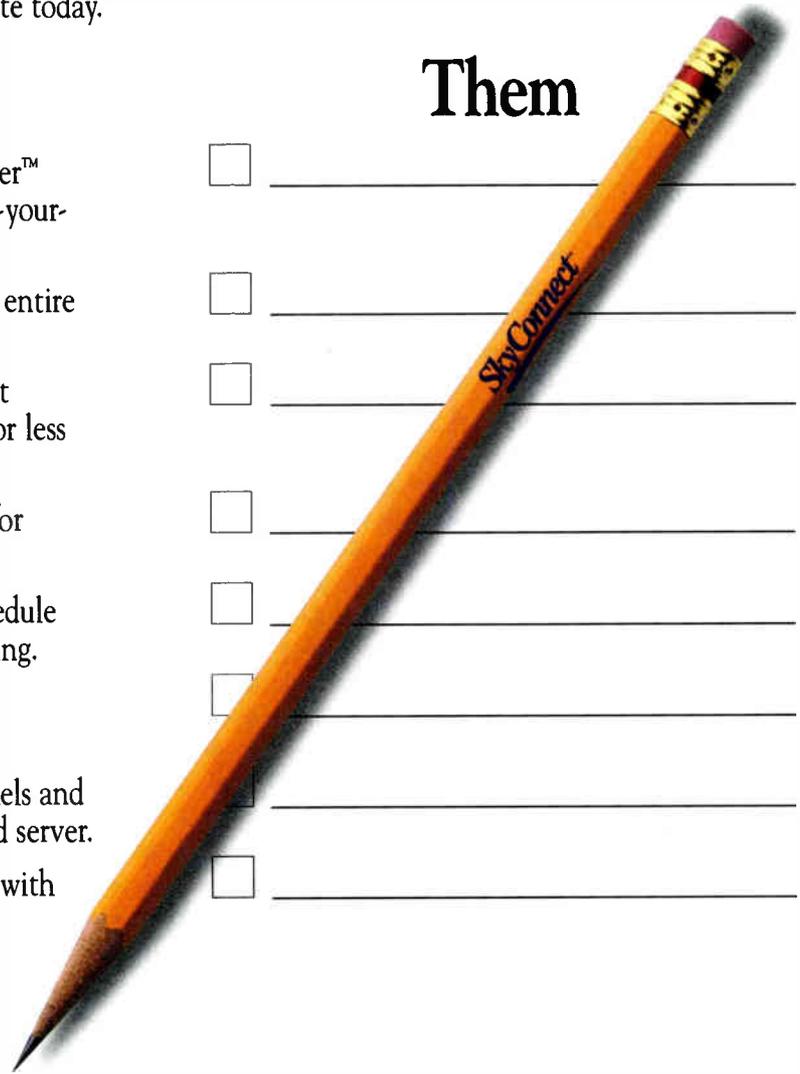
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small-office home-office (SOHO) market. In many ways, this is one of the areas where cable is positioned to take the lead.

There are areas in virtually every metropolitan service area where people have the demographic profile in terms of income, occupation and technical savvy to avail themselves of high-speed data services to the home or small office. Internet access is particularly lucrative at the present time. Anyone who has every surfed the Internet at 14.4 Kbps knows that the speed of traditional modems, even the newest 56 Kb variety (when they run at that speed) is woefully inadequate. ISDN lines provide some relief, but even 128 Kbps is underpowered for large downloads, graphics, video and multimedia. That's where cable modems come in.

Of course, as we pointed out in last month's article, this is easier said than done for the cable company. Large capital investments must be made to upgrade the network for two-way traffic. Or is there a way to sidestep this expense, at least initially? There is. Read on.

Think back for a second to that certificate of operating authority your company filed for. Remember, it allows companies like yours to buy unbundled components from an ILEC for resale. Just suppose you combined this capability to buy what you need from the telco and then supplement it with what can be provided in your own network. The key here is to be sure your certification does a few things, namely:

1. Provide for co-location of your equipment in the ILEC's central office. This will give you the meeting point you need to connect your equipment to its.

2. Make sure your certificate of operation in the state where you are doing business allows you to be a *facilities*-based carrier. That way, you can use your network whenever possible to save money, but round it out with the telephone company's network where it makes economic sense.

The "Fortune" level ($100 window)

This class of customer might just represent the most demanding, highest cost, least loyal and most highly competitive market segment your company will tackle. It might also just be the most profitable. Large corporations have insatiable appetites for telecommunications services of all types. They historically play hardball with all service providers, shop the market thoroughly and take a sharp pencil into negotiations. Nonetheless, they possess in many cases the intellectual savvy to understand even your most technologically advanced offerings and

The cable company must be prepared for a long sales cycle
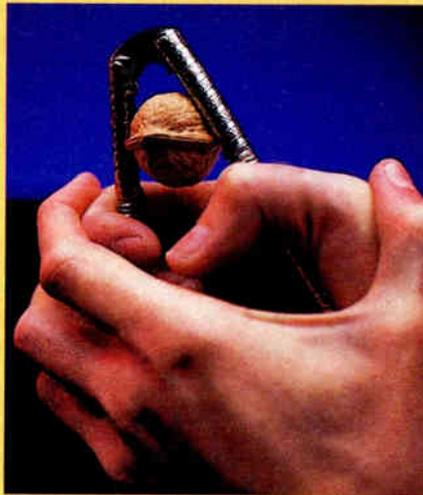
Figure 1: The $2 window. Traditional resale.

Start with "traditional" telephone services

Break into unbundled components

Switching components   Interoffice transport   Billing & collection   Copper loop
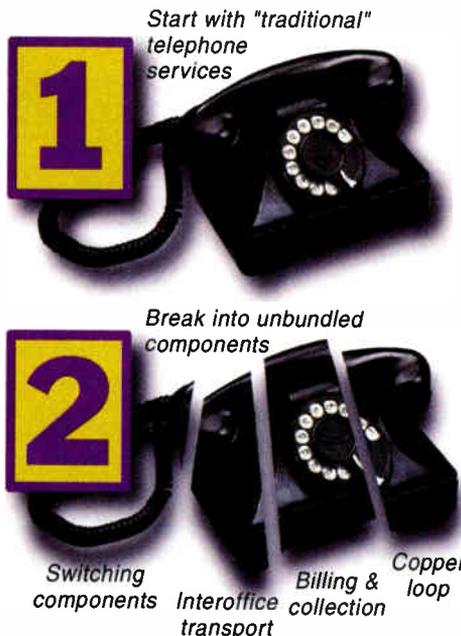
Projection: The average resale rate adopted by state regulatory commissions is around 20 percent. Companies astute enoug to assemble **unbundled** components purchased from the telco can expect much higher margins, at least initially.

have the muscle and capital to help you develop them—allowing you to sell the process elsewhere in years to come.

Getting a few of these bellwether users under your belt is therefore very useful indeed. To even have a chance in this market, however, the cable company needs to understand the unique dynamics of these organizations, and be in tune with what they care about. They must also be prepared for a long sales cycle, and be prepared to craft real, effective business solutions. Here are a few tips:

✔Use your advantages to tap the corporate market. First off, understand a few of the operational issues which plague today's large corporate information systems and telecommunications departments, especially surrounding the hard-to-manage client/server arena. A few of the operational issues associated in today's processing environments which can be capitalized upon by a savvy cable company include:

1. How do we give our users the bandwidth they will require at a price they can afford?

2. How do we intelligently overlay core business problems onto the appropriate advanced network technology?

3. What are "killer applications"? How do we grow them, shrink wrap them, and sell them to a skeptical user base?

4. How do we measure the results of network improvements in ways which will elevate our standing as professionals and create maximum impact on the core business?

5. What are we going to do about providing help desk support? Can we off load any of this responsibility to our vendors?

6. Can you imagine the "spare CPU cycles" on everyone's desk in our organization at this time? Is there any way we can tap this capacity by sharing services over a radically advanced network?

7. What about the long-term environment? How can we exploit opportunities in local telephone competition, for example, and other major industry changes afforded by new regulation and legislation?

In addition to these "hot buttons," anything which helps manage a client/server environment better might just provide the compelling reason a Fortune-500 company needs to give you a try.

✔Insatiable user demands for capacity. Users want to share larger and larger files, taking a greater and greater toll on network capacity. They need higher capacity services, and T-1 is not enough anymore. Cable is technologically capable of providing 10 Mbps and 16 Mbps services—native LAN speeds. These are much more appealing to

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The RDU is a new piece of test equipment. It allows technicians to monitor the return system from any point in the cable system without the traditional and cumbersome HE spectrum analyzer / camera setup.

The RDU allows system installers and technicians to view on any TV screen, the RF levels, Ingress and Noise present back at the HE from a subscriber's home, system amplifier, feeder tap or fiber node.

RDU: patent pending
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The RDU processes the X / Y output data generated by an internal spectrum analyzer and converts it to NTSC video for input to a standard CATV modulator.

The RDU displays noise, ingress and RF carriers, the same as a spectrum analyzer.

In addition, the RDU displays HE return levels on any 2 carrier frequencies in the 4-44 mhz bandwidth with a .5db resolution.

All controls for the RDU are software driven, no accidental changes in analyzer settings. The RDU is a stable environment for return monitoring and testing.

RDU allows test carriers and ingress / noise levels to be easily documented from every installation and service call.

The RDU is an efficient new tool to activate and maintain broadband return networks.

Above are samples of a TV screen that system installers or technicians would "see" in the field.

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Figure 2: *The $5 window. New services for the SOHO market.*
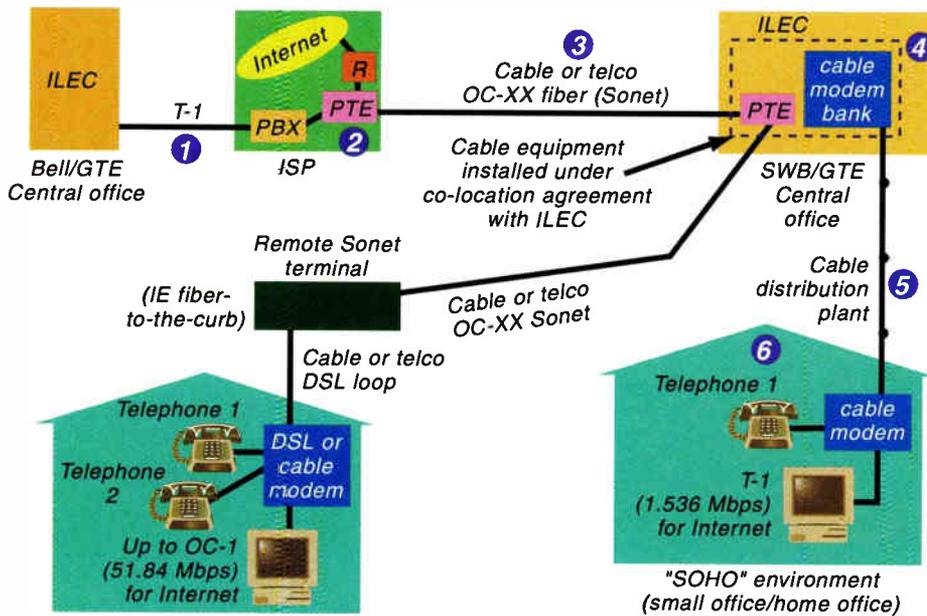
1 Discounted telephone services procured in multi-tenant sharing arrangement, using FCC proxy rate or by assembling unbundled components.

2 Telephone services are packaged with enhanced components through partnership or acquisition of ISP (Internet provider services).

3 OC-XX facilities provided by cable company or leased from ILEC through ICB assembly to central office serving "affluent" market.

4 Cable modem equipment placed in Bell central office under co-location tariff.

5 Coaxial "loop" to customer provided by cable company.

6 Result: Phone line, plus T-1 interconnection to Internet delivered for less than $50 per month.

this class of user and will sell.

✔Help desk support. This is a big deal. Any value-added services that the user can get from his supplier are a big selling point. As a minimum, do not expect this potential user to take on any additional overhead in this area just to accommodate your company–they'll show you the door.

✔System backups and archival. Could your company provide this user enough capacity to do things like on-line vaulting? That's where the user has enough affordable capacity (T-3 level or better) to connect to a remote location and do transaction backups in real time off-site. It is a very salable commodity to banks, brokerage companies and other firms where last night's tape backup is obsolete at five past nine.

✔Network management. This may be *the* most important consideration. Before opting for an "unproven" carrier, the Fortune-500 level client will want to see a Johnson Space Center level of network command and control. There are sound business reasons for improving your network management and control capabilities. This includes providing (or selling) high level network management services to client/server customers essentially "black-boxing themselves to death." Many information executives and end users alike are having second thoughts regarding management of technology because of cost, the rapid pace of technological change and staying focused on their core business issues.

Things to consider in a network management system include:

1. Can you log on to one device and survey

can be replicated elsewhere. They can also be licensed, shrink-wrapped and resold to less forward-thinking companies (after you have moved on to bigger and better things), providing new sources of revenue. **CED**

About the author

Leo A. Wrobel holds degrees in Telecommunications Systems Technology, Electronic Systems Technology and Business and Public Policy. An active author, lecturer and technical futurist, he has published eight books and dozens of trade articles on a variety of technical subjects. For the past 10 years, Wrobel has been president and CEO of Dallas-based Premiere Network Services Inc. www.dallas.net/~premiere

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everything going on in your network right now?

2. Do you have "blind spots" in the network behind critical components where you have to guess what is going on?

3. Does the first indication of trouble come from a control system, or from screaming users?

4. Do you ever get knowledge of impending trouble before the users notice it? Are you able to perform proactive maintenance?

5. Does your network management system provide your organization performance management; accounting and chargeout management; change control; alarm and problem resolution; audit and inventory of asset management capabilities; and capacity planning for future needs?

You will need these kinds of capabilities to be up to par with that bank, factory, brokerage house or other demanding user. You will also need to refine your capabilities in this area as your own company's network becomes more complex as a result of the new directions we have outlined in this article.

Summary

If you bat 1.000 on all of these issues, then your company has a chance to crack these potentially lucrative markets. Then the fun starts.

With the capacity that a well-designed cable company can bring to this class of user will come new services, some of which will permanently alter the way that user does business—and the way you do business. The things you learn by dealing with these new classes of customer

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Audio levels scream for attention
Headend maintenance, part 3

By Linc Reed-Nickerson, Product Development Manager, TV/Communications Test Business Unit, Tektronix Inc.
linc.reed-nickerson@tek.com

Editor's note: Parts 1 and 2 of this series discussed several ways to improve video performance at the headend. Part 3 deals with audio.

Simply stated, audio levels are the biggest area for improvement in a cable system.

Audio was long the poor stepchild of video in broadcasting. In 1953, the major television networks offered color, but it wasn't until 25 years later that they added high fidelity audio. FM stereo was in use in the early '60s, and by the 1970s, most FM stations broadcast in stereo. AM radio had multiple proposed standards for stereo. Stereo never caught on, however, probably because of a lack of receivers. Now, many AM stations are turning stereo off, or going off the air altogether. Television didn't adopt stereo

until the 1980s, with many markets still transmitting monaural sound in 1990. Fortunately, with the availability of receivers and programming increasing, there is a corresponding increase in stereo broadcasts.

Today, consumers have moved from the five-inch or smaller speaker found in most sets regardless of cabinet size to home theaters with elaborate speaker systems and Dolby surround sound. With the quality of television sound improving, subscriber expectations are raised correspondingly. Many cable systems fall short of what consumers expect.

It is interesting that a survey of the public has indicated the number-one reason for moving from VHS tapes to the new DVD disks is not improvement in the quality of the picture, but improvement in the sound.

The biggest complaint about audio is, "Why does the volume change from channel to channel on my cable system?" I have heard many excuses about why this problem cannot be solved, but good engineering practices,

attention to proper level setting, and judicious use of level maintaining devices do work.

Getting into the problem

First, let's look at some technical basics to make sure the system is properly wired.

Most operators know how to make up good F-fittings. Audio connections can be another matter. Unfortunately, there are as many different connectors or terminal strips as there are manufacturers of equipment, so making up connections can be a challenge. Let's start with the wire itself. The author has seen everything from microphone cable to zip cord used! There is good two-conductor shielded cable available from several manufacturers, however. As a former broadcaster, the author has a great deal of experience with Belden* 8451. It can be used wherever balanced or unbalanced audio connections are required. Belden 8451 is a twisted pair of #22 stranded wire with a foil shield and a #22 tracer. The use of solid conductor cable is

He Did It All Himself...

2 sausage pizzas, a six pack, and hooked-up his own cable TV.

We don't even know his name, but we know his method of operation. He can cost your company thousands in lost revenues, not to mention the fact he offered to hook-up his brother-in-law this weekend.

Cable Leakage Technologies has been in the RF leakage detection business for over 6 years and Wavetrackers have patrolled millions of miles of cable all over the world. Wavetracker boasts positive identification, 2-5 meter accuracy and one step prioritization. And all of that because CLT *invented* the original Wavetracker...it's that simple.

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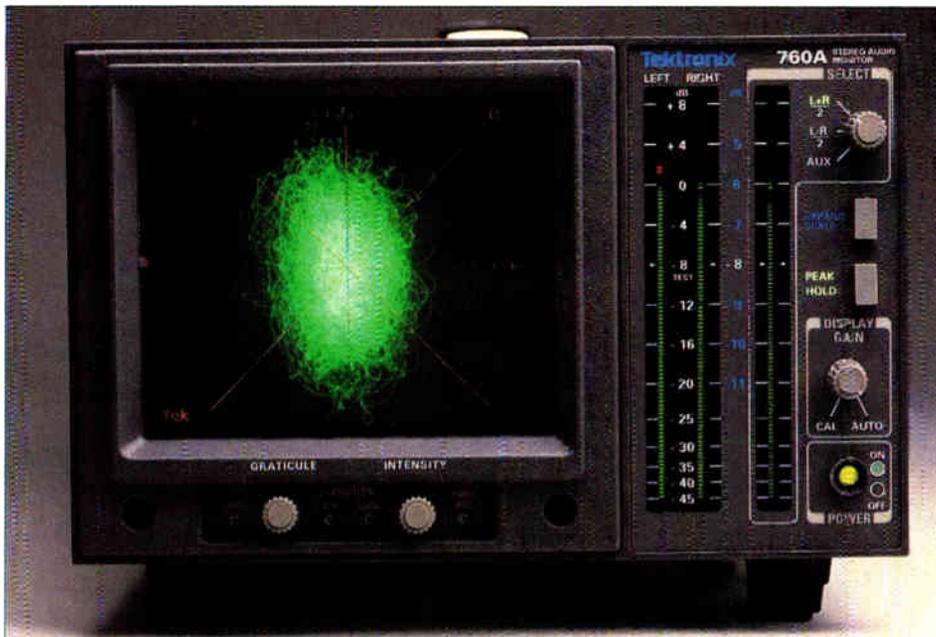
Figure 1: An audio monitor will help you optimize stereo performance by showing the relationships between the left and right channels.
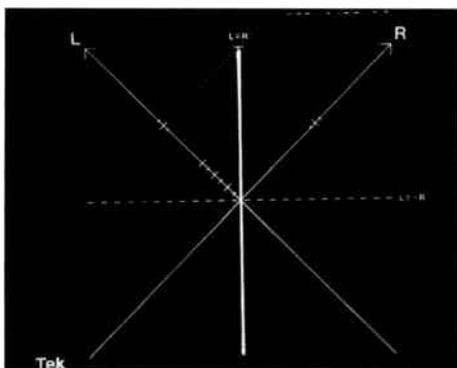
Figure 2: Left and right channels matched in phase and gain.

Figure 3: Out-of-phase stereo, unsuited for mono.

Start the headend audio 'tune up' with the off-air broadcaster

shield unconnected, just as you would with a balanced pair. Connect the black wire as negative terminal if you are making a balanced connection, or to ground if unbalanced.

Audio cables are available with a colored jacket. This can be a very good way to identify a left, right, mono or control pair. The author uses red to identify a cable that is carrying a critical signal–one that should be thought about before it is disconnected, such as power to an LNB.

As mentioned in part 2 of this series, the three most important things to remember for good performance are levels, levels and levels. If you observe good engineering practices and keep levels correct, your system will perform at its best. Of all the levels to set, audio can be the most challenging. Comparable to the 1 volt p-p level nominal for video, most cable TV audio equipment expects to work at 0 dBm.

Use some tools

Before we get into proper levels setting for subscriber satisfaction, let's talk about a simple tool often overlooked–the TV set in the headend. If you are still using a 12-inch monaural TV set, you need to upgrade. Select the same class of TV set as the majority of your subscribers–a 19-inch or, preferably, large stereo TV with remote control. When you make the purchase, be sure the set has stereo audio and video outputs available on RCA jacks. Now you can look, listen and surf.

Because a cable headend, which often has high ambient noise, is not a typical living room environment, a good pair of stereo headsets with high impedance should be part of the tool kit, too. Expect to pay about $100. At a minimum, you should have a sound level meter, such as the Radio Shack 33-2050, which you can use for general level setting. Many volt ohm meters (VOMs) will have an audio scale that is calibrated in dB. For proper stereo level and balance, you will want a test set with stereo metering and a lissajous display.

With these tools, plus your eyes and ears, you are now ready to balance your headend for high quality audio with little variation from channel to channel. Start the headend audio "tune up" with the off-air broadcaster. Most broadcast stations pay particularly close attention to audio levels. With the exception of the non-commercial stations, most TV stations heavily process their audio to accommodate loud commercials, which commercial producers have, in turn, heavily processed to make them loud. Being loud does not mean overmodulated; it does mean average levels are kept artificially high, however.

What this means to you, as a headend operator, is that any channel, broadcast or satellite

NOT advised because it breaks too easily.

There seems to be some confusion in the industry on how to properly prepare audio cable. In audio wiring, the shield is connected at one end only. Connecting the shield at both ends of a cable may result in common mode problems, often referred to as ground loops. The best way to make up a good cable is to remove about two inches of the outer jacket. Peel off the foil shield, use 1/16-inch shrink tube on the shield trace, and 1/8-inch shrink tube (about 3/4-inch) to seal the point where the wires emerge from the jacket.

Systems typically have both balanced (two wire and shield) and unbalanced (single conductor and shield) inputs and outputs. When using two-conductor cable with unbalanced connections, tie the black wire to the shield on one end of the cable, but not on the other. Leave the

Figure 4: Stereo with strong left content.


Figure 5: Severe clipping.

Figure 6: Balanced stereo well-suited for mono.

that has commercials will typically be the easiest to set and maintain. In many cases, processors are used to place a broadcast station on the system. Because you cannot control audio levels in processors, this is the place to start setting your system loudness. The broadcasters are the reference point . . . use your ears.

Now use the meter

Meters are of limited help in setting loudness, but can be used to get close. It can be as simple as placing the sound level meter in front of the TV set audio. Initially set the meter so the ambient room noise causes little or no deflection on the meter using the range selector. Now set the volume control on the TV set for peaks of about +2 dB. These are relative settings and do not tell you anything about deviation. At this point, you are just setting loudness.

Once your meter is set, surf through the channels and look for those that are high or low. You can get close with the meter, then use your ears for the final tweak.

For channels with commercials this should be easy, because audio processing is similar from channel to channel. The challenge comes in setting the levels for the premium channels and pay-per-view channels. You have to use your eyes and your ears. Regular program content may not be satisfactory. The best place to set levels is during movie credit music or, because you might not be able to wait that long, a male voice center channel. If you set the level during scenes such as air-to-air combat or during a more romantic moment, you are probably not going to get it right.

Once this is done, do it again; but wait a day or two between set-ups. It usually takes about three set-ups to get it right. Once you do, it is very easy to keep it right by surfing your system about once a week. Very soon you will know which channels need an occasional adjustment. Today, most operators provide relatively consistent audio–a few still don't. For those channels, you might want to
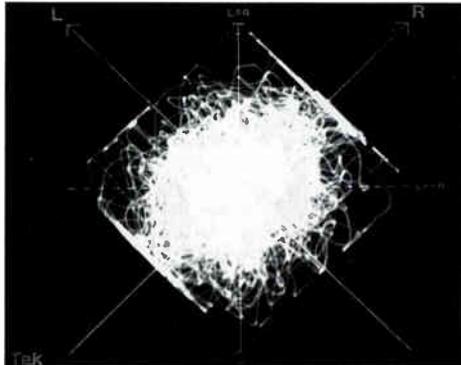
consider a device such as the Audio Rider.

Local origination channels can be completely out-of-control. The author highly recommends audio processing be done here. Aphex, DBX and others make compressor/limiters that can be used successfully for this application.

The finer points

To this point we have only talked about setting loudness in a quick, yet highly effective, manner. Now let's review some of the finer points of setting audio in a headend. As with video, it is important to set levels throughout the audio chain. Be certain there is 0 dBm maintained from the output of the satellite

The male voice center channel is a good place to set stereo balance

receiver/IRD to the input of the modulator. If you want, you can use bessel nulls to set deviation, but that is probably overkill in most headends.

To optimize stereo performance, you need to see the relationships between the left and right channels. For that, you need an audio monitor such as that shown in Figure 1.

The ability to look at stereo audio using the lissajous pattern displayed on an audio monitor will allow you to instantly see if your stereo is working, is in phase, is balanced, and is not being distorted by clipping. It is usually best to get the mono levels right first, and then work through the stereo channels to fine tune them.

The audio monitor can be connected to the left and right output of the stereo TV set or demodulator. The lissajous display will show a single vertical line for a monaural signal, as shown in Figure 2. If a horizontal line is dis-

played, as in Figure 3, it is an indication of an out-of-phase connection somewhere in the headend. This is a very bad condition, because anyone with a monaural signal will have weak and distorted audio.
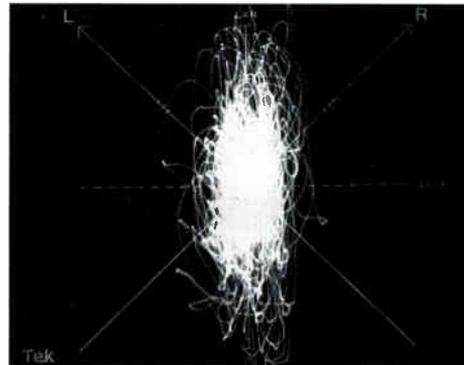
Quite often, with only the bar graph metering on the front of the stereo generator, it is very difficult to achieve correct stereo balance. Just as in setting loudness, the male voice center channel is a good place to set stereo balance, using your eyes and ears, of course. Figure 4 shows stereo with the left channel set too high.

If the display on the audio monitor shows distinctive lines at the outer edge, it is a result of clipping. This usually means a device in the audio chain is being overdriven (most likely) or a component has failed (less likely). Figure 5 shows a stereo signal with severe clipping, which will make it sound very distorted.

You can make up a set of leads like those you made up for your stereo headset to check levels and balance throughout your system. Once you have your system balanced for stereo, take the time to go through the headend again to be sure you have proper loudness settings. Figure 6 is how your system will look when it is properly balanced.

Many things can be done to polish the performance of a headend, and the suggestions I have made in this series only scratch the surface. SCTE chapter meetings are a good place to exchange ideas and find out how other operators have dealt with problems. The SCTE list on the Internet is another. You can join the list by sending the message "subscribe scte-list" to listserv@doit.wisc.edu. There are other methods that can be used to produce the same results.

The final article in the series will discuss ways to turn on digital services with minimal problems and increased subscriber satisfaction. **CED**

Editor's note: Radio Shack is a registered trademark of Tandy Corp., Fort Worth, Texas. Belden is a registered trademark of Belden Wire and Cable Company, Richmond, Ind.

PHOTO BY NICK WHITE, FPG

Rhapsody in network management

How to conduct a harmonious organization

By Van Macatee, Director,
Managed Network Services,
WTCI Inc.; and Mitch Matteau,
Director, Customer Service,
Arris Interactive

As the cable television industry begins to seriously contemplate the ins and outs of network management, two facts are becoming increasingly clear: 1) no matter how sophisticated the technology, it is of limited value if not organized and used to its fullest benefit; and 2)

competitors figured this out a long time ago.

To put it another way: to be a serious player in the telephony, Internet access and digital television markets, it is essential to master the subtleties of network management. Our industry is flooded with articles that describe models for designing network management systems, but without an understanding of how to build a responsive organization around the system, and how to use every bit of data delivered from a system to optimize cost efficiencies and increase customer satisfaction, their true worth will never be realized.

For almost a year, TCI has deployed and operated advanced two-way plant and services in several of its markets. These test beds have proved invaluable for trialing and testing new technologies, systems, processes and organizational paradigms. The following lessons and benefits—many drawn from our experience in deploying cable telephony—can be of great value to system operators, suppliers and vendors who are looking for a critical competitive edge as they enter a new age of cable service.

Organizing functions for success

The effective network manager skillfully blends industry and technological knowledge, a vision for customer satisfaction, and organizational leadership to create a process that continuously challenges the operator (and its vendors or suppliers) to strive for higher levels of customer service. Preventing problems or fixing network faults quickly and efficiently removes cost from the business, drives the unit cost of activities to the lowest possible level and improves customer satisfaction.

However, a good management structure is also essential to a successful network management operation. A wide diversity of disciplines–fault management/status monitoring, customer repair diagnosis, alarm/trouble correlation, tracking and escalation, event management and preventive/scheduled maintenance programs, among others–must be functionally organized to allow for effective multi-tasking and clear accountability. This structure allows the network manager to successfully deal with simultaneous issues by targeting inquiries to specific persons responsible for specific functions, without placing them in the impossible position of solving conflicting priorities.

In general, it is necessary to group some functions and clearly separate others. The fault management process and the customer repair process are two examples that must be structured to occur in parallel. The fault team must be able to detect and manage a major HFC fault in one section of the network without hindering

Figure 1: Network management functional organization

National operations control center — NOCC
- Status of all systems
- Traffic management/planning
- Event management
- Single point of contact for network operations

Regional maintenance control center(s) — West / East
- Physical/logical network surveillance
- Network installation, preventive/reactive maintenance, restoral
- Network dispatch
- One/region supporting several markets

Trouble report administration center(s) — West / East
- 1st level of trouble diagnostics
- Ticket routing and follow-up
- Trend analysis
- Prime interface to cust. serv.

Customer fulfillment center(s) — Market A / Market B / Market C / Market D / Market E
- Customer provisioning
- Premium installation
- Premium repair
- All products
- CST dispatch
- One per market

Figure 2: Ancillary network management functions

Network performance & results	OSS architecture & operation	Network management center: Real-time management	Capacity planning	Process & vendor management
• Production of all operational metrics and performance reports & KPIs	• Design for all mission critical ops systems	• Day-to-day, 24x7 oversight of all systems	• Oversight of network fill rates	• Management and ownership of all key process and vendor SLAs
• Architecture for data collection	• Ensures all open systems standards are complied with	• Fault management	• Capacity planning	• Monthly service reviews with all operation vendors and suppliers
• SPC, Pareto, production & distribution to all parties	• Ensures all regions and markets operate in compliance with SLAs	• Repair management	• Mass call event coordination	• Chief P.O.C. for redemption of chronic problems
• Keeper of all service improvement plans	• Single P.O.C. for system interface or coordination with market units	• Outage/event notification	• Traffic management and coordination with other carriers	
• FCC and outage reporting		• Overall coordination with contribution networks		

the customer repair team's ability to continue to work "normal" troubles from the balance of the network. This type of thinking reduces process failure, while keeping resources free to address problems as they occur.

As a company grows, the ability to scale becomes important. In a very large operation that spans dozens or even hundreds of mar-kets, splitting the functions into appropriately-sized regional network centers leverages the in-place network management assets across a larger network base, and therefore creates ever-increasing economies of scale. A typical functional organization is depicted in Figure 1.

Also, non-real-time functions of a network management organization should be structured separately from real-time activities. Although separate, these functions still support and complement the network management center, forming a critical and comprehensive suite of activities (see Figure 2). Although these functions presume a product portfolio that contains analog cable, digital television, Internet services and telephony services, this model can be adjusted to reflect a particular network and the products it carries.

Network management in action

The following incident provides a graphic example of how an effectively-organized network management system can impact cost and customer service issues.

✔Tuesday, 9:05 a.m.: A delivery truck knocks down seven drops in a cul-de-sac.

✔9:06 a.m.: An alert message reporting a telephony voice port (one of the seven drops) has gone out of service appears in the network management center.

✔9:12 a.m.: Status monitoring technician checks HFC status monitoring system and determines there to be no fault reported. Therefore,

✔9:14 a.m.: A truck is dispatched to the location of the fault to investigate.

✔9:40 a.m.: Truck arrives and reports drops down. Assistance is requested.

✔9:55 a.m.: Second truck arrives.

✔10:20 a.m.: Network management center sees telephony fault clear.

✔11:20 a.m.: Field tech reports all drops replaced and all service restored. Door tags placed explaining that a service failure had been detected and repaired while the customer was away.

This is an actual event that occurred in March 1997. Although the outage lasted for more than two hours, not one customer service call was generated. Without the telephony voice port installed in the cul-de-sac, residents arriving home that evening would have discovered that they were out of service and barraged customer service with angry calls. Without status monitoring capabilities, there would have been no way to know the HFC plant was clear of faults, therefore preventing unnecessary truck rolls or "windshield time." If you extrapolate this event across an entire network, it becomes easy to see the enormous benefits of a well-thought-out network management system.

Operations science

Operations science is a practical methodology that supports and defines a company's fundamental commitment to understanding and improving the outcomes of its business and network practices on a daily basis. The

key component of operations science is proper measurement, which in this sense, should be thought of as a systematic plan for collecting information about the quality or performance of network output.

Today's status monitoring and network management technologies generate enormous volumes of performance data that often go unused because of their sheer volume. One important tool that allows a network manager to rapidly identify and correct problems is statistical process control (SPC), which uses control charts as statistical methods for charting multiple data points generated by a process or network. The mean, upper and lower control limits for a string of data points are then calculated to determine performance. The mean reflects the average or overall performance, as well as the general trend, while the control limits reflect the highs and lows around the mean, helping to define the quality of the process or service.

This can be illustrated in a typical telephony-over-cable application (see Figure 3). Some equipment provides alert messages (indicated here as code EQP803) each time a voice port experiences a change-of-state (i.e., any time the device goes from in-service to out-of-service, or vice versa). The element manager logs each event both in terms of device name (location) and date/time, down to the second. Figure 3 charts the daily total and calculates the mean and control limits based on a rolling 30-day format. The mean (the light purple line) moves from around 100 to near 300 at the end of the first 30-day period as a result of a seven to 10 day period of instability. In statistical process control, data points (the sharp spikes above the upper control limit) are most often caused by forces external to the process or network, which is the case here. The points in this example were the result of planned upgrade activity in the network that occurred inside of maintenance windows (1 a.m. through 5 a.m.).

The perfect companion to a control chart is a Pareto chart (see Figure 4), which "decomposes" the data and provides a rank order view of the variation. In this case, the chart is published weekly and reflects the locations of the daily voice port alerts. The left scale is the count of voice port alerts, while the right scale is the percentage that each element is of the whole. By focusing on the "high bars," the effective network manager has a roadmap to prioritize the team's efforts into the area with the highest return and greatest impact—in other words, concentrate on the "worst offenders," instead of trying to fix everything at once. Each successive week should yield fewer alerts (typically resulting from a differ-

Figure 3: EQP803 alert count SPC
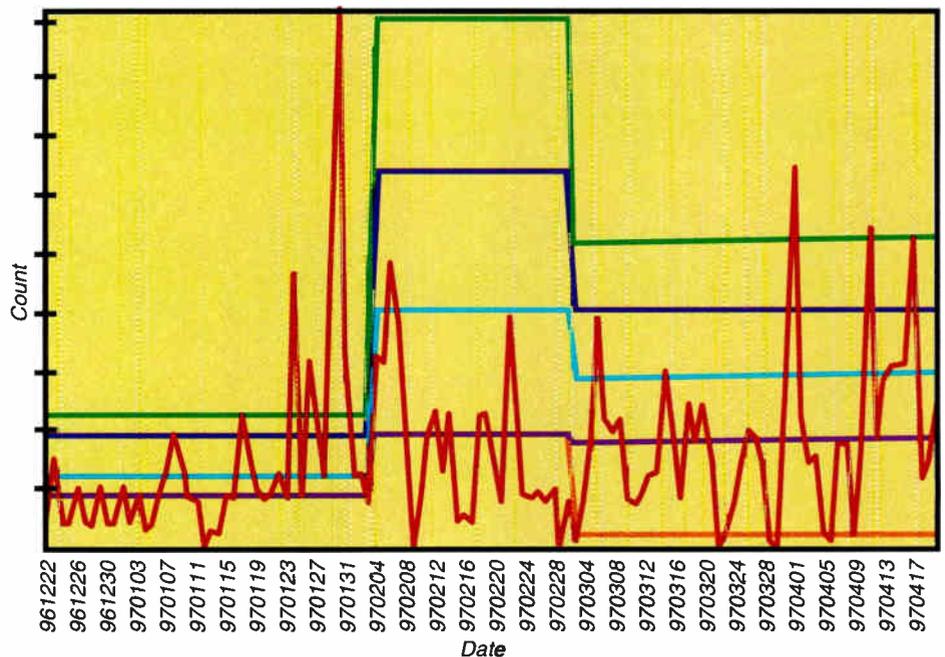
ent root cause), and the result over time will be a continuously improving network.

While these and other tools are critical elements in any network management system, the key remains constant vigilance over the network. Careful monitoring, combined with a daily review of available data, must in turn be followed by taking corrective action on every event in the network. Dealing with issues as—and in many cases, before—they occur will pay handsome dividends in both cost and customer satisfaction.

Lessons learned

We could list many other examples in which raw data can be used to optimize a network's efficacy. However, the point cannot be made strongly enough that without a carefully designed network management system that enjoys broad organizational support, the potential impact of such data can be greatly diluted, or lost entirely. Using the following suggestions as logistical and philosophical underpinnings will provide economies of scale that will make any network management program more efficient and cost-effective.

✔Centralize NOCs. Traditional wisdom in the cable industry places a network management center in each local system or market. However, local exchange carriers (LECs), interexchange carriers (IXCs) and Internet service providers (ISPs)—all of which are either in the process of completing, or have recently completed the task of consolidating their regional management centers—prove that one national network man-

agement center, or regional centers which oversee many local systems, is the best model for effective network management. This tried-and-true approach also optimizes cable networks.
✔Optimize status monitoring. The process of deploying status monitoring into the HFC plant should be carefully engineered, planned, managed and tracked. Simply placing transponders in enclosures and turning on software at the network management center is just not good enough. A few of the key steps include:

1. Assembling a team—vendor, engineering, outside plant, headend and network management personnel—to design and manage the project.

2. Viewing the project as discrete steps, addressing the transponders and the element management software uniquely.

3. Providing extensive training to all personnel who might come into contact with the status monitoring system.

4. Creating a certification process that verifies functionality in each individual transponder.

5. Paying particular attention to eliminating spurious alarms, which can lead to operator complacency.

6. Establishing alarm thresholds in a formal fashion and ensuring compliance in all systems.

7. Instituting a process to quickly repair failed transponders once the system is activated and certified.
✔Use all available data to manage the network. Existing technology can deliver invaluable information about the performance of your network. Each piece of data can be monitored, col-
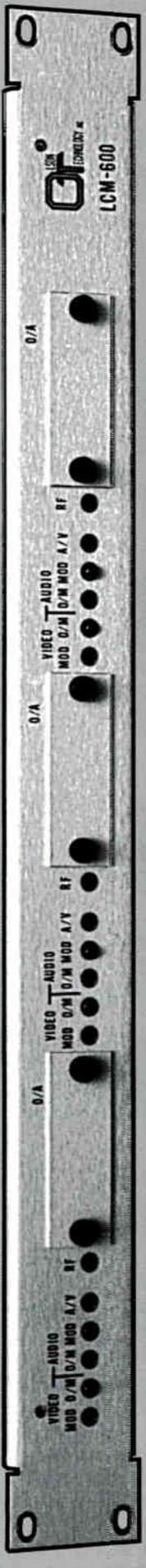
◆ NETWORK MANAGEMENT

Figure 4: EQP803 voice port pareto
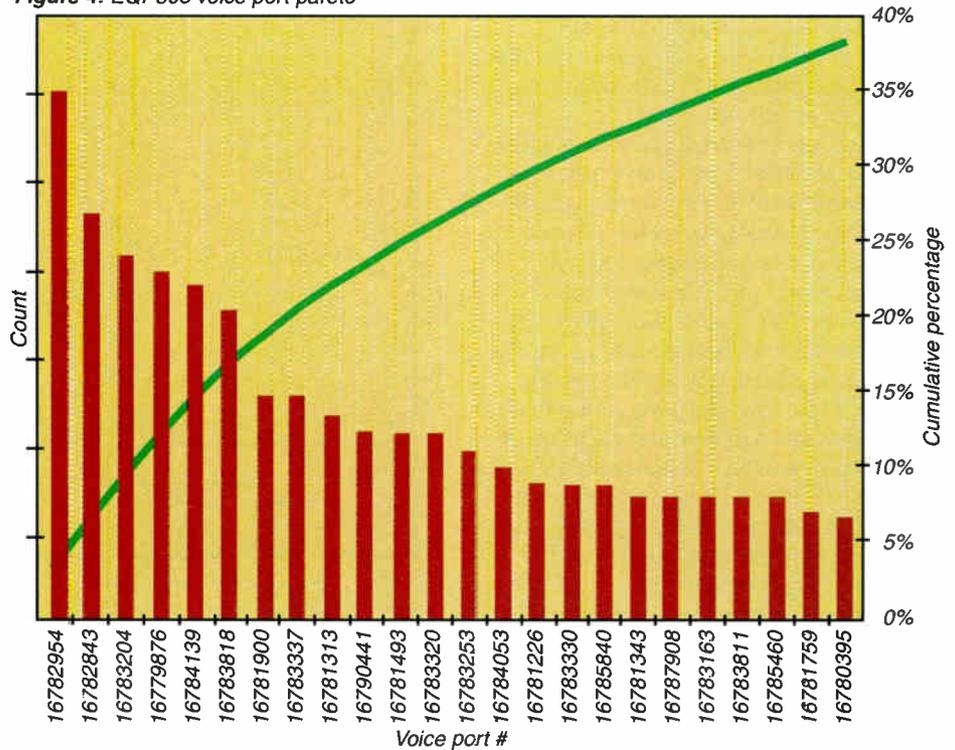
lated and analyzed to help provide an extremely high level of reliability to cable customers.

Voltage and current data from the status monitoring equipment depicts the state of all power systems. If readings are sampled daily and trended over time, the resulting curve can help predict and manage power consumption.

Telephony voice ports often report their transmit level back to the headend. This data can be captured and plotted into a Bell curve, and a model can be developed that predicts what the levels should be based on tap values, average drop length, etc. When compared to the actual curve, the model will quickly identify outliers that are victims of return path level misalignment.

Telemetry from the cable modem and telephony element managers will highlight plant problems that affect cable customers. Use the data to repair the fault before the cable customers calls.

Cable modem element managers often contain tools that measure bit error or errored packets between the headend equipment and the modem at the customer's premise. This data will identify return path problems.

✓Change the culture. Traditional cable companies rely upon individual technicians who make their own decisions as to when and how they respond to service calls. However, as cable companies begin operating advanced networks carrying telephony and/or Internet services, this culture is counterproductive and

undermines the reliability of the overall service. Strict compliance with a change control and scheduled maintenance policy is vital to success. Technicians need to understand the services carried on the plant to ensure both timely fault detection and a full comprehension of the impact of maintenance actions.

Good for the core business

Implementing a sound network management strategy will produce benefits across all aspects of the business. All products and services that operate under the umbrella will enjoy the benefits of greater reliability, reduced repair times and improved efficiency. Network management will dispatch trucks to specific locations in the network based on alert telemetry. Multiple technicians in trucks searching for the location of a fault based on unhappy customer calls will be dramatically reduced. Increased network reliability means fewer truck rolls. Increased network reliability and reduced repair time translate to reduced customer service cost, as well as reduced churn by dissatisfied customers.

The lessons from network management are clear: Relieve your customer of the burden of alerting you to network problems by managing and monitoring the network *yourself.* You will do it far more efficiently and cost-effectively, and will have a much greater chance of reaping the ultimate reward: a satisfied and loyal customer base. **CED**

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EAS 911 Encoder/Decoder

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Nebraska op
Distance learning cashes in on educational data

By Leslie Ellis

When Galaxy Cablevision undertook a network upgrade two years ago, it seemed a logical way to save on costs by consolidating headends.

This month, that upgrade turns into a moneymaker, too, as Galaxy starts collecting state funds from the Nebraska Department of Education for distance learning and high-speed data services.

The paycheck is large: One-time fees of roughly $60,000 per school from 30 participating schools, and about $279,000 per year in recurring fees collected from the aggregate schools.

Galaxy, headquartered in Sikeston, Mo. runs 550 cable systems in 16 states. In Nebraska, the MSO has been routinely interconnecting its 95 systems there, collapsing a widely-scattered topology into seven or eight system clusters per headend.

More recently, Galaxy's upgrade surpassed the pre-

Galaxy and BNI employees conduct network testing.
All photos courtesy of Broadband Networks Inc.

dictable and also became a tale of how it and a vendor partner seized an opportunity, then fought to keep it.

The smell of opportunity

It all started last November, when Galaxy approached the Nebraska Department of Education to see if there were any fits between local schools' needs and Galaxy's upgraded networks.

It turned out to be a well-timed call. The state was in the midst of planning how to interconnect four educational service units (ESUs 3, 4, 5 and 6) that served more than 60 K-12 schools in the same region.

At the time, Galaxy had already installed 350 strand miles of fiber in the southeastern portion of the state, which enabled it to gang 35 systems over four headends, executives explained to the NDE.

To educators, Galaxy's upgraded plant meant they could link 24 schools to three headends, says Terry Cordova, vice president of engineering for the MSO. Two weeks after it identified the distance learning application, Galaxy executives demonstrated the system to 175 educators. "We knew we had to work pretty fast to come up with a design for three of the ESUs," recalls Cordova.

Galaxy took along executives with Broadband Networks Inc., a State College, Pa.-based manufacturer, as a key technology partner that would enable the services.

Their pitch: To link Galaxy's fiber network directly to coaxial plant in each school, moving signals in an analog format, says Bob Beaury, president of BNI. "It's basic broadband–broadband plant dedicated to schools.

A map of Galaxy/EDCOMM's interactive systems in southeast Nebraska. Source: BNI
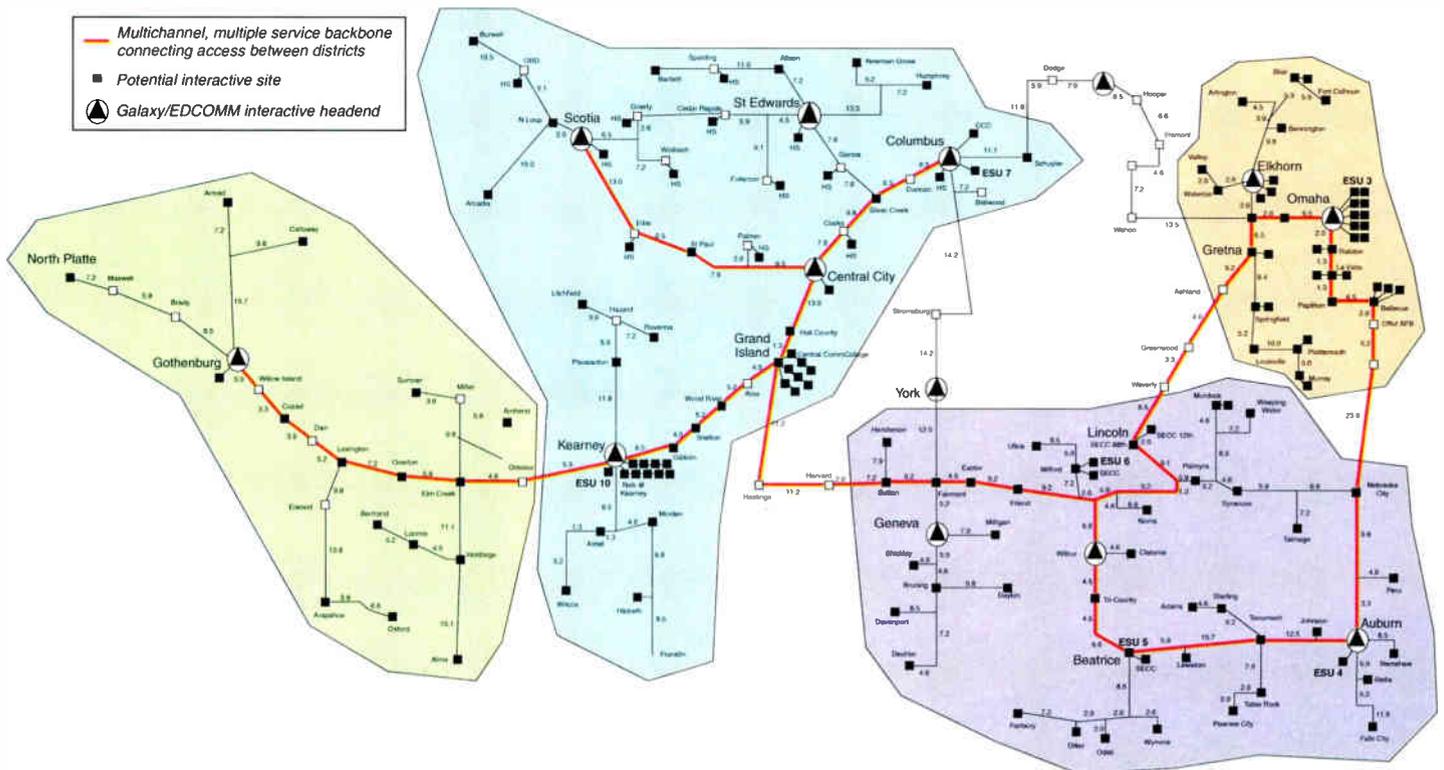
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"The idea was to craft a hybrid fiber/coax configuration with fiber to the schools, and coaxial inside them," says Beaury.

Together, Galaxy and BNl showed educators how their analog solution could provide full-motion videoconferencing, wide area networking (WAN), high-speed data, and links to "NebSat," an educational satellite service.

"Frankly, it was a hit," says Cordova.

"Most of the schools had some form of dial-up Internet connection; some had a 56 kbps line," he continues. "We offered, as part of our basic package, to deliver Internet traffic over our fiber network, so that they didn't need the phone lines, and they, of course, had the high speeds of cable modems."

The NebSat link also raised enthusiasm levels among the educators. NebSat isn't fully

Technical personnel dig trenches for fiber, in preparation for network deployment.

available in rural areas of the state, so Galaxy demonstrated how the programming could be moved from the downlink to the fiber, then dropped off to participating schools.

Educators loved the idea. One school system in particular–Milligan Public Schools, which graduated nine students this year–was especially relieved with the link for sheer survival reasons. "They're fighting just to survive, and a distance learning network could save them," one BNI executive recalls.

Enter: Telco threat

But, predictably, as acceptance levels grew from the educators, so did interest from competitors US West and Alliant Communications, two telcos serving different parts of ESUs 4, 5 and 6. Their counter pitch: Digital technologies.

Don Ferneding, manager of direct services for three of the ESUs, says the telcos and the Nebraska Telephone Association lobbied heavily against the analog approach pitched by Galaxy, pushing instead a digital scheme for the schools.

And, says Don Vanderheiden, a retired school superintendent who works as a consultant for the NDE's telecommunications projects: "There was actually a political move . . . to disallow any state funding for any projects that didn't use digital. It was not just a little thing," Vanderheiden continues. "It took several of us two months to get that fought and won."

The telco contingent proposed a digital scheme based on DS-3 lines, which Vanderheiden valued at $468,000 per year, based on a yearly line connection charge of $15,600 per school multiplied by 30 schools.

Links to the Internet at T-1 speeds (1.54 Megabits per second) were priced separately by the telcos, at approximately $1,300/year/school, says Vanderheiden.

Pinched for pennies, educational executives were underwhelmed by the pricey digital alternative pitched by the telcos.

"(Galaxy) offered twice the capabilities at 30 percent less cost. We're working with tax dol-
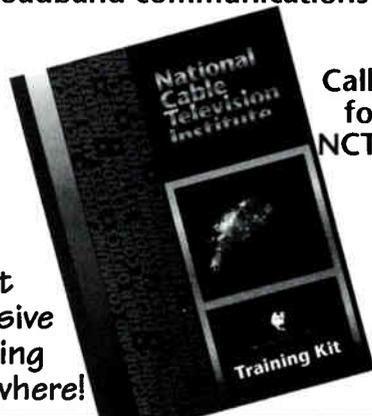
Students interact with television monitors to enhance the distance learning experience.

lars here, so we had to find the best deals without sacrificing quality," Ferneding explains.

Despite enthusiasm from the schools, the next four months wrapped Galaxy in red tape. Executives were hauled off to meetings and public hearings around the state, to defend their pro-analog approach.

"It was a terrible political fight. (The telcos) were saying that analog is dead, and that Galaxy's approach was proprietary—pretty much anything they could come up with, to protect their revenues," says one source who was close to the negotiations, who preferred anonymity.

Ferneding says the schools rallied for Galaxy's analog approach "because we could get more bang for our buck—digital was too expensive." Plus, he was intrigued by Galaxy's high-speed Internet proposal, which offered connections at 10 Mbps. which were faster than telco proposals.

Ultimately, Galaxy was told it had to file for an intrastate telecommunications certificate.

At one point, according to Cordova. Ascent offered to match Galaxy's price. "But by then, it wasn't as much a cost issue as it was functionality, and we still killed them on video conferencing as well as data expandability."

In the end, Galaxy won. It received its telecommunications certificate in early July, and immediately began hooking up equipment to meet a September 15 deadline to have 30 schools operational.

Executives representing the Nebraska Department of Education were glad to see it happen. "It looked like (telco) was going to be the technology we had to use, until the cable company stepped up," explains Vanderheiden.

At press time, BNI was busily readying racks of equipment to ship off to Nebraska. In addition to all lightwave transmission and reception gear used in the network to connect each school, BNI is supplying "everything but the fiber plant—classroom equipment down to cameras and VCRs, as well as all the data networking equipment for the LAN and WAN," says Beaury.

For the high-speed data service, Galaxy

plans to use headend and cable modem gear made by Bay Networks Inc. Students will receive a partitioned 10 Mbps link, says Beaury. That's so that some of the throughput can be dynamically assigned to control, conference scheduling and other applications.

Galaxy is planning to link another batch of 30 schools by early next year, executives say. On the plant side, plans are now underway to

lengthen its fiber network to span 1,200 miles.

Galaxy is also in discussions with other Nebraska MSOs and independent telephone companies to create a statewide network for educational and other business applications.

"We've been able to show some of them the potential business, and they're excited about it," says Cordova. "It's a pretty significant revenue stream." **CED**

MSOs: IP telephony
Plan to start tests plan no longer stuck on 'hold'

By Fred Dawson

IP telephony, floated as an interesting possibility for cable interests in industry forums at the start of this year, has quickly moved to the front burner, bringing with it a seachange in MSO thinking about voice services, and indeed, about data networking in general.

Cable companies and their affiliates involved in the delivery of data services are working closely with a variety of vendors in hopes of starting tests of various approaches to exploiting the power of packet-based voice and videoconferencing technology, starting as early as this fall. At the same time, through Cable Television Laboratories, they have begun two initiatives which could have a great bearing on their eventual ability to use the technology to deliver voice services on a mass scale.

One of these initiatives, undertaken by a CEO-level taskforce led by Time Warner Cable Chairman and CEO Joseph Collins, is attempting to put together an agreement on a national cable data backbone that would establish a common distributed computer networking architecture for delivering a wide range of services based on the advanced applications tied to Internet-protocol technology. The other initiative, focused specifically on IP telephony under the leadership of CableLabs Senior Vice President for Internet technology Jerry Bennington, is one of several special information-gathering strategic projects which are designed to help CableLabs members determine the opportunities surrounding new technologies.

"A national cable IP network would be a slam-dunk for us with respect to just about any high-speed data application you can think of,"

says CableLabs President Richard Green. "The (cable company) CEOs have made it clear they believe the industry really needs to take advantage of this opportunity."

As Green notes, the Internet industry, through projects undertaken by the Internet Engineering Task Force, is churning out a wide array of standardized approaches to advanced applications such as IP multicasting. videoconferencing and telephony which are best suited for implementation over privately-controlled high-speed IP networks, as opposed to the less well-equipped public Internet. "Given the state-of-the-art computer networking infrastructure that cable is building, these applications are really made to order for us," Green notes.

Indeed, recent vendor successes at improving the quality of Internet-based telephony have triggered a surge in commercial support for widescale implementation of the technology outside the cable industry in applications ranging from the integration of voice onto local area networks to the creation of commercial long distance calling infrastructures. As a result, vendors report, the market environment is right for moving to the next stage, which involves development of IP-based systems that will allow MSOs to exploit their high-speed local access and national backbone infrastructures to greatest advantage, going well beyond the range of initial applications now taking shape here and abroad.

ILLUSTRATION BY WILLIAM WESTHEIMER, THE STOCK MARKET

"We expect to have cable customers using our product in trials before the year is out," says Tom Houghton, technical manager for Lucent Technology's Internet Telephony Server SP product line. "There's a lot of R&D still to do to meet all the requirements for commercial applications over cable, but the current algorithms are sufficient for use in trials."

Cable strategists are reluctant to discuss specific plans at this point, though they widely acknowledge they are avidly investigating the possibilities. "As vendors come up with ways to make packet telephony a more useful tool, it makes sense that we would include it as an option over high-speed data connections," says James Chiddix, senior vice president of engineering and technology at Time Warner Cable. "But just how broad a usage there would be depends on a lot of things, including progress on standards."

Progress on standards, driven by growing corporate demand for packet voice options, has been considerable over the past several months. Where, a year ago, IP telephony was confined to proprietary, incompatible products with no way to interface data network calls with the public switched telephone networks, today, the latest IP telephony software products come with such interfaces, known as "server gateways," and are compliant with the IP telephony standard H.323.

Standardization of these products is now possible because H.323, once focused on videoconferencing over fairly high bandwidth feeds, has been extended to apply to voice-only applications and to high-latency environments as well, thanks to advances in compression that have made quality voice transmission possible at bit rates of 5 kilobits-per-second or less. As a result, cable operators have a tremendous range of options to choose from, where voice or videoconference add-ons to data services such as chat, e-mail or on-line games might turn out to be as popular as a pure voice service.

For example, VDOnet Corp.'s release of its VDOphone 3.0 serves as "a proof of statement" that it is now possible to bring together the multimedia and two-way communications components that can enable these types of applications, says Steve Chambers, vice president of marketing at VDOnet. "What we're saying is that the tools are here to develop content that really distinguishes broadband connections from other connections," Chambers adds.

Where previous iterations of VDOphone and VDOlive, the company's video streaming software, were tailored to work in the low-bandwidth environment of dial-up access, the latest versions are scalable from low- to broadband access levels, Chambers notes. This means that the transmission between any two Internet connections will automatically adjust to bandwidth capacity, making it possible for people on high-speed data links to see each other or view clips or live feeds in high resolution without the herky-jerky motion associated with low frame-rate transmissions, he explains.

At the same time, he adds, implementations of VDOphone 3.0 in various applications by software developers will interface with the same applications using other videophone software that is compliant with H.323.

One of the first applications combining the VDO software suites will be for call centers at a large travel concern, where people calling in over the Internet will be able to converse "face-to-face" with travel representatives and then be shown video clips of hotels and destinations, depending on their interests. "This is just one of a wide range of applications you'll be seeing involving use of call centers in conjunction with video streaming," Chambers says.

Sources also report that MediaOne Express is preparing to put the VDOnet technology to use in new content components, including a classroom-in-the-home service which allows students and teachers to talk to each other while sharing access to text and graphics material. MediaOne officials decline to discuss their new content strategies, which will be introduced in

various systems as the year progresses.

As the VDOphone travel agency application suggests, the gains in voice and videoconferencing technologies also have implications for cable in on-line commerce, customer service and marketing applications. In another example of how the technologies might be used, MCI is developing Internet interfaces with its call centers that will allow people connecting to the carrier's home page to click on an icon and be connected to an operator.

"We can do least-cost, least-latency, least-hop or closest-geography routing," says Harvey Kaufman, president of MCI supplier NetSpeak Corp., which developed the Webphone, a "smart" device that supports Internet voice and video applications without use of a PC. "The plan in this environment is to take the call and give the caller the best connection or experience possible."

Such capabilities require interface of Internet connections with server gateways put in place by the commercial entity. As standards-compliant tools supplied by software developers gain wider distribution, commercial entities are likely to see the videophone/streaming connection as an important attraction in drawing Internet users to their Web sites, Kaufman says.

"There are many other benefits to companies as well," he notes. "They reduce their exposure to 800 number incoming calls and to making return calls over the public switched network, and it's much easier to get data on the caller because you're getting it through the Web site, as opposed to having to ask a lot of questions."

But, of all the applications cable might have for IP telephony, the one that remains most galvanizing is the use of the technology as a substitute for circuit switched standard phone service. The cable trials Lucent is preparing to supply would allow operators to deliver first-class quality local and long distance voice service using their own facilities end-to-end, Houghton notes. "We're seeing tremendous interest in IP telephony as a full substitute for standard voice service," he adds.

But this application, even for Lucent's highly regarded technology, represents a big leap beyond the capabilities of the system Lucent began delivering for trials in non-cable applications this past summer. Where Lucent-supplied trials by MCI, France Telecom and ICG Communications are aimed at allowing corporations to provide low-cost connections from local PBX (private branch exchange) locations to distant ones that bypass long distance networks, the planned cable trials not only will require low latency in the translation from IP to circuit switched protocols and vice versa, but will also require an automatic latency-adjustment capability to compensate for fluctuations in network performance, Houghton notes.

"We're now in the process of measuring latency in the context of how a real product performs over operating networks, and we're getting pretty good numbers," Houghton says. "It's still noticeable, but it's low enough to meet requirements for the cable trials."

Along with working to further reduce the gateway-induced latency to where it isn't noticeable at all, Lucent is making headway on the latency adjustment requirements of the cable environment, where contention for bandwidth can create wide variations in the bit rate over any user's connection. "This is a bigger challenge, but we think we can meet it," Houghton says.

Another major supplier of IP telephony products, VocalTec Communications Ltd., is promoting an alternative approach in cable that would avoid the technical and cost hurdles associated with meeting this challenge. VocalTec, in talks with @Home Network and other cable entities, hopes to build on the approach taken in a new strategy that's intended to make use of its latest advances in the dial-up domain.

In one of the most far-reaching IP telephony initiatives yet mounted by a vendor, VocalTec has established a global alliance of "Internet Telephone Service Providers" to support cut-rate long-distance calling over the Internet in conjunction with Release 5 of its Internet Phone software. The new release, with enhanced video and audio performance, will be used by an initial lineup of ITSPs serving 23 cities outside the U.S., and another eight in this country to provide long-distance PC-to-phone connections at discounts of up to 80 percent from standard connections, says Scott Wharton, product manager at VocalTec.

"We look on this as the first stage in a shift to making IP telephony a real business opportunity for service providers," Wharton says. "Involvement of the cable industry will take us to the next stage, where high-speed connectivity makes phone-to-phone call quality almost indistinguishable from circuit switched service."

The pre-cable infrastructure described by Wharton involves initiation of calls from PCs to standard telephones located anywhere in the territories served by the ITSPs, which are local Internet service providers who install VocalTec's Internet Telephony Gateway server at their points of presence. The ITG server allows packet-based calls coming into ITSP facilities to be translated to standard analog phone signals for distribution through local switches to the final destination.

Users must download the $49.95 Release 5 version of the Internet Phone client software to their PCs in order to participate. When seeking to dial a number in any of the covered cities, the user goes to the service Web site and is registered with the ITSP serving the region the user wants to call. Once registered, the user can place a call to any number in the ITSP's area for a fee that's charged against a credit card. Typical rates are 15 cents per minute to the U.K., a little more to various other European points, and 20-25 cents per minute to various Asian cities, Wharton says.

While the Internet backbone imposes some latency on the two-way connections, the latest improvements in VocalTec's system using new packet loss reconstruction algorithms and better delay handling to reduce audio delay to

where it is barely noticeable in the PC-to-phone application, Wharton notes. The new VocalTec system, its first to be compatible with the H.323 Internet calling standard, also supports videophone connections for users equipped with a parallel port video camera or a video camera with a standard Windows-compatible video capture card.

VocalTec has been pitching an approach to exploiting these capabilities that would be very low cost and relatively simple for cable operators, allowing them to offer phone-to-phone long-distance connections at deep discounts using high-speed backbones that bypass the Internet backbone, Wharton says. "A backbone such as @Home's reduces end-to-end latency to 80 milliseconds, which overcomes the problem we have with phone-to-phone applications of our technology over the Internet," he adds.

In a completely packetized end-to-end voice application over cable, if the customer uses a standard phone, as would be the case for non-PC calls, the signal must be instantly converted to or from the digital IP packet format, Wharton notes. "What we're saying to operators is that you can avoid having to install costly conversion equipment at every customer site by using standard telephone links between the premises and the Internet Gateway Phone server," he says.

In this scenario, the operator would lease lines from telcos, convert voice signals to IP at the server and send them out over the high-speed data backbone for conversion back to standard voice at a server at the other end of the call. But, as Wharton acknowledges, cable operators are reluctant to embrace any service plan that would use someone else's facilities, even though those facilities might be readily available under terms of deregulation.

Nonetheless, Wharton says VocalTec's pitch has been well received. "The opportunity to move quickly into this and offer a very low-cost long-distance service is very appealing," he says.

As VocalTec's ITSP initiative suggests, ISPs represent another class of potential users of IP telephony who might find the opportunity appealing as well, offering competition to cable as it moves in this direction, notwithstanding the bandwidth limitations of the dial-up world. This is a good news/bad news scenario for cable, insofar as the industry will benefit to the extent IP telephony technology gains broad market support even though new competitors will be going after the same customer base as they, too, find ways to expand bandwidth to the end user.

One ISP that believes it has hit on a successful path to early entry is Concentric Network Inc., a nationwide ISP based in

IP faxing is not nearly as daunting a challenge as IP voice telephony
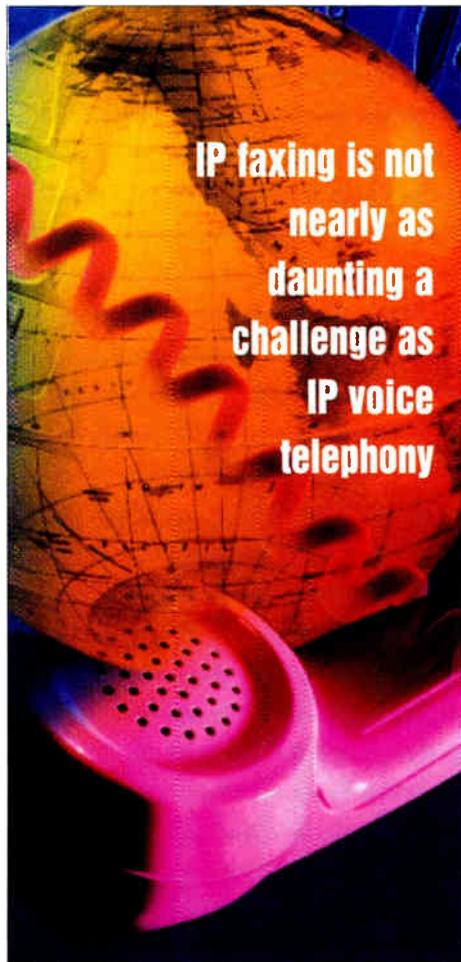
Cupertino, Calif. that is starting out in IP telephony on the enterprise side and hopes later to move into the residential market. "We're working on some partnerships (with software vendors) that we'll be announcing shortly to enable us to package and deliver video (conferencing) and voice services to our business customers," says Connie DeWitt, product line manager for voice and video services at Concentric.

Concentric has built its strategy on an ability to offer various speeds of access services, from 28.8 kilobit-per-second dial-up to dedicated T-1 (1.5 Mbps) links, in conjunction with high-speed regional and national interconnections that avoid the traditional telecommunications and Internet backbone bottlenecks. In California, where the firm has installed three "superPOPs" (points of presence) to cover the entire state, competitive local exchange carriers supply the pipes that take data off the local telephone switches and deliver it to the POPs, which are interconnected with other superPOPs as well as traditional POPs throughout the country over an ATM (asynchronous transfer mode) network.

In some respects, this model resembles the one the cable industry is attempting to fashion through cooperation on a nationwide data backbone and the various provisioning protocols and transport techniques required for end-to-end connectivity industry-wide. But while Concentric has dial-up reach to 95 percent of U.S. households and most businesses, it is taking a guarded approach to rolling out telephony services.

"We have a guaranteed latency of 150 milliseconds or less over all connections, including 28.8 dial-up, which is well below detectable latency for voice communications, so some of our (corporate) customers are implementing voice and video conferencing for internal communications on their own," DeWitt says. "But there are limits to how fast you can move in offering services, especially video conferencing, based on the way things are presently done within the corporate environment."

For example, she notes, most desktop computers are not equipped with microphones, cameras and headsets, and many LANs are not set up to support distribution of video. As a result, the first application Concentric will focus on as it rolls out IP-telephony services is one that supplants the legacy switched video conferencing systems that are connected to specific conferencing rooms within the corporate facilities.

"We're not at the general use stage within companies, but that will come," DeWitt adds.

Concentric's first voice-only IP service will target the hot market for links that bypass international toll calls. "We see a huge opportunity in the international arena because of the price differential, but we know that opportunity has a fairly short life of maybe two or three years," DeWitt says.

More important to long-term prospects is the telecommuter and small office environment, she adds. "This is the direction we're going, but not right away," she notes.

One factor holding back ISPs is the flat-rate price bind they find themselves in, DeWitt says. "You can look to Concentric for leadership in creating value-added pricing structures," she adds, declining to elaborate.

Further fueling the push into IP telephony are ISP uses of the technology to provide fax services. WorldCom Inc.'s ISP subsidiary, UUNet Technologies Inc., recently became the first ISP to promise circuit-switched quality with fax-to-fax as well as PC-to-fax or PC-to-PC capabilities on a worldwide basis. PSINet, another leading ISP, and Concentric made known their fax plans in June, and, a month earlier, Netscape Communications made available the fax-over-Internet technology of NetXchange Communications Inc. as part of its Navigator browser, meaning virtually anyone could begin sending faxes over the Internet with a simple download of client software.

But it's the strategy outlined by UUNet that marks emergence of IP faxing as an industrial-strength phenomenon. By bypassing both circuit switched networks and the hodge-podge of data links that make up the Internet backbone, UUNet will be able to deliver a low-cost, high-quality fax service to anyone who signs up with the company for an Internet connection, officials say.

"We're installing over 100 fax servers around the world using our existing infrastructure," says John Sidgmore, CEO of UUNet and vice chairman of WorldCom. "This is a major, major play for us."

IP faxing is not nearly as daunting a challenge as IP voice telephony, where the need for very low latency isochronous communications is a major barrier to widescale use. But the principle is the same when it comes to interfacing people on data links with people making connections through circuit switched lines. In both cases, servers at data network points of presence provide support for directing and translating calls back-and-forth between the data and circuit switched links, thereby eliminating the need for all participants in an IP-originated communication to be connected to the Internet.

UUNet's service also demonstrates the importance to IP telephony of data networks that avoid the bottlenecks in the Internet. By using its own data links rather than the Internet backbone, in which it shares responsibility as a provider, UUNet achieves latency levels that meet the quality of service standards for fax services, notes Allen Taffel, the ISP's vice president of marketing and business development. "Our ability to control the quality of service by avoiding peering points (Internet interconnection points) has ramifications for how quickly the fax is delivered, the reliability of the service and the overall security of the service as well," Taffel says.

Such advantages explain why the cable industry has put so high a premium on working out the business and operational issues associated with creating a ubiquitous IP data backbone. As previously reported (see the June issue, p. 116), there are major obstacles to be overcome, but so far, the commitment at the top of the industry appears to be driving MSOs toward solutions.

There's too much at stake for the industry to fail in its backbone initiative, Green says. "There's a tremendous interest in things like IP telephony where the benefits really come into focus once you have everybody connected to a universal backbone," he notes. "I think we're already seeing significant progress under Joe Collin's leadership." **CED**

The issue: Signal theft

Over the past year or so, cable systems have attempted to "get tough" on cable pirates in an attempt to recoup some of the estimated $5 billion the industry loses to cable thieves every year. It's not an easy battle, and it takes commitment to make a real impact. What are your thoughts when it comes to cable theft?

The questions:

1. What is your system's current penetration rate for basic subscription services?

☐ Below 35%   ☐ 35%-55%   ☐ 56%-75%   ☐ Over 75%

2. What would you guess is the current level of basic service theft in your system?

☐ Less than 5%   ☐ 5%-15%   ☐ 16%-25%   ☐ Over 25%

3. What is your system's current penetration rate for premium services (of all basic subs)?

☐ Less than 50%   ☐ 50%-75%   ☐ 75%-100%

4. What would you guess is the current level of premium service theft among basic subscribers in your system?

☐ Less than 5%   ☐ 5%-15%   ☐ 16%-25%   ☐ Over 25%

5. How much revenue does your system expect to lose to signal theft during 1997?

☐ Less than $20,000   ☐ $20K-$35K

☐ $36K-$50K   ☐ Over $50,000

6. What recent steps has your system taken to reduce signal theft?

☐ None   ☐ Regular audits   ☐ Offer amnesty

☐ Started security program   ☐ Other

7. How concerned is your system's management about local signal theft?

☐ Very concerned   ☐ Somewhat concerned   ☐ Not concerned

8. Has your system filed charges against anyone for service theft over the past year or so?

☐ Yes   ☐ No   ☐ Don't know

9. What hardware do you have in place to battle piracy?

☐ Scrambling   ☐ Traps   ☐ Locking pedestals

☐ Set-top descramblers   ☐ None

10. Do you think piracy rates will drop with the advent of digital set-tops and digital TVs?

☐ Yes   ☐ No   ☐ Don't know

11. Do you think you have more, about the same or a fewer number of signal pirates today compared with a year ago?

☐ More   ☐ The same   ☐ Fewer

Your comments:

Fax us at 303-393-6654

Make a copy of this page and fax it back to us at the number above, or mail it to *CED*, 600 South Cherry Street, Suite 400, Denver, Colo. 80222.

*Every month, we'll pick one response from those we receive and award $50. See official rules below.

Names won't be published if you request your name to be withheld, but fill out the name and job information to ensure that only one response per person is tabulated.

Your name and title

_____

_____

System name:

_____

Location:

_____

Your MSO:

_____

Your job function:

_____

Daytime phone #:

_____

The issue: Going interactive

Operators are spending millions of dollars to upgrade their networks and implement new services like high-speed data. Along with that has come a new push for networks to become more transactional than ever. But to do that, a cable network has to be two-way active. Getting that return plant working well can be a tricky proposition, especially in large networks. This survey asked for your thoughts about upgrading to two-way.

For cable operators, it's clear that upgrading to interactivity is an important goal. Large majorities who responded to the survey said it's "very important" that high-speed data or some form of interactive service be offered over their cable systems, and for the first time, a majority of those queried have some amount of two-way plant up and running.

With that experience of running two-way plant comes knowledge. The jury is still out as to how difficult it's going to be to maintain a clean return path, but the majority expects it to be problematic. That could force some to evolve toward higher-order modulation schemes that are designed to mitigate those problems.

An interesting shift has also occurred in the PC vs. TV fight. A clear majority of cable personnel now say it's the PC that will become the interactive appliance in the home, whereas a couple of years ago, the TV was seen as the dominant interactive device.

Odd, however, are the respondents' views on interactive video. While no one said interactive TV was a priority for their systems, they did say they'd get similar penetration rates for interactive video-on-demand services as they would if they rolled out Internet access services.

Congratulations to John Wallis of Adams CATV in Carbondale, Pa., who won $50 for his response. Want to become eligible for $50? Fill out the survey on the previous page and fax it in!

The results:

1. How important is it to the management of your system that high-speed data or some sort of interactive service be offered over your system?

Very important	Somewhat important
78%	**11%**

Not important	Don't know
11%	**0%**

2. How soon do you think services like interactive shopping, games and other services will be offered over your cable system?

1-2 years	3-4 years	5+ years	Don't know
56%	**33%**	**11%**	**0%**

3. Is your system presently real-time, two-way active?

Yes	No	Don't know
78%	**22%**	**0%**

4. If not, are there any plans to activate the return path within the next 12 months?

Yes	No	Don't know
0%	**100%**	**0%**

5. How difficult do you think it will be to fire up the return plant and keep it "clean" enough to offer services like telephony and data reliably?

Difficult	Slight problem	No problem
33%	**33%**	**22%**

6. Do you think your system will have to use an advanced modulation scheme like spread spectrum to make the return path more usable?

Yes	No	Don't know
22%	**33%**	**44%**

7. Seven years from now, do you think people will be spending more time interacting with the TV–or with a personal computer?

TV	PC	Don't know
11%	**67%**	**22%**

8. If you offered true video-on-demand services today where movies cost $5 each, what percentage of your subscribers would buy them each month, in your opinion?

Less than 5%	5-10%	10-30%	30+%
33%	**22%**	**11%**	**22%**

9. If you offered high-speed data and Internet access at $40 per month today, what percentage of your subscribers would sign up, in your opinion?

Less than 5%	5-10%	10-30%	30+%
33%	**22%**	**33%**	**0%**

10. Has your system added fiber optic technology to help break the system up into smaller "cells"?

Yes	No	Don't know
56%	**44%**	**0%**

11. Overall, of the following choices, which has the highest priority with your system's management right now?

Data delivery	Telephony
44%	**11%**

Interactive TV	Plain old TV
0%	**44%**

Your comments:

"Even with the small node sizes we have (20-100 homes per mile), noise funneling back to the headend is a major problem."
– Gene Neary, Adelphia Cable, Plymouth, Mass.

"We have been testing two-way cable modems for years. On July 1, we began commercial service at $99 per month for two-way 500 kbps service."
–Bob Moss, Cable Co-op, Palo Alto, Calif.

VideoMask™ Interdiction System Multiple Dwelling Interdiction Unit (MDIU)

Blonder Tongue's VideoMask™ Interdiction System is the complete program security solution for today's cable market. The Multiple Dwelling Interdiction Unit (MDIU) is a new member of the VideoMask™ family and is ideal for MDU installations. The MDIU is available in 8, 12, and 16 port configurations and is housed in a rugged, outdoor, steel enclosure. Each MDIU consists of one or more 4-port subscriber groups mounted in an RFI-tight steel inner enclosure. An outer steel enclosure provides excellent protection for outdoor installations, while an integrated lock prevents tampering with the interdiction components.

The MDIU is suitable for wall mounting and includes a backing plate with locating studs for quick installation. A removable bottom panel provides easy access to the entry/exit connections and subscriber drops. Ample room is provided for installing a directional coupler for those system designs requiring cascaded.

Available in 8, 12, and 16 port configurations

MDIU's. This work space can also accommodate the installation of L-band components for those systems providing both analog (50-750 MHz) and digital (950-2150 MHz) programming. Blonder Tongue also manufactures these L-band components - please contact our Sales/Marketing Departments for more information.

Blonder Tongue's VideoMask™ Interdiction Unit (VMIU), which serves 4 subscribers from a die cast housing, is also suitable for pedestal based MDU installations. Blonder Tongue has recently begun offering several pedestal mounting kits, including Channell (SPH1320, SPH1212, SPH1010) and Reltec (TV1024) models. These bracket kits allow up to 4 VMIU's (a total of 16 ports) to be mounted in one pedestal, with plenty of room for entry/exit connections and subscriber drop cables. Both the MDIU and VMIU provide identical electrical performance and can be intermixed on properties to increase the efficiency of the system design.

Reader Service 47

RESOURCE CENTER

Advanced Networking

C-COR Electronics, Inc.   Circle # 16
C-COR's RF amplifiers, AM headend equipment, digital fiber optics, and customized service and maintenance provide global solutions for your network. p. 31

NextLevel Systems, Inc./Broadband Networks Group   Circle # 32
GI/NextLevel Broadband Networks Group is a worldwide market leader in digital and analog set top systems for wired and wireless cable television networks. p. 57

NextLevel Systems, Inc. (Corp. HQ)   Circle # 19
GI/NextLevel Broadband Networks Group is a worldwide market leader in digital and analog set top systems for wired and wireless cable television networks. p. 39

Construction Equipment

Lemco Tool Corp.   Circle # 45
DROP INSTALLATION tools include CLI preventing torque wrenches; hardline coaxial SPLICING TOOLS perform one-step cable preparation; AERIAL CONSTRUCTION tools for safe and productive system deployment. p. 79

Telecrafter Products   Circle # 4, 29
Supplies drop installation products for CATV, DBS, and wireless operators, single and dual cable fastening products, identification tags, residential enclosures. p. 8, 89

Datacom Equipment

Bay Networks, Inc.   Circle # 90 p. 43

Hayes Microcomputer Products, Inc. Circle # 35 p. 69

Distribution Equipment

Alpha Technologies Inc.   Circle # 2
World leading manufacturer of power conversion products, widely used in cable television, telecommunications, and data networks around the world. Offer a complete line of AC and DC UPS systems, line conditioners, batteries, and accessories. p. 5

Hennessy Products   Circle # 86 p. 46

Distributors

ITOCHU Cable Services   Circle # 8
iCS, Inc. is a leading full service stocking distributorr, operating ten sales offices and nine warehouses conveniently located in North and South America. p. 15

Power & Telephone Supply Co.   Circle # 26
Power & Telephone Supply serves the power and communications material distribution needs of the U.S. through 18 strategically placed stocking warehouses, including a specialized export facility in Miami, Florida. p. 51

Sprint North Supply   Circle # 10 p. 19

TeleWire Supply Company   Circle # 11
TeleWire Supply is a leading nationwide distributor of products needed to build and service a broadband communications network. p. 21

Fiber Optic Equipment

Corning Incorporated   Circle # 18
The Corning Optical Fiber Information Center gives you FREE access to the most extensive fiber-optic library in the industry. p. 35

Pirelli Cable Corp.   Circle # 17
Leading manufacturer of fiber optic loose tube, ribbon, interconnect, and distribution cables. Supplier of connectivity systems including connectorized cable assemblies, drop cable, distribution panels, adapters, and optical fiber access tools. p. 33

Siecor Corporation   Circle # 20
Celebrating its 20th anniversary, Siecor Corporation is a leader in telecommunications technology for voice, data and video applications. Siecor–At Your Service. p. 40-41

Synchronous Group Inc.   Circle # 37
The Actair and Antares 1550nm external modulation transmitters offer outstanding performance and the best specifications in the industry. Perfect for super trunks and direct distribution. p. 71

Lindsay Electronics   Circle # 44
Our revolutionary new technology creates 1 GHz communication amplifiers, passives, taps, and subscriber materials to solve system problems before they become subscriber problems. p. 79

Philips Broadband Networks   Circle # 14
A global supplier of broadband RF and fiber optic transport equipment, is also a leading provider of advanced systems used to access broadband telephony and data services. p. 27

Headend Equipment

ADC Telecommunications, Inc.   Circle # 1
Leading global supplier of transmission and networking systems. The company holds a preeminent market position in physical connectivity products for fiber optic, twisted pair, coaxial and wireless networks worldwide. p. 2-3

Barco, Inc.   Circle # 21
BARCO's Gemini Upconverter is an ideal alternative to conventional modulators for hub site headends, accepts digital or analog IF inputs and saves cost and space. p. 43

Blonder-Tongue Laboratories, Inc. Circle # 47, 48
Quality manufacturer of headend equipment (including pre-fabricated headends), reception, distribution, MDU interdiction products and test equipment. p. 83

Dawn Satellite   Circle # 15
Technical information and competitive prices on products such as: satellite "dish" antennas, satellite receivers, digital ready LNBs, modulators, processors and a wide variety of related products. p. 29

Harmonic Lightwaves, Inc.   Circle # 7
A worldwide supplier of highly integrated fiber optic transmission, digital headend and element management systems for the delivery of interactive services over broadband networks. p. 13

Microwave Filter Co., Inc.   Circle # 43
Passive electronic filters, traps and filter networks for interference elimination and signal processing at the TVRO, headend and distribution equipment. p. 79

Passive Devices   Circle # 87 p. 63

Pico Macom Inc.   Circle # 38, 40
Pico Macom offers a full line of quality headend components including satellite receivers, agile modulators and demodulators, signal processors, amplifiers, and completely assembled headends. p. 73, 75

Scientific-Atlanta   Circle # 50
Scientific-Atlanta's new Continuum™ Headend System for analog and digital applications. This features a vertical packaging design which allows for up to forty front-loaded modules to fit into a standard 70" rack. p. 104

SkyConnect   Circle # 23
SkyConnect meets the demands of the growing cable advertising industry by offering the most complete digital advertising solutions available. p. 47

Spectrum   Circle # 33
The Sub-Alert utilizes the advanced features of the Sage Endec for total automation and will interface with your headend by IF, baseband video or comb generator. p. 28-29, 66

RESOURCE CENTER

TFT, Inc.   Circle # 34
Manufactures and markets through CATV OEM's & system integrators (EAS) Emergency Alert System Products, including: EAS 911 Encoder / Decoder, EAS 930A Multi-Module Receiver and (IHAD) In Home Alert Device. p. 67

Services

International Engineering Consortium (IEC)
A nonprofit organization dedicated to advancing the field of business and engineering in the information industry through noncommercial and university programs. p. 92

National Cable Television Institute (NCTI) Circle # 36
National Cable Television Institute (NCTI) is the world's largest independent provider of broadband industry training; both technical and non-technical. p. 70

TCS Communications   Circle # 25 p. 50

Women in Cable
A professional association serving more than 3,300 members across the country. Its mission is to empower women in cable and telecommunications to achieve their professional, personal and economic goals while influencing the future of the industries it serves. p. 28

Subscriber Equipment

Pace MicroTechnology   Circle # 22 p. 45

Pioneer New Media Tech.   Circle # 27
Manufactures advanced analog and digital CATV terminal featuring interactive functions. as well as controller software. p. 52-53

Test Equipment

AM Communications   Circle # 49
OmniStat by AM is the worldwide choice for monitoring HFC telecommunications networks. It is the standard for ADC, NEXT Level, Philips and Scientific-Atlanta. p. 103

Cable Leakage Technologies   Circle # 28
With the FCC imposing stiff fines for leakage, CLT presents operators with the only sure, comprehensive method of locating and documenting the nearest street address of system faults/signal leakage. p. 55

Cable Resources, Inc.   Circle # 24
CRI manufactures "original tools for cable operations." Tools include converter container lock boxes, foam shelves, converter bags and return test equipment. p. 49

CTV Inc.   Circle # 46
CTV Inc. offers quality repair and calibration of CATV test equipment, and specializes in the upgrade of CALAN 1776 RX and 1777 TX. Also available, refurbished CALAN equipment. p. 79

Hewlett-Packard Company   Circle # 5, 31, 41
Hewlett-Packard offers a comprehensive range of test equipment to keep your entire broadband system at peak performance - from headend to subscriber drop. p. 9, 60-61, 77

Riser Bond Instruments   Circle # 30
Manufacturer of TDRs with unique and exclusive features to locate and identify faults and conditions in metallic two conductor cable. p. 59

Sadelco, Inc.   Circle # 39
Sadelco, Inc. manufactures SLMs for CATV. Mini-max meters can now provide accurate reading of the average power of all digital channels. p. 74

Sencore   Circle # 12
Sencore designs and manufactures a full line of CATV, Wireless CATV, QAM and MPEG-2 test instruments. Each instrument is designed to meet your system analyzing and troubleshooting needs. p. 23

Trilithic, Inc.   Circle # 9, 13
Trilithic manufactures test equipment for the CATV and LAN industries and components for aerospace and satellite communications. Key products are SLMs, leakage detectors, and a comprehensive line of return test equipment. p. 17, 25

Wavetek Corporation   Circle # 6
Manufactures equipment for CATV, telecommunications, wireless, and general purpose test. CATV equipment includes signal level, analysis, and leakage meters, sweep and monitoring equipment. p. 10-11

Companies in this issue

The following companies are cited in articles and features in the current issue. Page numbers refer to where the initial mention takes place in a particular story. Listings do not include some departments.

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http://www.barco-usa.com

Bay Networks, Inc.
http://www.baynetworks.com/cable

Blonder-Tongue Laboratories, Inc.
http://www.hometeam.com/blonder

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http://www.c-cor.com

Corning Incorporated
http://www.corningfiber.com

CTV Inc.
http://www.budcocable.com

Harmonic Lightwaves, Inc.
http://www.harmonic-lightwaves.com

Hayes Microcomputer Products, Inc.
http://www.hayes.com

Hennessy Products
http://www.hennessy.com

Hewlett-Packard Company
http://www.hp.com/go/catv

International Engineering Consortium (IEC)
http://www.iec.org

Microwave Filter Co., Inc.
http://www.ras.com/mwfilter/mwfilter.htm

National Cable Television Institute (NCTI)
http://www.ncti.com

NextLevel Systems, Inc./Broadband Networks Group
http://www.nlvl.com

NextLevel Systems, Inc. (Corp. HQ)
http://www.nlvl.com

Pace MicroTechnology
http://www.pace.co.uk

Passive Devices Inc.
http://www.pdi-eft.com

Philips Broadband Networks
http://www.be.philips.com/pbn

Pico Macom Inc.
http://www.piconet.com

Pioneer New Media Tech.
http://www.pioneerusa.com

Power & Telephone Supply Co.
http://www.ptsupply.com

Riser-Bond Instruments
http://www.riserbond.com

Sadelco, Inc.
http://www.sadelco.com

Scientific-Atlanta
http://www.sciatl.com

Siecor Corporation
http://www.siecor.com

SkyConnect
http://www.skyconnect.com

Spectrum
http://www.spectrummhz.com

Sprint North Supply
http://www.sprintnorthsupply.com

Synchronous Group Inc.
http://www.syngroup.com

TCS Communications
http:www.tcscomm.com

Telecrafter Products
Email: teleprod@compuserve.com

TeleWire Supply Company
http://telewiresupply.com

TFT, Inc.
http://www.TFTInc.com

Trilithic, Inc.
http://www.trilithic.com

Wavetek Corporation
http://www.wavetek.com

Women in Cable
http:www.wict.org

CED

OCTOBER

6-8 Technology Forecasting for the Telecom Industry, produced by Technology Futures Inc. Location: The Renaissance Hotel, Austin, Texas. Call Diane Sanso (800) 835-3887; or (512) 258-8898.

20-24 Fiber Optic Splicing and Testing, produced by Nynex. Location: Nynex Learning Center, Marlboro, Mass. Call (800) 239-3300.

22 Analog Headend Design, produced by Scientific-Atlanta Institute. Location: Atlanta. Call (800) 722-2009, press "3" when prompted.

23-24 Operating Analog Headend Systems, produced by Scientific-Atlanta Institute. Location: Atlanta. Call (800) 722-2009, press "3" when prompted.

27-29 Rocky Mountain SCTE Chapter 2nd Annual Cable TEC Symposium. Location: Holiday Inn, Ft. Collins, Colo. Call Hugh Long (303) 603-5236.

27-11/7 Outside Plant Engineering–Basic (OPE-BX), Bellcore TEC Training from Nynex. Location: Marlboro, Mass. Call (800) 832-2463 or (708) 960-6300.

28-30 Digital Network Engineering, produced by NextLevel Systems. Location: Hatboro, Pa. Call (215) 674-4800.

NOVEMBER

5 Emerging Video and Telecommunications Technologies, produced by Tektronix Inc. Location: Raleigh, N.C. Call (800) 763-3133.

Trade shows

October
8-10 Private & Wireless Show, produced by National Satellite Publishing Inc. (NSP). Location: Wyndham Anatole Hotel, Dallas, Texas. Call (713) 975-0030, ext. 28; or (800) 555-0224.

20-22 Eastern Cable Show. Location: Atlanta, Ga. Call the Southern Cable TV Association (404) 255-1608 for more information.

21-23 1997 National Communications Forum/InfoVision97. Location: Chicago. Call (312) 559-4600.

December
10-12 The Western Cable Show. Location: Anaheim, Calif. Call the CCTA at (510) 428-2225.

January
8-11 Consumer Electronics Show (CES). Location: Las Vegas, Nev. Call the Consumer Electronics Manufacturers Association (703) 907-7600.

28-30 SCTE Emerging Technologies Conference. Call the SCTE (610) 363-6888.

February
25-27 The Texas Cable Show. Location: San Antonio, Texas. Call (512) 474-2082.

7 Emerging Video and Telecommunications Technologies, produced by Tektronix Inc. Location: Atlanta, Ga. Call (800) 763-3133.

7-8 Operating RF-IPPV Systems, produced by

Scientific-Atlanta Institute. Location: Atlanta. Call (800) 722-2009, press "3" when prompted.

11 Emerging Video and Telecommunications Technologies, produced by Tektronix Inc. Location: Dallas, Texas. Call (800) 763-3133.

17-21 Hands-On Fiber Optic Installation for Local Area Networks (Multimode and Singlemode), produced by Siecor Corp. Location: Hickory, N.C. Call (800) 743-2671, ext. 5539 or 5560.

18-20 Cable Television Technology, produced by C-Cor Electronics Inc. Location: Fremont, Calif. Call C-Cor Technical Customer Services (800) 233-2267, ext. 4422.

19-20 Planning, Implementing and Managing Network Telephony, produced by ICM Conferences Inc. Location: Las Vegas, Nev. Call Eric Beauchamp (312) 540-3854.

21 Emerging Video and Telecommunications Technologies, produced by Tektronix Inc. Location: Santa Clara, Calif. Call (800) 763-3133.

DECEMBER

8-9 Fiber Optic Network Design, produced by Pearson Technologies Inc. Location: Washington, D.C. Call (800) 589-2549.

8-11 Hands-On Fiber Optic Installation for Outside Plant Applications, produced by Siecor Corp. Location: Hickory, N.C. Call (800) 743-2671, ext. 5539 or 5560.

15-18 Hands-On Fiber Optic Installation,

Maintenance and Restoration for CATV Applications, produced by Siecor Corp. Location: Hickory, N.C. Call (800) 743-2671, ext. 5539 or 5560.

JANUARY

8-9 Telecommunications Fundamentals, produced by American Research Group. Location: Morristown, N.J. Call (919) 461-8600.

26-27 Telecommunications Fundamentals, produced by American Research Group. Location: Chicago, Ill. Call (919) 461-8600.

26-29 ComNet '98. Location: Washington, D.C. Call MHA Event Management (800) 545-3976.

FEBRUARY

2-4 Wireless Cable International's Winter Show. Location: Singapore. Call the Wireless Cable Association (202) 452-7823 for additional information.

8-11 CompTel '98. Location: Las Vegas, Nev. Call the Competitive Telecommunications Association (202) 296-6650 for more information.

8-12 1998 Western ComForum. Location: Dallas, Texas. Call the International Engineering Consortium (312) 559-4600.

22-27 OFC '98 (Optical Fiber Conference). Location: San Jose, Calif. Call the Optical Society of America (202) 416-1980 for additional information.

23-25 CTIA's Wireless '98. Location: Atlanta, Ga. Call the Cellular Telecommunications Industry Association (202) 785-0081.
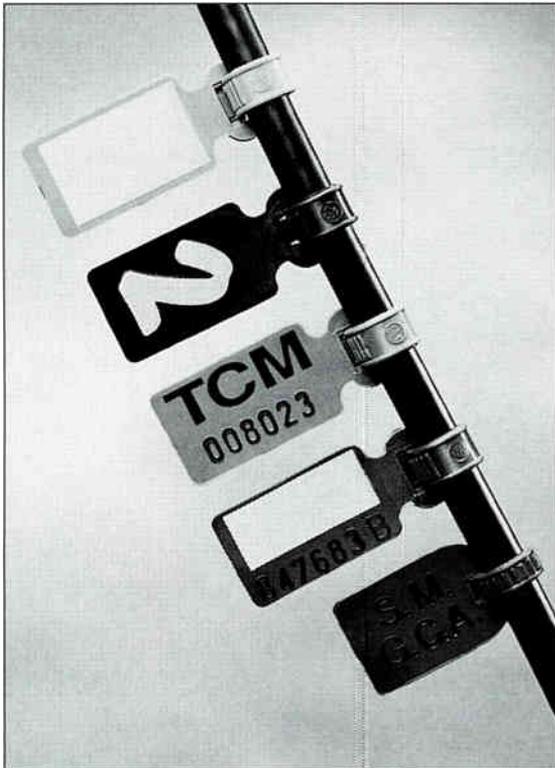
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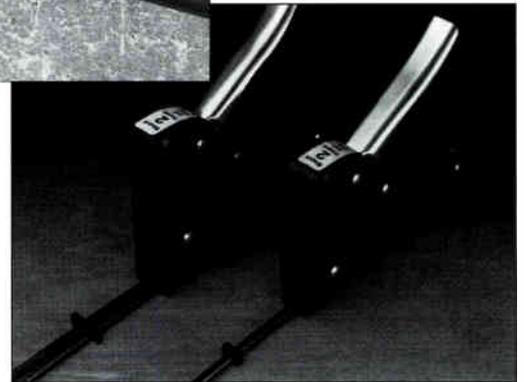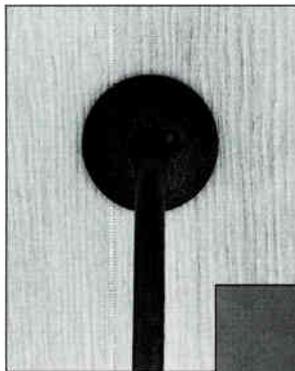
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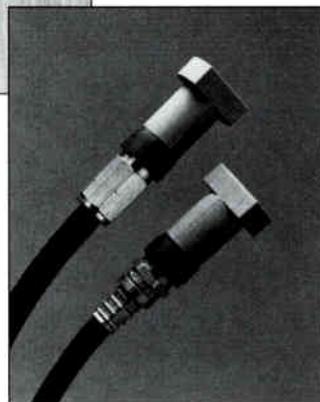
Telecrafter Products

Direct merchants to the telecommunications industry

800-257-2448 or FAX **303-986-1042**

Reader Service 29

Optical amp module

STURBRIDGE, Mass.–Galileo Corp. has introduced its FluoroAmp, its first fluoride-based optical amplifier module. The module is designed for use in wavelength division multiplexed (WDM) and dense wavelength division multiplexed (DWDM) networks. Based on Galileo's proprietary fluoride fiber, the module exhibits uniform gain in excess

Galileo's FluoroAmp

of 30 dB from 1534 to 1562 nm, a saturated power output in excess of 13 dBm and a noise figure of less than 4.5 dB. It incorporates all necessary components, including WDM couplers, optics, pump laser and monitoring photodiodes in a compact module that interfaces electronically via a SCSI-2 connector and silica SMF-28 fiber pigtails with the option of any standard fiber connector.

Circle Reader Service number 52

Simplified remote

SCHENECTADY, N.Y.–Contec has introduced a simple remote to operate NextLevel Systems' (formerly General Instrument) CFT2200 and DCT1000 advanced convertors. The RT-SR21 fills the need for simplicity and ease-of-use, says the company. The remote features a simple design, clean layout, well-spaced keys, a "One Touch" power button that simultaneously turns on the TV and the convertor, and Point and Press programming.

For cable operators, the RT-SR21 will help minimize confusion and reduce customer service calls, says Contec. With the launch of this latest remote, the company now offers three remote controls that operate advanced analog and digital set-tops.

Circle Reader Service number 53

1550 nm transmitter

SUNNYVALE, Calif.–Harmonic Lightwaves Inc. has announced the availability of its new high-power MAXLink 1550 nm transmitter.
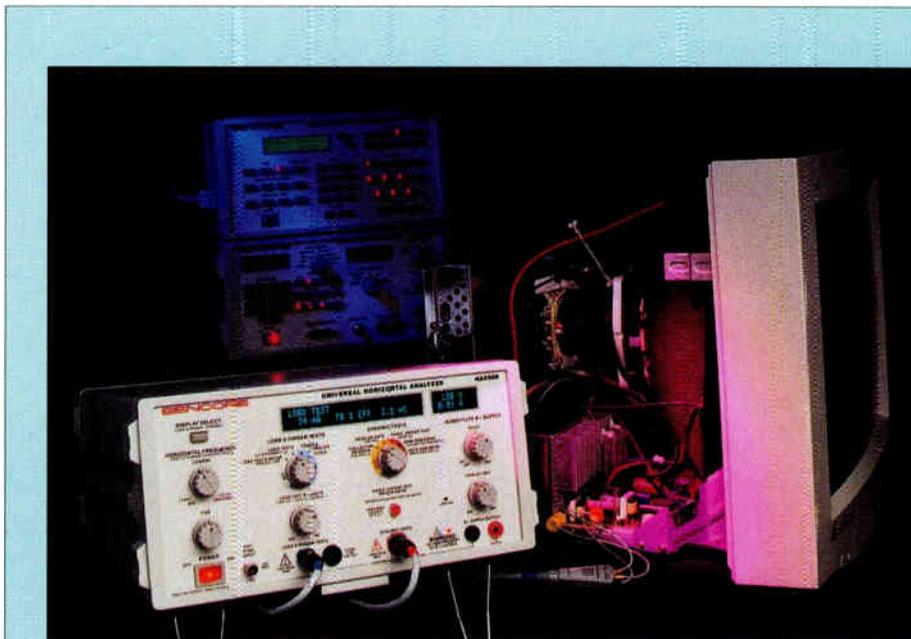
Horizontal analyzer

SIOUX FALLS, S.D.–Sencore Inc. has introduced a new universal horizontal circuit analyzer that works with all computer monitors, televisions, projection TVs and other CRT video displays.

The HA2500 provides a unique frequency lock and variable horizontal frequency system that allows the user to quickly service all horizontal circuits, no matter the frequency (15 kHz to 125 kHz).

Available in two models, the HLT 7709 with 750 MHz bandwidth, and the HLT 7809 with 870 MHz bandwidth, the transmitter provides improved performance and economy in both distribution and supertrunking applications, says the company.

The MAXLink extends the company's series of 1550 nm transmitters by increasing the optical output power to 9 dBm from each of the dual complementary outputs. The high output level, effectively 12 dBm of total optical power, enables dense distribution without requiring the use of an optical amplifier. The complementary outputs enable cancellation of common mode noise when used with the Harmonic Link Extender, resulting in high-performance supertrunking, says the company.

Circle Reader Service number 54

VSAT modem

SUNNYVALE, Calif.–Stanford Telecom has introduced a new VSAT modem, the STEL-9260, which can significantly reduce the cost of a VSAT system, says the company. Specifically, Stanford has tailored the product's features to mid-range data applications.
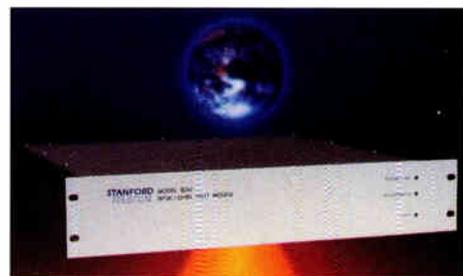
Stanford Telecom's VSAT modem

The transmitter section of the STEL-9260 has direct RF output covering the 52 to 88 MHz IF range, and programmable power levels from -5 to -25 dBm. The receiver is a true, variable rate demodulator, which is user-programmable from 19.6 to 1,024 kbps BPSK, and 64 to 2,048 kbps QPSK.

The STEL-9260 receive function includes on-board forward error correction (FEC), which provides a constraint length K=7 at Rate 1/2 to reduce overhead and assure the highest signal integrity. Higher speed modems require more costly FEC options at Rate 3/4 or 7/8. Performance is better than 1 dB from theoretical. The STEL-9260 can track input frequency

A SAMPLE OF TOPICS ADDRESSED

Business, Marketing, and Regulatory Issues
- Evolving competitive landscape
- Effects of the 1996 Telecom Act
- New entrants vs incumbents in the local loop
- Building the information society
- Causes and effects of industry convergence
- Customer satisfaction and profitability
- Imperatives in customer care
- The ITS and NII initiatives
- Business-case modeling for new ventures
- The new data dial environment
- Providing rural telecommunications
- Optimum service planning
- Data warehousing applications
- Smart cards and marketing
- Broadband deployment options
- Standards and the GII
- The tradeoffs of universal service
- IN, UMTS, and TINA
- Understanding market share growth
- Service branding and bundling
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- Sources of capital for telecom providers

Network Technology and Applications
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- ASDL and ISDN
- Fiber deployment in the loop
- Intelligent networks
- Hybrid fiber/coax networks and applications
- TCP/IP network design
- Implementing frame relay
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- Video-on-demand
- Global information infrastructures
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- Messaging, signaling, and broadband protocols
- Metropolitan SMDS
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- The fiber-optic information superhighway
- Future of the World Wide Web
- AFS and the Web
- The future of telecom and the Internet
- Internet access router requirements
- Internet Protocol Next Generation
- MPEG-2
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- Videoconferencing
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- Networks for broadband multimedia
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- Interactive broadband and PCS services
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- Content-delivery services
- Digital broadcasting

Computer Applications, Data Communications, and Software Directions
- Intelligent peripherals and the advanced intelligent network
- Gigabit Ethernet networks
- Enterprise computing in communications
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- Computer/telephony integration
- Digital content management
- IN speech recognition

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- Wireless telecom access
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- PCS versus wireless
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Operations and Quality Control
- Business support systems
- Total quality management and re-engineering
- Exceeding customer expectations
- Network simulation and testing
- Performance standards and interconnection
- Powering issues and solutions
- TMN and local loop service management
- Full-service network management
- IN testing
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- TMN and IN
- Service control in interactive communications

The International Scene
- Canada and the communications millennium
- Telecom in China
- Fiber optics in developing countries
- Access technologies for developing countries
- The Asia-Pacific satellite market
- Telecom in developing Asia
- Latin America and the Caribbean in the GATS
- Japan in the information age

Evolving Technology to a Revenue Platform
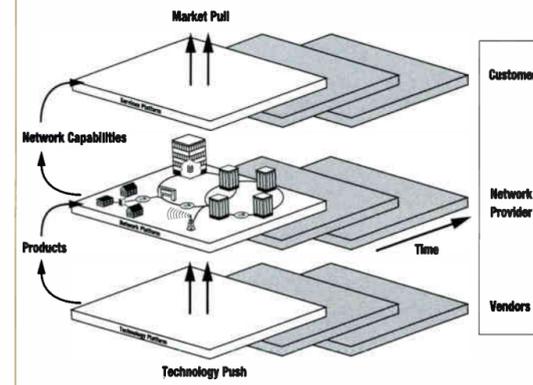
SNA Over a Frame Relay Network
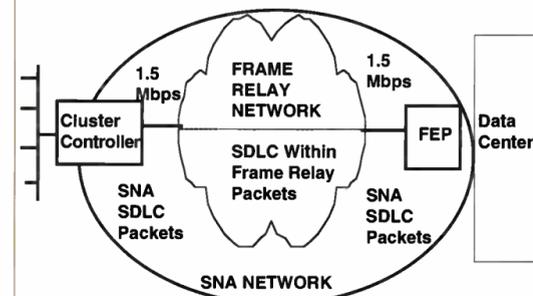
Fundamental aspects of current technologies and network operations are explored.

The International Engineering Consortium, established in 1944, is a nonprofit organization dedicated to catalyzing positive change in the information industry and university communities. The Consortium provides unsurpassed educational opportunities for today's information industry professionals and conducts a variety of industry-university programs. The Consortium also conducts research and provides publications addressing major opportunities and challenges of the information age. The Consortium is affiliated with more than 70 leading, high-technology universities.

Chief Executive Officers Visions

In this section, the following Chief Executive Officers share their visions on a variety of key issues facing the industry.

Lester M. Alberthal, EDS Corporation

Robert E. Allen, AT&T

Robert Annunziata, Teleport Communications Group

Salim A.L. Bhatia, BroadBand Technologies, Inc.

Michael J. Birck, Tellabs

Sir Peter Bonfield, British Telecommunications plc, and Concert plc

Brian A. Canfield, BC Telecom Inc.

William V. Catucci, AT&T Canada Long Distance Services Company

James L. Donald, DSC Communications Corporation

David W. Dorman, Pacific Bell

William T. Esrey, Sprint

Michael Fitzpatrick, Pacific Telesis Enterprises

Louis V. Gerstner, IBM

George Gilder, Discovery Institute

Richard R. Green, CableLabs

George H. Heilmeier, Bellcore

Royce Holland, MFS Communications Company, Inc.

Glenn R. Jones, Jones Intercable Corporation

Robert W. Kinzie, Iridium LLC

Robert J. Massey, CompuServe Incorporated

Richard D. McCormick, U S West Inc.

John McLennan, Bell Canada

Scott McNealy, Sun MicroSystems

John Millard, Mitel Corporation

Jean C. Monty, Northern Telecom Limited (Nortel)

Richard C. Notebaert, Ameritech Corporation

Philip J. Quigley, Pacific Telesis Group

Bert C. Roberts, Jr., MCI Communications Corporation

W.J. Sanders III, AMD

Charles Sirois, Telesystem Ltd. and Teleglobe Inc.

Raymond W. Smith, Bell Atlantic

Edward Whitacre, SBC Communications Inc.

ANNUAL REVIEW OF COMMUNICATIONS 1997

The International Engineering Consortium's *Annual Review of Communications* is an indispensable reference publication for telecommunications and information industry professionals. Each year, the Consortium brings together into one unique resource the most current thinking and practical experience of industry professionals on a variety of topics currently facing the information industry. This invaluable reference tool is a must for executives, managers, and educators in all sectors of today's changing communications industries.

Special 50th Anniversary Issue

The *Annual Review of Communications 1997* marks the 50th edition of the *Annual Review.* This special commemorative issue contains both cutting-edge updates of current technologies and applications, as well as basic tutorials intended to bring readers up to date on new developments in the industry. Brought together in one 1,100-page volume are insightful essays on:

- Business, marketing, and regulatory issues
- Multimedia, the Internet, and on-line services
- Network technology and applications
- Computer applications
- Data communications
- Wireless communications
- Operations
- Quality control

Features

- Offers up-to-date information on a range of key topics, all in one volume
- Discusses the hard-won experiences of industry players over the past year
- Contains a special focus on the international telecommunications/information industry in countries such as China, India, Africa, Brazil, Mexico, France, Germany, England, Canada, Russia, and Japan
- Evaluates the status of critical industry technologies and applications
- Forecasts how and where markets will develop for various services
- Provides insight on successful business practices and strategies
- Contains extensive diagrams, graphs, and tables to help illustrate key concepts
- Includes an acronym guide and extensive index

Enhanced Service Curve — Examples

Residential Subscriptions to Communications Services — 1985-2000
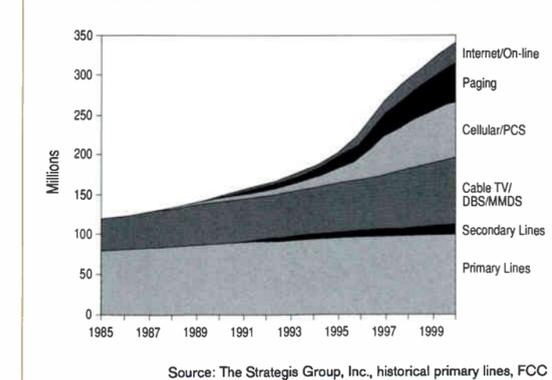
Source: The Strategis Group, Inc., historical primary lines, FCC

Up-to-date information on key industry markets, trends, and consumer behavior is presented.

MAJOR ORGANIZATIONS REPRESENTED

More than 200 experts from a wide variety of change-driven corporations and research institutes are represented in this edition of the Annual Review, including:

AG Communication Systems
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Alcatel
Ameritech
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A.T. Kearney, Inc.
AT&T
BC Telecom Inc.
Bell Atlantic
Bell Canada
Bellcore
BellSouth
Boston Technology
BroadBand Technologies, Inc.
CableLabs
Celcore, Inc.
Cisco Systems
Clear Communications
CompuServe Incorporated
Comverse Network Systems
Digital Equipment Corporation
DSC Communications Corporation
ECI/Telematics
EDS Corporation
E/O Networks
Frontier Technologies Corporation
General Instrument Corporation
Global Broadcasting Corporation
GTE Corporation
Hewlett-Packard Laboratories
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Iridium LLC
Jones Intercable, Inc.
Lightbridge, Inc.
Lucent Technologies
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MFS Communications
Mitel Corporation
Mitsubishi Corporation
Motorola
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MTA-EMCI
National Semiconductor Corporation
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Omnipoint Corporation
Pacific Bell
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Probe Research
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SBC Communications Inc.
Scientific-Atlanta, Inc.
Securicor Telesciences Inc.
Shyam Telecom, Ltd.
Siemens AG
Southern New England Telephone Company
Sprint
Sun MicroSystems
Swiss Telecom North America
Tadiran Telecommunications, Inc.

Tandem Computers Inc.
TDS Telecom
Technology Trading House
Teleport Communications Group (TCG)
3Com Primary Access
3M Telecommunications Systems Division
US Robotics
U S West

DBS Terminal Average Cost Breakdown

- Memory
- ASICs
- RF
- Power Supply
- Mechanical
- Conversion
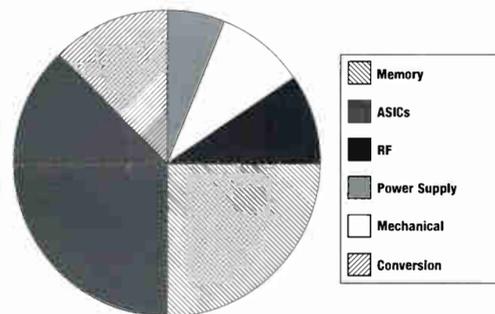
Present Value of Investment Over 5 Years: Regulated Service Deployment

Net Present Value = -S.02 million

$.24 — Year 1
$.21 — Year 2
$.28 — Year 3
$.34 — Year 4
$.24 — Year 5

Yearly Returns

-$1.33 Initial Investment

- Additional Returns
- Returns
- Initial Investment
- Additional Initial Investment
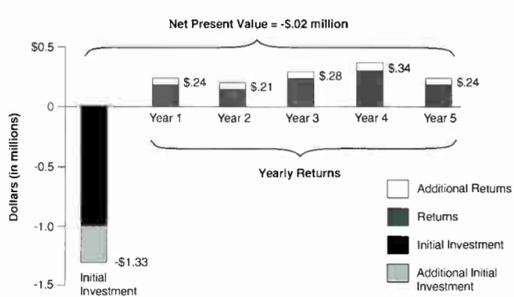
Assumptions: 5-year planning horizon; 10% discount rate; mandated deployment increases the initial investment 33%; 10% increase in variable operating costs; and 20% increase in revenues. Also assumes market or territory is increased but demand is weaker in these areas.

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The economics of various technology options and deployments are analyzed.

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OTHER PUBLICATIONS (Please fax me detailed information on the following checked items)

❑ A Strategic Vision of the Wireless Industry: Communications Unbound
❑ The Wireless Industry and the Coming Personal Communications Services Revolution
❑ The Local Loop: Access Technologies, Services, and Business Challenges (Volume 2 in a series)
❑ Intelligent Networks: Current Advances and Business Issues (Volume 2 in a series)
❑ The Telecom Outlook Report: 1997-2007
❑ Competition for Access Services in the Local Loop

❑ The Consolidation of the Information Industry: A Paradigm Shift
❑ Broadband/Multimedia Services and Networks: Technologies, Applications and Recent Developments (Volume 2 in a series)
❑ Worldwide Wireless Communications

Plenary Session VideoForum Series
❑ Capturing Today's Broadband/Multimedia and Local Loop Opportunities
❑ The Wide World of IN Solutions

Annual Review of Communications

1997

Volume 50

Presented by the

International Engineering Consortium

Sencore's universal horizontal circuit analyzer

The unit provides a "Horizontal Output Load Test" that simplifies testing and set-up. The unit allows the user to test the circuit even without applying AC power. This feature will help provide more accurate estimates, reduce the number of damaged replacement parts and will speed the technician's diagnosis and repair, says Sencore. The HA2500 also incorporates the patented "Ringer" test for analyzing IHVTs, flybacks and yokes in seconds. The new "dynamic tests" help the user analyze horizontal circuits in a powered-up condition to catch even subtle defects in the power supply and drive signal. This test can help eliminate call-backs and reworks associated with horizontal circuits. The HA2500 also incorporates a special variable-current limited and protected B+ substitute supply. This feature allows the tech to test and troubleshoot, even when the power supply is dead.

Circle Reader Service number 51

drift up to ±2 MHz without the loss of signal lock. For instance, the specified carrier tracking range is ±2 MHz for a data rate of 64 kbps with BPSK, or a data rate of 128 kbps with QPSK.

Circle Reader Service number 55

Digital waveform monitor

HAUPPAUGE, N.Y.–Leader Instruments has announced a new monitoring unit, the LV 5150D, which handles both serial digital and analog components for HDTV signals in the 1125/60 (59.94) format. It provides full

Leader's LV 5150D monitoring unit

waveform monitoring functions, including line select, cursors and memory presets of test setups. Picture display of the Y or G component, with a line select strobe, is also provided. The unit offers a vector display of chroma component, as well as a Lissajous display for stereo audio.

Two SDI inputs are accommodated with an active output of the channel selected for observation. Waveform display and decoded picture monitor outputs may be set to GBR or YPbPr form.

Circle Reader Service number 56

Interactive training

EXTON, Pa.–The Society of Cable Telecommunications Engineers (SCTE) has expanded its educational offerings to include computer-based training for industry technical personnel. Two software packages, Telecom Technologies and T-1 Transmission Basics, which are currently available only to SCTE members, provide a solid introduction to the fundamentals of telephone and T-1 transmission, as well as switching technologies. Graphics, navigation tools, glossary features and on-line help bring the practical information on the technologies to life. Each program takes about four to six hours to complete.

The information provided in the interactive training programs is designed to support the Society's Telephony Certification program in a way that is both convenient and cost-effective for telecommunications employers, says the Society. The CBT courses are licensed to allow each cable system to purchase one copy of the program and install it on a computer for up to one year–allowing for not only an unlimited number of trainees, but flexibility in opportunities to learn and review the material.

"As our industry deploys telecommunications services, it becomes imperative that the Society's members understand the telephony and wide-area data services history of development," says SCTE VP of Technical Programs Marv Nelson. "This is one of the reasons behind the introduction of the Society's Telephony Certification Program."

Circle Reader Service number 57

Dense WDM

MARLBOROUGH, Mass.–Artel Video Systems has released MegaWav, a new dense wave division multiplexer (DWDM) system for multichannel broadcast video transport, cable TV supertrunking, multichannel interoffice trunking and high-channel density solutions. Originally designed to increase the capacity of the installed fiber plants for telephony networks, the technology has been adapted by Artel for deployment in local area video networks.

MegaWav has the capability to optically multiplex up to nine optical digital data streams on a single fiber, providing easy expandability for operators, without the cost of installing additional fiber. The platform sup-

ports all of the Artel video, audio and data transport products.

MegaWav is designed to easily integrate current fiber optic technologies, and gives multiplexing functionality to Artel's DigiLink, MegaLink and SL4000 product lines, as well as products from other manufacturers, providing an advantage over traditional electrical multiplexing, says the company, which requires the same transmission speed. When combined with the SL4000 multichannel video transport product, up to 54 studio quality video signals can be transported on a single fiber, with an aggregate bit rate of 10.8 Gbps.

Circle Reader Service number 58

More ACM fonts

SALT LAKE CITY, Utah–FrontLine Communications has announced the availability of 28 new fonts for its All Channel Message System. The new font selection allows users to create more stylized and unique looks for their scrolling messages and pages, and will be especially useful in applications for community bulletin boards and cross-channel promotions. The text messaging capabilities of ACM are suited to EAS solutions, as well as other multichannel applications. All new fonts are free to current ACM users and can be downloaded from the FrontLine Web site at www.frontlinecom.com.

Circle Reader Service number 59

Test signal generators

CORAL SPRINGS, Fla.–VisionTeq recently introduced the HG-701, a new return path signal generator which produces six ultra flat, high output level (51 ±0.25 dBmV) carriers

VisionTeq's return path signal generator

spaced 7 MHz apart within the 5 to 42 MHz return band. The ±0.25 dB ultra flat output removes the need for awkward-to-use calibration charts.

The unit is rugged and compact, with encapsulated components, and has a re-chargeable battery which allows continuous operation for more than 8.5 hours. This high-quality, high-stability, crystal-controlled signal source is a

cost-effective solution for those looking for an end-of-line test signal generator to implement and align the return path of two-way cable systems, says the company.

In addition to the HG-701, VisionTeq has developed a family of test oscillators, which includes models compatible with most international standards, and welcomes inquiries for any custom broadband RF product designs.

Circle Reader Service number 60

Signal monitoring software

BEAVERTON, Ore.–Tektronix Inc. has introduced its CSS50 Cable Television System Software to address the complex maintenance, installation and regulatory compliance challenges faced by cable TV network operators.

The CSS50 software supports a new line of instruments currently applicable to the North American NTSC standard. In addition, the software provides full compatibility with 32-bit remote control software products, making remote operation in Windows 95 and
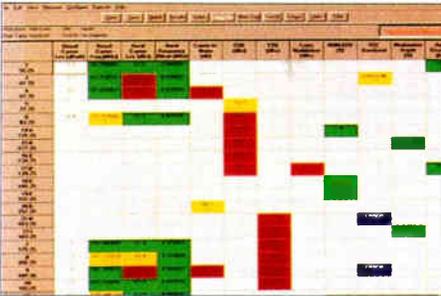
Tektronix Inc.'s CSS50 software

Windows NT more straightforward. CSS50 supports the DS1000 Series of demodulators, the VM100 Series video measurement sets, and both the 2714 and 2715 cable TV spectrum analyzer models.

The CSS50, DS1000 Series, VM100 Series and 2714 or 2715 together offer a total solution that automatically performs all FCC proof of performance tests to specification and ensures consistency and repeatability of all measurements, according to Tek.

Circle Reader Service number 61

Cross-connect module

SPOKANE, Wash.–Telect has introduced its new Broadband Intra-Office DSX module which allows network administrators to accomplish digital signal cross-connects between floors and buildings without expensive repeater modules. The module integrates the repeater function within the DSX to handle cross-connects up to 450 feet in distance.
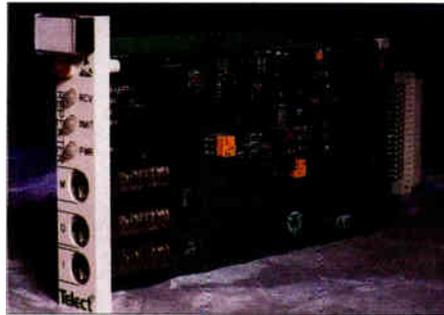
Telect's cross-connect module

The industry-compatible module fits in Telect's Broadband Connectivity System, or in any other industry-standard broadband system. It occupies half the rack space of conventional DSX plus repeater configurations.

Circle Reader Service number 62

Cable TV enclosure

BELLINGHAM, Wash.–Alpha Technologies has added a new application-specific enclosure, the UPE/M6, which allows the co-location of a utility meter, power supply and up to six float-service, gelled electrolyte batteries.

The UPE/M6 is constructed of durable, long-lasting aluminum and a powder coat finish for corrosion resistance. The enclosure's doors are flush and mechanized with double locks for safety and security.

The unit features a 15 amp "HM" High Magnetic circuit breaker, a duplex AC receptacle, a service power inserter with a cable TV fitting, and an LRI lamp for simple status monitoring. Sliding battery trays hold up to six gel cell batteries near the bottom of the enclosure to maximize battery convection cooling.

Circle Reader Service number 63

Cable measurement system

UNION CITY, Calif.–DCM Industries has announced the availability of its coaxial cable measurement system for testing all types of coaxial cables.

The CMS coax system evaluates and

records test data for every significant high- and low-frequency parameter. The stand-alone, fully integrated system requires minimum operator skills to learn and operate.

The system features an advanced coaxial cable connection fixture. It

DCM's coaxial cable measurement system

eliminates the need for expensive termination

connectors and requires no special cable preparation. Software features include test program, specification editor, tabular and graphic data output, ASCII conversion and data file management. Integrated test reports for low- and high-frequency tests are produced in several user-selectable formats and can be automatically compared against user-defined specification limits.

Circle Reader Service number 64

Financial service products

ENGLEWOOD, Colo.–CSG Systems Inc. has added two new financial service products—Credit Verification and Recurring Credit Card Processing.

CSG's Credit Verification is an interface to a third-party credit bureau that allows customer service representatives (CSRs) to verify credit instantly and detect fraud of potential or current customers. It comes in either Basic Service or Enhanced Service versions.

The Basic Service displays information that matches the Social Security number given by applicants. It also indicates if the address of the applicant is non-residential and displays "public alert" flags to alert CSRs when a Social Security number is assigned to someone who has filed bankruptcy or has a tax lien. The Enhanced Service calculates a credit risk score on the applicant and includes all features of Basic Service.

CSG's Recurring Credit Card Processing allows customers to have their bills paid automatically by credit card charge, which reduces deliquencies and churn. It also eliminates such problems as lost payments, misread scanlines or check document amounts.

Circle Reader Service number 65

Video multiplexer

MELVILLE, N.Y.–Vicon Industries Inc. has introduced its AurorA Digital Video Multiplexer. The AurorA offers a choice of 16 channel monochrome or color units with simplex or duplex operation. Nine multiscreen displays with various titling options

Vicon's AurorA multiplexer

for live or playback video are available, including full screen, picture-in-picture, quad, 3x3, 4x4, three variations of these and a user configuration. The picture rate is optimal, based on scenic activity.

Circle Reader Service number 66

Marcus to deploy Bay solution

SANTA CLARA, Calif.–Marcus Cable has selected Bay Networks Inc.'s internetworking solutions for the delivery of Marcus@Home–the company's new high-speed data and Internet access service.

The operator will deploy Bay Networks' LANcity Personal (LCP) cable modems to provide connectivity for the launch of its new on-line service, Marcus@Home, to households in the Fort Worth and Park City, Texas area.

"In launching this program to enable our subscribers high-speed Internet access, one of our top priorities is to ensure dependable connectivity for our customers," said Jeff Tokar, director of new business and technology at Marcus, in a statement.

The Marcus@Home service will give users 24-hour unlimited access to the Internet, as well as other on-line services and applications, including home shopping, distance learning, interactive gaming, videoconferencing and IP telephony.

Time Warner–Tampa picks Lindsay taps

LINDSAY, Ontario–Lindsay Electronics has entered into a supply contract with Time Warner, Tampa, Fla. to provide Lindsay's model LGT nine-inch tap. The multi-year deal will provide product for the entire Tampa Bay and St. Petersburg area. The electrical/mechanical design of the tap makes it suitable for the extreme environmental conditions found in this area, as well as allowing additional services without extensive plant modifications.

GTE selects NL solution for digital

HATBORO, Pa.–GTE Media Ventures has selected NextLevel Systems Inc. Broadband Networks Group to supply technology and equipment to support GTE's launch of full digital video service.

NextLevel's end-to-end solution includes the ACC-4000D addressable controller and related headend equipment, plus DCT-1000 digital consumer set-top terminals for GTE's Florida plant. GTE is one of the company's first U.S. customers to launch the NextLevel ACC-4000D in a digital system.

GTE's 750 MHz video network currently passes more than 150,000 homes, and under its current expansion plans, this number is expected to exceed 400,000 by the end of 1998. GTE has expanded its Florida network to include Safety Harbor and Dunedin, in addition to Clearwater, St. Petersburg and parts of Pinellas County.

GTE's deployment will increase the number of video programming channels from 79 to 114, and will include the Starsight electronic programming guide, as well as Music Choice. NextLevel's digital technology provides the GTE system with the ability to deliver features such as expanded channel capacity, digital-quality video, Dolby digital audio, the option to deliver a 16x9 aspect ratio "movie-like" video display, and the capability to offer other interactive services.

The ACC-4000D family of access con-

trollers features a multi-tasking system server platform that controls all of the signaling and messaging to and from the GTE customers' DCT-1000 addressable set-top terminals. It accurately stores records of all addressable transactions and links directly to the operator's business system for timely billing.

C-Cor to supply Century

STATE COLLEGE, Pa.–C-Cor Electronics Inc. will provide Century Communications of Rohnert Park, Calif. with FlexNet 700 Series 750 MHz trunks, bridgers and line extenders, and FlexNode AM fiber nodes. The equipment will be used in an HFC architecture with a full fiber backbone. C-Cor has been selected for Phase 1 of the system, which was started this past July.

CableTime, SeaChange announce deal

MAYNARD, Mass.–SeaChange International Inc. has announced a multi-million dollar commitment for the purchase of its digital ad insertion systems and satellite services from CableTime, a U.S. cable ad sales contractor. Beginning with 100 headend systems to be installed in 1998, the Sea-Change–CableTime relationship will create the largest single cable advertising delivery system, according to executives at SeaChange.

". . . Working with SeaChange will enable our existing digital systems to receive satellite delivery of ads to local headends," said Darrell Campbell, president of CableTime, in a written statement.

Based in College Station, Texas, CableTime is a subsidiary of U.S. cable operator TCA Cable TV. CableTime manages ad sales in more than 500 headends in more than 30 states, reaching more than three million subscribers.

CableLabs contracts with Yassini

LOUISVILLE, Colo.–To help attain interoperable cable modems, Cable Television Laboratories Inc. (CableLabs) has contracted with cable modem inventor Rouzbeh Yassini, CEO of YAS Corp. Yassini is the former CEO of LANCity, which was among the first companies to develop and commercialize cable modems. Yassini will direct the testing and verification stage of the MCNS/DOCSIS standardization process, according to information released by CableLabs.

"Because interoperability testing and verification is critical to cable modem mass deployment, CableLabs has sought Yassini's advice as the technology's developer to employ his proven strategies and tactics in the direction of this standardization process," explained Dr. Richard Green, CableLabs president and CEO, in a statement.

CableLabs is managing the three stages of the Data-Over-Cable Service Interface Specification (DOCSIS) under the leadership of Bob Cruickshank, director of CableLabs Digital Network Technologies. Stage one, the RF specification, concluded in March 1997, enables suppliers to begin building interoperable, high-speed cable modems plus modem headend systems.

Stage two, testing and verification, overseen by Yassini, is expected to be finished by March 1998. The final stage, commercialization, follows with an anticipated year-end 1998 retail availability date.

Cox selects Tellabs' Titan system

LISLE, Ill.–Tellabs is supplying its Sonet-based Titan 5500 digital cross-connect system to Cox Communications for use in local service offerings throughout Cox properties nationwide, including California, Oklahoma, Virginia and Arizona.

The two companies signed a three-year contract that names Tellabs as Cox Communications' exclusive source for Sonet 3/1 digital cross-connect systems. The agreement is estimated to be worth about $5 million, according to information supplied by Tellabs.

Cox is building a multi-service network designed to deliver voice and data services in select markets nationwide. The company is beginning to roll out local telephone service to both business and residential customers in three markets (see "Spotlight," page 18). **CED**

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CATV Engineering and Training

Blonder Tongue has multiple openings for technically qualified CATV engineering associates. Successful candidates will train and assist Blonder Tongue's customers to specify, design, and implement Blonder Tongue products into CATV and private cable systems.

Qualified candidates will have a minimum of 10 years CATV technical and three years of classroom instructional experience in several of the following areas: satellite and broadcast TV headend signal processing, trunk and feeder broadband distribution, CARS band or 18 GHz AM microwave, or addressable interdiction systems. Candidates must be able to teach with confidence, clearly convey technical concepts and present a professional image. Supervision of technical associates can substitute for instructional experience.

Educational Criteria: Minimum of a High School diploma and formal technical education. Candidates with a BS in engineering and partial or full SCTE BCE certification get preference. At least one position requires fluency in Spanish or Portuguese. Travel requirements range from moderate to extensive, depending on the position.

Here's how to apply.

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ResNet Communications provides cable and Video-On-Demand (VOD) services to multi-family residences. Utilizing proven networked communications technology, ResNet is well on its way to becoming a major player in the rapidly expanding private cable-services market. ResNet is looking for qualified applicants for the following CATV positions.

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MDU Const./Project Mgmt. Positions #180397
Service Technicians/Installers Positions #180497
Quality Control Engineers Positions #180597
Training (Management/Trainer) Positions #180697
Billing System Manager ((SG) # 180797

Experience in a multifamily environment or shared services helpful. Interested candidates should submit a letter of application, resume and a salary history to:

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Loss of ally in D.C. signals end of an era

By Walter S. Ciciora, Ph.D.

The term "end of an era" is too commonly used to have the impact that it should. But I can't think of another way of expressing the departure of Wendell Bailey from the National Cable Television Association (NCTA). From the perspective of the cable engineering community, we've lost "a friend in Washington," an ally and an important interface to government and to cable's non-technical management.

Certainly, we have not lost a friend. I'm sure most of us who know him well will keep in close contact with Wendell no matter where he goes. And I'm sure we all wish him well. But we have lost a friend in Washington. Anyone who ever attended an NCTA Engineering Committee meeting had to be impressed by the famous (or infamous) "Washington Report" which began each meeting. Without any preparation, Wendell could stand up and recite in a coherent manner the goings-on in Washington. When necessary, he would call in someone from the legal department to clarify or expand on a point. But usually, Wendell would extemporaneously talk for at least an hour, and often for two, about what was happening, what it meant, what direction it was likely to take, and what we should do about it.

I think Wendell's most valuable contribution to the cable industry has been the structuring and conduct of the NCTA Engineering Committee. Before Wendell, the Committee was a small group which occasionally met and did relatively fewer things. Wendell saw the potential for what could be accomplished by a group which met regularly for a sufficient length of time to interact both in the meeting and outside of it. In fact, some of the most important accomplishments took place in the halls while on break, or over dinner or breakfast in smaller ad hoc groups.

The strength of the NCTA Engineering Committee is the combination of technical folks from all three of the major segments of the industry: cable operators, equipment suppliers and programmers. No other organization brings these three separate but interdependent branches together on a regular basis to consider common problems. In particular, engineers from equipment suppliers get to regularly interface with their technical customers.

When I first started coming to Engineering Committee meetings, I was with Zenith as an equipment supplier. I then transitioned to American Television and Communications on the cable operator side. The benefit derived when on the supplier side was a casual, informal way of learning the needs and issues of the operators. The atmosphere of the NCTA Engineering Committee made that possible in a manner that could not be accomplished any other way.

The other major contribution is in conjunction with Katherine Rutkowski. The cable industry's most important technical record is the NCTA Convention Technical Papers publication. Katherine and Wendell have ensured that the quality of the papers is scholarly, yet practical and useful. The technical record is continuous and invaluable, and is a resource both for those with years of experience in the cable industry, and those who are just entering it.

Bridging the communication gap

The engineering community and management have always been separated by a communications barrier. Management often views engineers as folks who spend money and want to play with new technology, when the most recent technology has only lately become almost understandable to them. For their part, most engineers do not explain difficult technical issues well. This is partly out of a lack of patience and partly because that kind of communication is missing in the technologist's skill set. Wendell was an important bridge between the cable technical community and the management of the industry. He was comfortable with both groups and had their trust. As such, he could explain technical issues in a manner that did not embarrass or intimidate the non-technicals.

Wendell was also very active internationally. In a world growing smaller every day, this is more important than most appreciate. This visibility helps U.S. cable operators with interests abroad. It also helps U.S. equipment suppliers and programmers. While it is difficult to trace specific individual benefits, the overall exposure of U.S. technological prowess to a world hungry for more television "lifts all boats." The U.S. cable industry needs continuous exposure, if its technological exports are to thrive.

A frightening thought is that another industry might see the immense value that could be had from employing Wendell and make him the proverbial "offer he couldn't refuse." Not only would Wendell be lost to the cable industry, but he could become an important asset to a competitive industry. I'm sure that this is not now in the works. However, Wendell is well-known, and I'm certain attractive offers will come his way. I certainly hope that the best offer comes from a cable-friendly source.

I can't count the number of people and the number of times I've heard it said that there may not be a suitable replacement for Wendell. While there are many who could do the technical side, and there are many others who could do the political and interpretation side, we know of no one who can comfortably master both sides of Wendell's job. What is needed is rare: someone who can understand the technology, see its significance, communicate the meaning, work the political process and tolerate the frustrations. Most who are technically competent have no patience for the political process. Most who are politically sensitive have little technical experience.

I guess it is most appropriate to end this piece with a simple "thank you" to Wendell for all of his contributions to the cable technical community. The industry will miss him, but most of all, we in the technical community will miss him! **CED**

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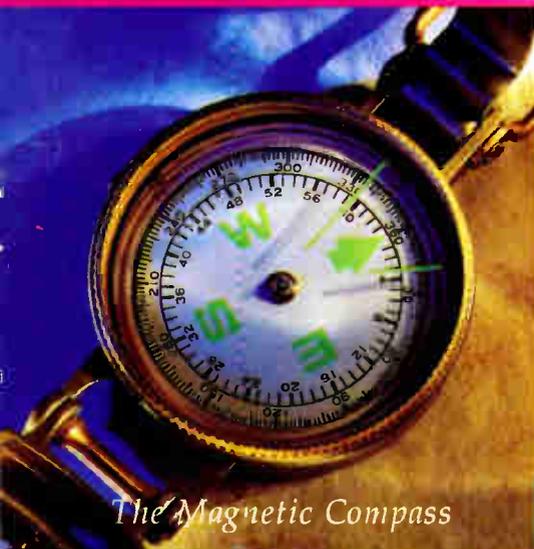
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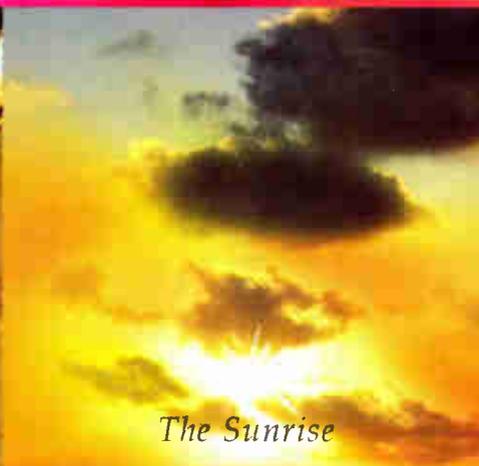
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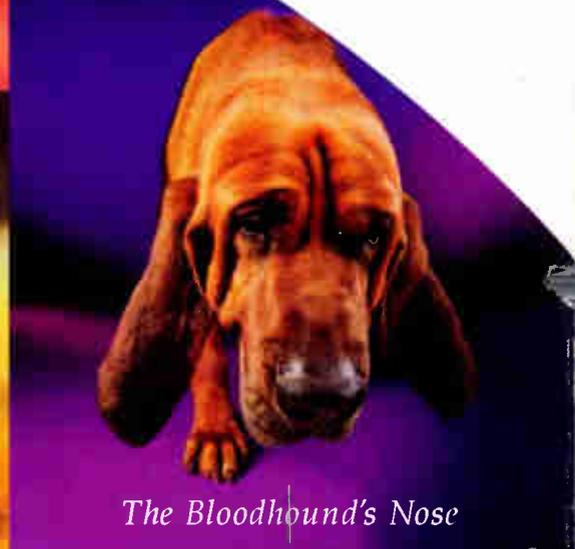
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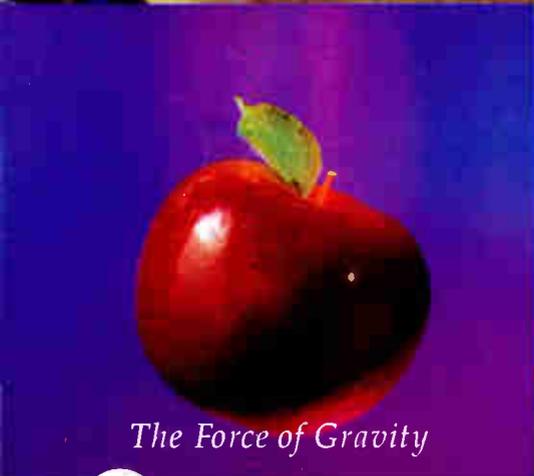
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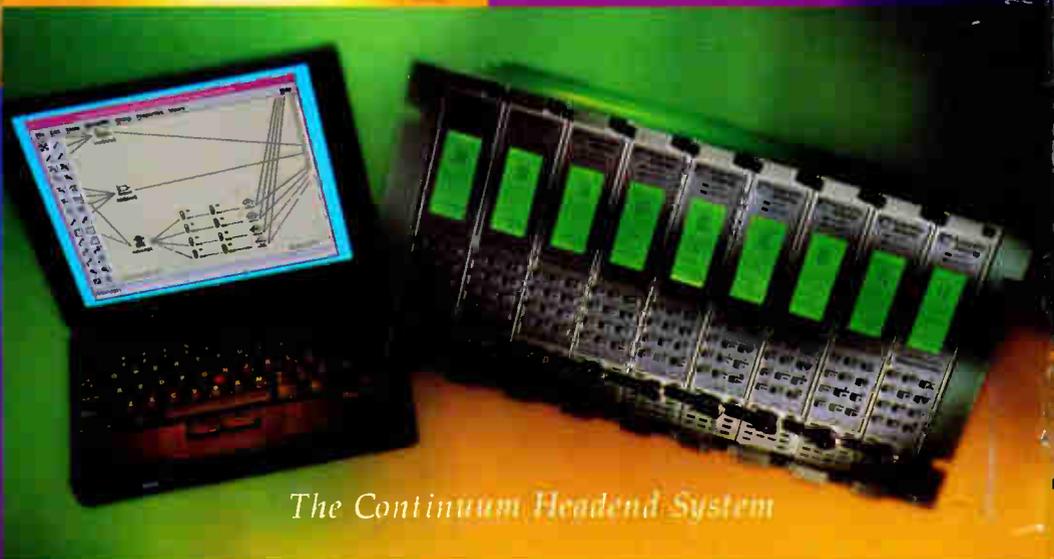
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