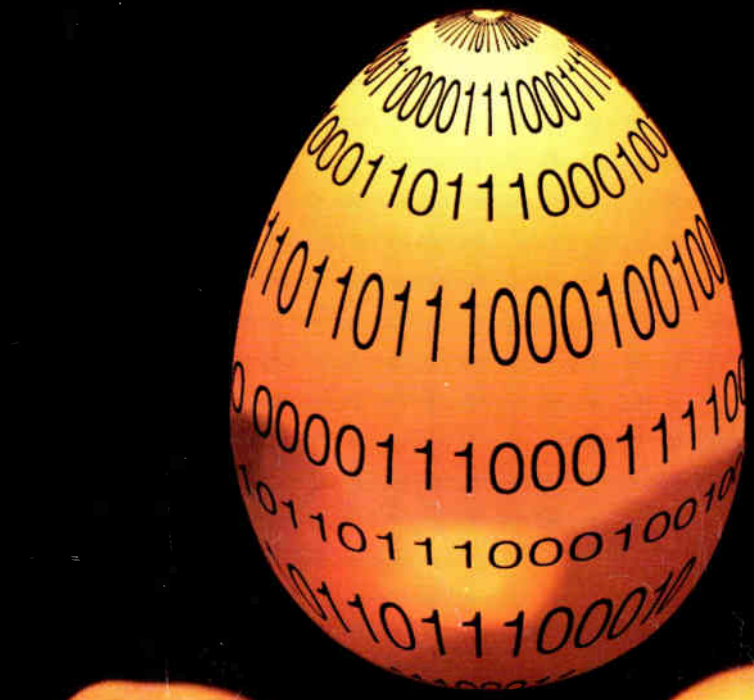
APRIL 1996

COMMUNICATIONS ENGINEERING & DESIGN
THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

Is digital cable's golden egg?



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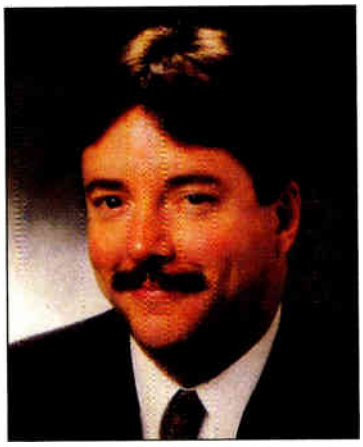

Stirring the sleeping giant

At the time of this writing, US West was suffering the slings and arrows of the daily press for abruptly ceasing its video dialtone trial in Omaha, Neb. Upon reading many of the accounts, it would be easy to assume interactive TV's Armageddon had arrived. But is interactive TV dead, or is US West simply guilty of following its instincts and not marketplace reality?

A peek inside the Omaha trial is quite revealing: US West can be accused of overengineering its network–and because of that, it learned several very expensive lessons. For example, US West found that:

✔ Intelligent set-tops are expensive. Insiders say the company spent about $2,300 for each set-top, while Scientific-Atlanta, the manufacturer, ate about $1,000 per unit.

✔ Video-on-demand is neat, but it can't offset the cost of those expensive set-tops.

✔ Just like in Orlando, system integration has turned out to be more complicated than anyone could have predicted.

✔ Software requires millions of lines of code to make disparate pieces of the system talk the same language. Making servers and set-tops sing off the same sheet of music without missing a note requires a lot of practice until the harmonies are just right.

✔ In spite of the millions spent, US West's system didn't enjoy the level of reliability its customers have come to expect from the company. In brief, the current state of technology "wasn't quite ready for prime time," Nancy Sullivan, executive director for broadband and multimedia services for US West, was quoted as saying.

But the vision of a converged world, where consumers do indeed take control of their television sets and view what they want when they want it, isn't necessarily flawed. In fact, unlike some future predictions, it doesn't require a leap of faith to see the day when such functionality will be welcome. In the meantime, US West intends to continue offering "plain old" cable TV service to the 10,000 customers it has signed up in Omaha.

Cable MSOs are probably cheering the fact that US West pulled the proverbial plug in Omaha after spending millions to learn what most cable operators already knew, but was US West's Omaha test a complete failure, or merely a setback? In my mind, the answer depends on the RBOC's next move. After it takes over the Continental Cablevision properties, will US West begin acting more like a cable company, or continue to overthink and overengineer the obvious?

By no means is digital dead. And sooner or later, the sleeping giants that are the telcos will wake up and begin shaking the Earth. Their competitors had better be armed and ready and prepared to fight for their lives when that day finally arrives.

Roger J. Brown

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Photo by Javier Dauden

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By Jeff Prsha, TV/COM

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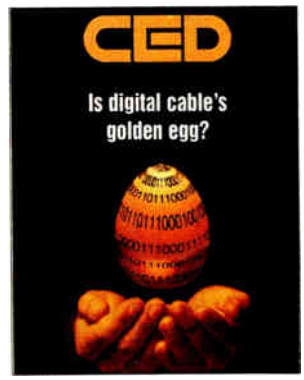

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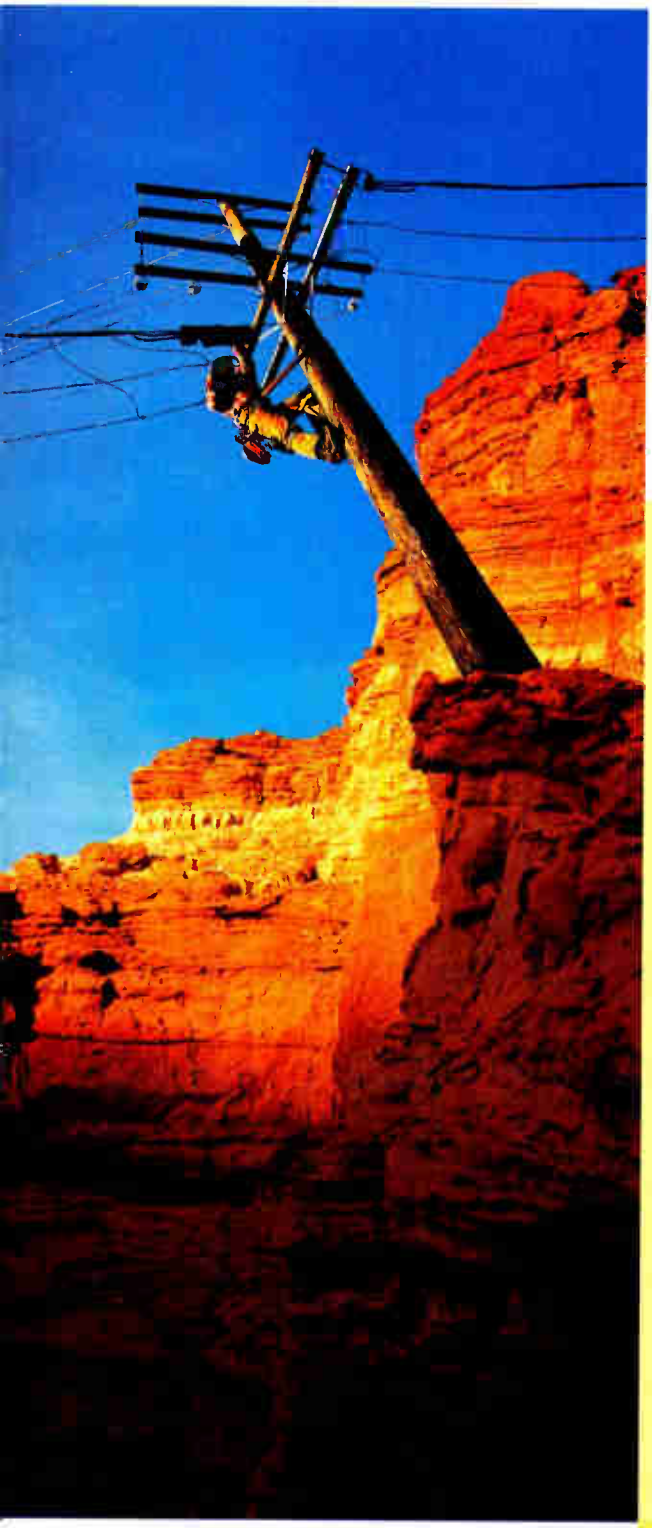

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Sprint Spectrum group refocuses effort, concentrates on wireless

After a year in which the local telecommunications landscape has changed considerably, the Sprint Spectrum group (formerly known as the Sprint Telecommunications Venture) has pulled back its plans to wire the local loop for telephony services. The four partners that comprise the group consist of Sprint, Tele-Communications Inc., Comcast Corporation and Cox Communications. Last year, the group combined to bid $2.1 billion for spectrum to roll out personal communications services–a situation that hasn't changed, according to the players.

But the group's plans to hardwire 10 million homes to cablephone using the Sprint name will not be met by the end of next year. Wireline partners include Falcon Cable, InterMedia Partners, Lenfest Group, Marcus Cable, Rifkin & Associates, TKR Cable, Susquehanna Cable and Coastside Cable.

That part of the deal apparently unraveled for a number of reasons, including Sprint's interest in getting more revenue from high-speed Internet access services, something the cable partners refused to do.

In addition, the recently passed telecom reform allows for resale of local exchange services, which could make entree into the local loop occur much faster than a network rebuild.

Meanwhile, the partnership felt compelled to reiterate its commitment to its wireless PCS strategy after the *Wall Street Journal* published what it thought was a "misleading" article. "The partners reiterated that they remain committed to their vision of a single integrated offering of wireless service, alternative local telephone service, and long distance service in a package with cable television service," they said in a press release.

"As was described in a February 1 news release, competitive local telephone offerings will be subject to individual joint ventures to be negotiated between Sprint and each cable partner, rather than through the Sprint Spectrum venture. This approach is believed to be superior and will provide additional flexibility in executing the wireline plan. Discussions on wireline joint ventures to provide wireline service are ongoing between Sprint and the individual cable partners."

Sprint Spectrum's wireless plans remain on schedule to introduce wireless service in 20 to 25 markets by the end of the year. Definitive vendor contracts were signed on February 1, and discussions over vendor financing are expected to be completed in the next several weeks.

Vyvx, Time Warner agree to 5-year deal

Vyvx Inc. has signed a five-year, multi-million dollar strategic service agreement with Time Warner Inc. under which Vyvx will provide dedicated and occasional video transmission services to Time Warner, enabling the company to interconnect the video services of its broadcasting and cable subsidiaries using Vyvx's nationwide fiber-optic network.

Vyvx provides video over its own 11,000-mile network–one of only five national fiber-optic networks. Vyvx customers include all of the U.S. national broadcasting companies and numerous cable-network companies.

Other recent Vyvx announcements have included the purchase of four satellite teleports in Los Angeles, Denver, Atlanta and New York (Carteret, N.J.) from an ICG Wireless Services subsidiary. The capabilities acquired will be utilized to support the Time Warner agreement.

Vyvx also has entered into agreements with IBM, Sun Microsystems Computer Company and others to support its development of a prototype for a national video-archiver system. That system, in conjunction with a planned network capacity expansion and an ATM (asynchronous transfer mode) switching system, will help position Vyvx as the broadband Internet.

MSOs' appetite for fiber slows

For the first time in several years, the cable industry's slice of the optical fiber market actually shrunk, according to a market analysis undertaken by Corning Inc. Cliff Hund, director of worldwide marketing for Corning's Opto-Electronics Group, said the three percent reduction in overall marketshare (as compared to last year) is not indicative of anything long-term, however.

"We think cable will continue to grow faster than telcos in fiber usage, at 30 percent, as opposed to 20 percent," Hund said in a telephone briefing. In sheer volume, the telcos continue to lead the North American market, accounting for 49 percent of all fiber sold. Cable TV is a distant second at 29 percent. That's a three percent drop from last year, when cable TV represented 32 percent of the North American market.

Corning issued its analysis during the Optical Fiber Conference in San Jose, Calif. in late February.

Worldwide, the entire fiber market grew at a healthy 25 percent clip, to nearly 23 million kilometers of installed fiber. The North American market, which represents 43 percent of the global market, grew 30 percent to about 9.8 million kilometers, according to Hund's analysis.

Despite its percentage drop, the cable TV market still grew about 30 percent over the previous 12 months, accounting for about 2.8 million kilometers of fiber usage in 1995. Big users were Tele-Communications Inc., Time Warner Cable and Cox Communications.

"Cable largely reached its limit as far as the amount of fiber it can install due to resources, capital and having enough people to install it," said Hund.

Meanwhile, the telcos bought 4.8 million kilometers of fiber, growing 35 percent over the previous year. Driving that market were Pacific Telesis, Ameritech and US West, all of whom installed more fiber in anticipation of new-line requests, Hund said.

TCI forms new business units

Tele-Communications Inc. formed two new companies to capitalize on the popularity of the Internet and to foster the development of new technology in schools and the workplace.

The first company, called ETC w/tci, is dedicated to improving technology applications in the classroom, in the workplace and at home. The new venture draws upon TCI's technological skills and experience in education, and brings together a host of leading education organizations. Tony Coelho will serve as chairman and CEO of ETC.

ETC launched its Education Division and announced plans to launch the commercial training and international divisions later in 1996. The Education Division will provide a range of products, services and multiple delivery systems to the educational community, including programs delivered via cable or satellite, software, hardware and training.

Intended to be an all-inclusive resource for educators who are seeking state-of-the-art technology to improve student performance, ETC has the support of the National Education Association, the American Federation of

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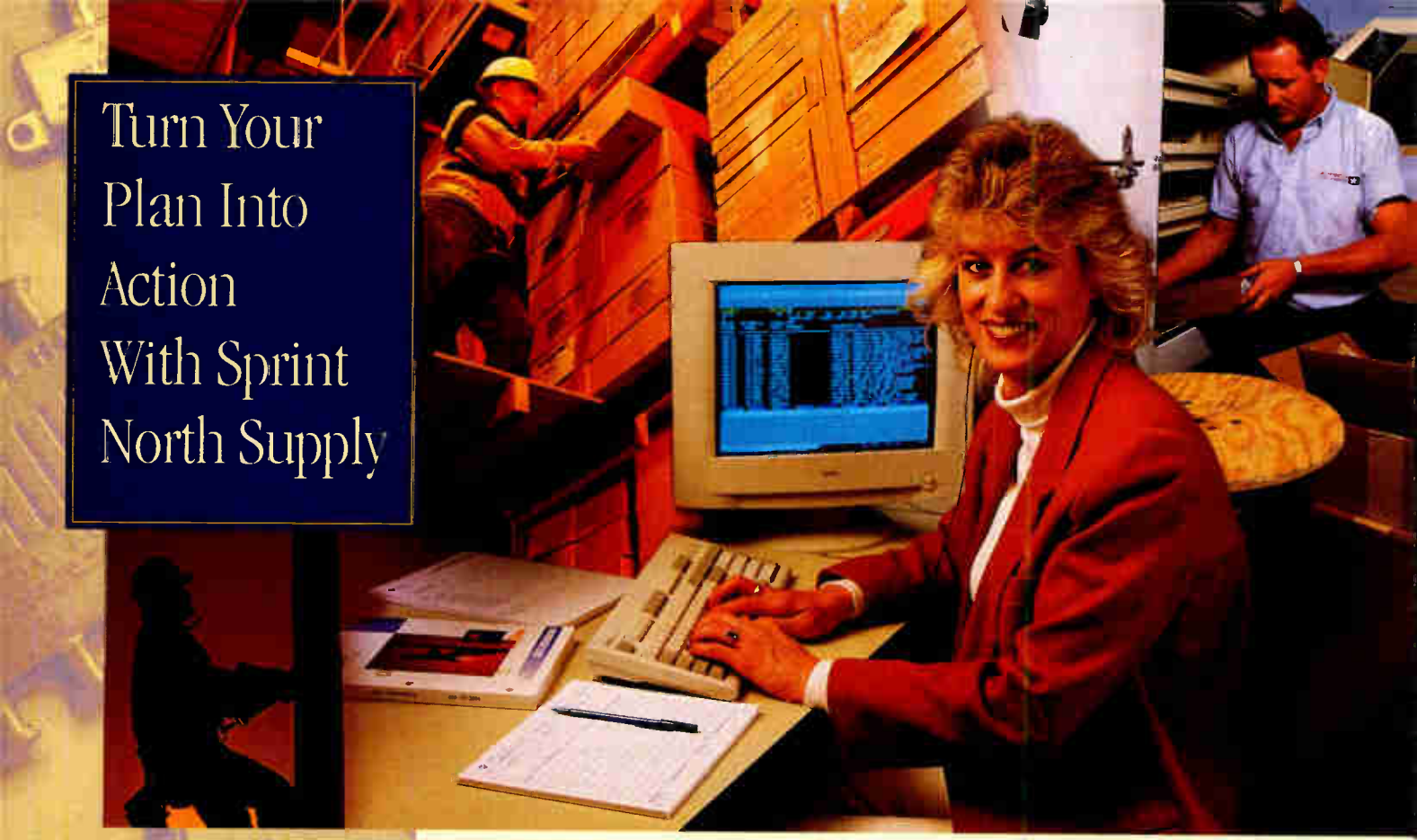

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Teachers, the American Association of School Administrators, the National School Boards Association and the National Association of Secondary School Principals.

ETC's partners include Discovery Communications Inc., Northern Arizona University, The Lightspan Partnership Inc., Compton's NewMedia, The Learning Company, Ingenius and SoftKey.

Programs are offered on both cable and Direct Broadcast Satellite (DBS) systems. Through its partner, Primestar by TCI, ETC will provide DBS satellite dishes to schools in its service areas that are not served by cable. Approximately 10,000 dishes will be provided. This will enable schools to connect to more than 500 hours of cable educational programming, multimedia services and data resources.

Together with The Lightspan Partnership, The Learning Company, Compton's NewMedia, and SoftKey, ETC will also offer educators a choice of top-of-the-line software, CD-ROMs and on-line service products. Through Ingenius, an electronically delivered data service, ETC will supply two interactive news products: "What on Earth," a daily multimedia news journal for kids, and "Xchange," a 24-hour, unedited news feed that delivers more than 20 international and national news wire services and information providers.

In addition, to support educators' hardware needs, ETC will provide full voice, video and data networks, plus a range of services to support the equipment. ETC operates in any computer environment, including Mac and PC.

TCI has also formed a new business unit that will develop and manage TCI's entry into the Internet services business, including TCI's investment in @Home. Called TCI Internet Services Inc., the group's efforts will be led by Bruce Ravenel, senior vice president for TCI Communications Inc.

"The creation of this new business unit exemplifies the role of TCI Technology Ventures within TCI," said Larry Romrell, executive vice president of TCI and president and CEO of TCI Technology Ventures. "Technology Ventures develops the future technologies TCI needs for growth into new service areas, and focuses on future new revenue businesses."

TCI Technology Ventures initially developed the Internet services strategy for TCI, including investments in the Microsoft Network and Netscape Communications, and the creation of @Home with Kleiner Perkins Caufield & Byers (KPCB). Other Technology Venture developments include the National Digital Television Center, the acquisition of the United Video Satellite Group, TV Guide On-Screen, the Sega Channel, the joint venture with Acclaim Entertainment, and TCI's recently announced ETC w/tci educational technology and communications company.

@Home, a joint venture between TCI and KPCB, is developing an Internet backbone and access network engineered to provide consumer broadband access to the World Wide Web. As the largest affiliate of @Home, TCI is upgrading its existing cable networks to support high-speed access to the Internet for its customers. TCI and @Home are planning service launches in selected markets during 1996, with a national rollout to follow in 1997.

Lucent unveils new broadband transport net

Telecommunications service providers with long distance routes can now upgrade their networks while decreasing the number of components they need to do so with a new broadband transport solution offered by Lucent Technologies.

Called the Broadband Transport Network (BTN), the solution uses technology developed at Bell Laboratories to eliminate the need for numerous optical fibers and regenerators or single-channel optical fiber amplifiers in new, high-capacity networks. The solution also allows service providers to increase by at least eight-fold the capacity of their existing fiber optic networks.

BTN consists of three main elements: TrueWave singlemode optical fiber; Optical Line System (OLS) terminal equipment and optical amplifiers; and Synchronous Optical Network (Sonet) transport terminals and Synchronous Digital Hierarchy (SDH) transport terminals.

The TrueWave fiber and optical amplifiers enable longer distances between network elements. As a result, long distance providers need fewer components for their initial network investments. In addition, because the BTN solution uses optical amplifiers that amplify multiple wavelengths simultaneously, only terminals need to be added in central offices to expand network capacity. This prevents costly component upgrades to outside plant networks.

BTN optical amplifiers and dense wavelength division multiplexing (DWDM) capabilities combine optical signals so they can be amplified as a group and transported over a single fiber. By transmitting optical signals at eight wavelengths using the BTN, new or existing networks can increase their network capacity from 2.5 Gigabits per second (Gbps) to 20 Gbps.

The BTN primarily targets long distance telecommunications providers. However, local service providers also are potential customers for the portions of their networks that require "repeatered" systems, or for applications in which multiple wavelengths offer distinct customer advantages. An example of this is a customer wanting a dedicated wavelength for security reasons.

The BTN solution complements Lucent Technologies' hybrid fiber/coax (HFC) and switched digital video (SDV) networking solutions because the HFC and SDV solutions are designed for use in the access portion of the networks, while the BTN focuses on the network backbone.

The complete BTN offering will be available in the second quarter of 1996. TrueWave fiber is available now.

New book details utility telecom trials

"New Ventures in Utility Telecommunications," a compilation of updates on the telecommunications activities of electric and gas utilities, has been released by Chartwell Inc. The 90-page book details utility involvement in the new PCS systems now being installed, the explosion of utility home pages on the Internet, new broadband trials, network installations and movement by automatic meter reading giant Itron into the broader telecommunications field.

Utilities featured in case studies include: Texas Utilities and SCANA Corp., both helping rush PCS systems to market; Virginia Power, which has partnered with Nortel in an effort to develop a new broadband pipeline to the home; Potomac Electric Co., which is working with Metricom to install a new high-speed data network for the nation's capital; Public Service Electric and Gas, which is hosting AT&T's first efforts as a broadband "solution" for utilities; and others.

The book can be ordered directly from the publisher via e-mail at utility.info@Chartwellinc.com. A sample chapter and table of contents are available at Chartwell's World Wide Web site: http://chartwellinc.com.

Yahoo! and Rogers develop Canadian version

Yahoo! Inc. has reached an agreement with Rogers Communications, Canada's largest diversified media company, to create a unique Canadian version of Yahoo!'s Internet guide.

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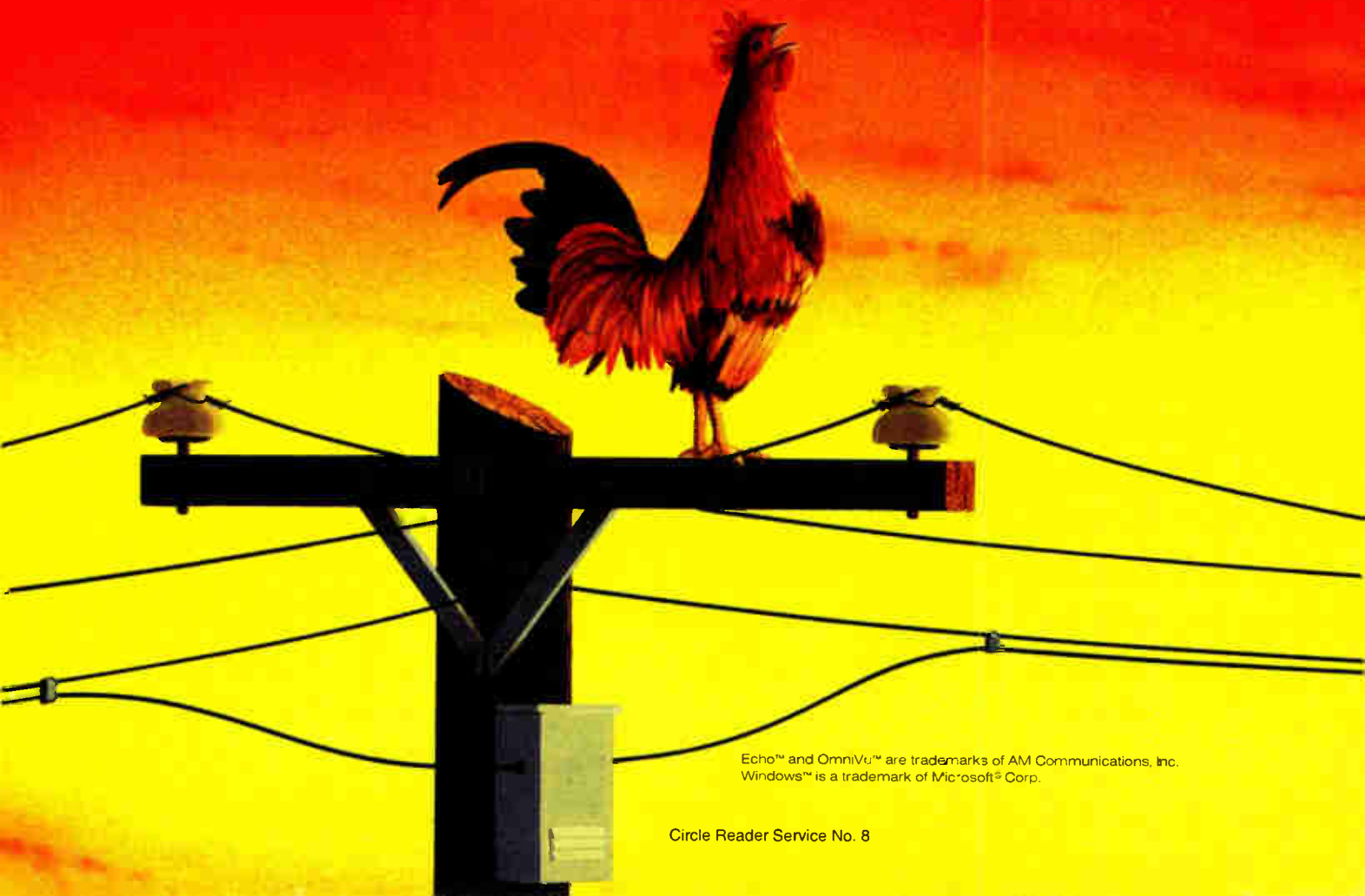

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The deal represents the next stage of Yahoo! Inc.'s strategy to establish partnerships in high-growth markets to strengthen an already growing international presence. Yahoo! recently announced a joint venture with SOFTBANK Corporation of Japan to create a Japanese version of its Internet guide.

Yahoo! is already widely used throughout Canada's growing Internet market. With household penetration currently estimated at seven to nine percent, Canada is the second most active Internet market outside the U.S. The Canadian version of Yahoo! will feature content specifically programmed for the Canadian market. Yahoo! Canada will be jointly developed by Yahoo! Inc. and Rogers Multi-Media Inc., the content arm of Rogers Communications.

"We're pleased to be working with a market leader such as Rogers to help strengthen our global presence," said Yahoo! co-founder Jerry Yang, upon making the announcement. "Working with communications experts such as Rogers is increasingly valuable to us as we continue to develop Yahoo! as an Internet media company."

Yahoo! Canada will be available directly, or through the Canadian Online Explorer (CANOE), the new World Wide Web-based on-line service announced recently by Rogers Multi-Media.

"We're delighted to be working with people of Yahoo!'s caliber in terms of innovation and vision," said John Tory, president of Rogers Multi-Media. "We see this as another significant move in positioning our companies to take advantage of the emerging environment for on-line services."

Teleport slates plan to build fiber networks

Teleport Communications Group (TCG) announced 1996 plans to build fiber networks in Cleveland, Ohio; Portland, Ore.; Salt Lake City, Utah and Washington, D.C. in 1996.

"This expansion simply continues our growth and our commitment to bringing consumers nationwide a true choice of local phone carriers," said Bob Annunziata, TCG's president and CEO. "The advent of the new federal telecommunications law and the removal of artificial regulatory obstacles will permit TCG to take effective advantage of opportunities to serve the nation's local communities."

With the addition of these four new metropolitan networks, TCG will raise from 47 to 51 the number of Metropolitan Statistical Areas served by its voice, data and video services. With the additional cities, TCG will raise from 22 to 26 the number of networks in operation offering a range of advanced private line and switched local services. Completion of an initial network in each city is expected by mid-1996.

"Wherever TCG goes, we will continue to bring the seeds of choice and competition until a thriving and vigorous competitive local phone market flourishes nationwide," Annunziata said.

Sierra Pacific, Brooks to build fiber net in Reno

Sierra Pacific Power Co. has entered into an agreement with competitive access provider Brooks Fiber Communications (BFC) to build and operate a fiber optic network in northern Nevada's Reno/Sparks area. The Reno-based utility is a subsidiary of Sierra Pacific Resources.

The St. Louis-based Brooks Fiber will spend upwards of $10 million on the project, which will use 27 miles of Sierra Pacific's overhead and underground facilities in Reno/Sparks. Completion of the project is scheduled for spring 1996.

"In addition to providing Sierra Pacific with added revenues through rental of our utility structures, the fiber optic network will enhance our communications capability and position us in a more competitive posture," said Victor Pena, Sierra's vice president for business diversity and corporate treasurer. "We aren't looking to get into the telephone business, but by teaming up with Brooks Fiber we can leverage our existing assets into additional revenues for the company, plus add a superior communications system for our business."

BFC has fiber optic networks in operation or under construction in 24 other cities across the country, and has numerous other cities currently under development.

Initially, the network will operate in the core downtown business district, first connecting larger businesses and others to this area's long distance carriers, such as AT&T, MCI and U.S. Sprint. Then, incrementally, it will be able to serve the broader community by introducing additional products and services.

Jottings

After spending at least eight weeks at the negotiation table, **Augat Inc.** in late February announced it had halted its efforts to acquire **Lindsay Specialty Products**, a privately held manufacturer of cable TV equipment located near Toronto. Apparently, the two companies were never able to solve several major issues. Sources close to the companies said one major stumbling block was Augat's intent to move manufacturing jobs to the Northwest . . . **Hughes Communications** has elected to use a fiber optic link supplied by **Ortel Corp.** to monitor its growing satellite network. The new equipment will allow Hughes to "see" the actual signal spectra at C- and Ku-band but eliminates costly up- and downconvertors that could affect signal quality . . . The **Frankfort (Ky.) Plant Board** has chosen **Moore Diversified Products** to supply equipment to enable an integrated utility monitoring and control system that will ride over the municipally-owned cable TV network. The system will provide for remote meter reading, cable signal status monitoring and service interdiction. In the future, the city plans to include power outage monitoring, remote electric disconnect, home security and medical lifeline services. The system will ultimately cover all 20,000 area homes . . . The **Canadian government** has given the go-ahead to the LMDS industry by approving the 27.35 to 28.35 GHz band. In Canada, the millimeter-wave service that can deliver video, voice and high-speed data will be known as a Local Multipoint Communication System . . . San Jose-based **SDL Inc.** has developed a 30-milliwatt distributed feedback laser that operates in the 1550 nm range. The device is intended for high power applications, such as broadcast of cable TV signals, because its output can be split numerous times to feed several receivers. The unit is designed for continuous wave operation with modulation provided by an external modulator and features low RIN and a narrow linewidth . . . Students and faculty at member colleges of the **Southeastern Pennsylvania Consortium for Information Technology and Training** soon will be able to participate in distance learning using interactive video technology as the result of a project launched by **Bell Atlantic-Pennsylvania** and the consortium. A coalition of eight independent liberal arts colleges, the group will promote a unique approach to education, information sharing, and career preparation that can be used as a model for other small colleges and universities. The project will establish interactive video demonstration sites in classrooms and offer distance learning courses to students . . . **Ameritech** is one of several companies which is partnering with **Microsoft** to simplify the ordering and use of high-speed digital ISDN lines for users of the Microsoft Windows 95 operations system . . . . CED

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Circle Reader Service No. 9

HITS' digital answer man preps for launch

Charlie Kennamer

On a desk in Charlie Kennamer's office sits a high-speed, high-capacity, state-of-the-art personal computer. And right beside it stands a jerry-rigged fan which is keeping the supercomputer from going supernova when it gets too hot—the result of too many computations overtaxing its computer brain. Sometimes, technology needs a little help. On a much grander scale, Kennamer stands ready to help the cable industry make the most of its roll-out of digital technology.

If you don't already know who Kennamer is, you soon will. That's because he's the one who answers the red phone when MSOs, programmers, vendors and just about anyone else calls for technical information about Headend In The Sky (HITS), a product of TCI Technology Ventures Inc. The HITS concept centers around making digital technology affordable by providing digitized and compressed video programming and support to cable operators, from the smallest to the largest MSO. And it's up to Kennamer to get the word out about HITS, answer questions and clear up the rumors.

While initially, the HITS mission is to enable the cable industry to fight off competitors which are already embracing digital, the longer term goal is much broader. "That's to apply all forms of digital technology in new and innovative ways to enable our customers to remain the best providers of entertainment and information services," says Kennamer, who is senior director of engineering services–HITS. That will require smart, targeted marketing tactics, he adds.

"It would be illogical, and not cost-effective, to force this technology into the homes of people who are perfectly happy, and who aren't looking for something more," he explains.

Kennamer's current projects include developing a digital "bible" that spells out the planning requirements for the headend, the demands of digital on the plant itself and the effects of the home environment on signal quality. He's also keeping tabs on cable's competitors: Kennamer has set up a demo area where TCI employees can check out everything from the latest DSS receiver, to products such as electronic program guides that are related to the launch of the digital platform.

One ancillary project he is working on in conjunction with CableLabs involves conducting the first expert, and later, non-expert viewing tests of digital television. Over the next few months, "typical" television viewers will be brought into the HITS facility to watch digital video and provide feedback on their perceptions of the technology, as well as the types of artifacts that bother them. CableLabs is already conducting tests with industry experts who are looking at representative samples of digital TV in various formats and bit rates.

Kennamer's latest mission is a far cry from his cable beginnings in the late 1960s, when he maintained and operated a small, closed-circuit cable TV system, composed of pole-mounted amplifiers with vacuum tubes in them, on the campus of Auburn University. From there, he went to work for a systems house designing and installing TV studios and small cable systems. The next turn in his career path led him to the world of education, where he served for nearly 10 years as the director of media facilities at a community college in Oklahoma.

While the job was great fun, Kennamer decided at some point that it was not his future, and jumped back into cable as chief technician for Cox Cable in Oklahoma City, where he managed the activation, operation and maintenance of the system's plant, as well as accompanying headend and microwave equipment. After about three years with Cox, Kennamer joined the corporate engineering staff of TeleCable in Norfolk, Va. as a staff engineer, and soon became deeply involved in the aggressive deployment of addressable technology into every one of the operator's systems. Eventually, he would be named vice president/addressable technology.

"By the late '80s, TeleCable had addressable boxes in a little over 75 percent of its customers' homes, which at that time, was about 600,000 subscribers," he recalls. His work with addressability included interacting with vendors to define hardware and software, and developing interfaces between addressable and billing systems.

With the growth of pay-per-view technology in the mid-'80s, Kennamer helped TeleCable implement a trail-blazing technology for customer orders: ANI, or automatic number identification. Again, he worked with vendors to develop hardware and software that would process ANI data. Kennamer also implemented a pilot project for another method of PPV ordering which utilized an interactive, two-way system.

His responsibilities for headend and earth station engineering at the company foreshadowed his work in digital, as he helped General Instrument and HBO in field-testing the DigiCipher I system, while working with programmers as they migrated to analog and digital compressed satellite scrambling.

Digital gets real in '97

A self-described "NPR news junkie," Kennamer loves to listen to an old-time radio in his office at HITS, and admits that he watches TV mainly "to see what's on it," not for entertainment. Recognizing that many cable subscribers have a thirst for entertainment choices that far surpasses his own, however, he says that development of digital to the home will begin in the third quarter of '96. And when will digital products finally be real?

"Digital will achieve significant penetration in the cable industry," predicts Kennamer, "by the end of '97." By then, Kennamer will be moving so fast, he might need a fan to cool *him* down.

–Dana Cervenka

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Circle Reader Service No. 10

Cable's suppliers not anti-competitive

By Wendell Bailey, VP of Science and Technology, NCTA

Some time ago, I wrote a column about a software package which I had just purchased. This software had a disclaimer printed on the package regarding copyright: "You can make a backup only once, and this software cannot be used on more than one computer at a time." This package was an authoring program that allowed the user to design software for use under the Microsoft Windows operating protocol. What was amazing about this otherwise seemingly standard copyright agreement was the statement that if the user "developed a useful program with these authoring tools," then the publishers of these software tools would, in fact, have the rights to the program that had been designed. This is a lot like the Royal typewriter company demanding royalties from Agatha Christie's books because they had been typed on a Royal typewriter. While it's not clear whether this is all legal or not, it seems that everything the cable industry does has some relationship to copyright.

A euphemism

The reason for this strange and mysterious tale from the past is a more contemporary situation. The retail sale of navigational devices is a euphemism for the selling of set-top boxes at retail. This is a provision in the 1996 Telecom Reform Act that recently passed Congress and was signed by the President. The point of this provision is that there are people who think that cable operators and cable equipment suppliers are preventing or slowing competition, and thus, lower prices, for consumers by not allowing cable industry set-top boxes to be sold at retail. If they were available at retail, the argument goes, then other manufacturers could make and sell those same set-top boxes in competition to the cable industry.

But if people are currently brandishing Uzis as they steal these boxes from warehouses, then how can the cable industry allow people to sell the boxes openly at commercial retail outlets?

That's a pretty good question. One of the answers that has been put forth by the people who are trying to get this provision installed is that they don't really mean that the security functions would need to be involved, at least in the analog world. They do say, however, that the sale of set-tops should include just those boxes that do not have security, but which have other features and functions in them. I might be tempted to issue a small cheer of relief, because the cable industry has long had available what are known as "plain Jane" convertors, or set-tops for sale in retail outlets. In fact, it is difficult to pick up a commercial inflight magazine that doesn't have an ad for what amounts to a channel tuning enhancer for old TV sets, or a remote control addition to TV sets without wireless remote. It's all well and good that there are vendors who make those devices, and that some of cable's customers buy them, and in those cases, the industry's security is not at stake.

Imagine my surprise, however, having learned that someone who is arguing this case had enough sense to understand cable's sensitivity to security, when the same person opined that cable operators and cable equipment suppliers should not be allowed to sell a box that has security in it and also has any other features or functions in it.

In other words, if a feature such as an onscreen program guide is provided, it must be in a box that's separate from the box that is providing security. The point here, of course, is an issue of whether or not the cable operator would have an unfair competitive advantage if it sold features and functions along with a needed security element in the same device. Further, one member representing the retail consumer electronics business has proposed that if, in fact, a cable equipment supplier or operator wished to put a feature or function into a box containing security, that would be allowed only if said vendor made the feature or function that it was providing in that box a free and open license with complete disclosure. This issue would allow anyone to build a product with someone else's designs and sell it as a standalone unit.

This would be roughly like saying that Honda Motor Cars would not be allowed to sell a car with a Honda radio in it without giving away the patents and rights for any circuitry that was unique to that radio. All other radio manufacturers would be able to build the radio that would compete with it on features and functions. The consumer would only be allowed to buy cars, therefore, without a radio, and would have to specify one of the countless radios as a unit to be installed. What about the television set manufacturers that sell TV sets with VCRs built into them? Does someone have to give up their rights to that technology, to any proprietary elements that are there? In fact, what about TV sets that come with program guides? Every vendor seems to have its own idea of a program guide, and some of those must surely be proprietary. And yet, the very people who represent them at the retail level are trying to see to it that the cable people do not have proprietary rights to anything they may have invented or designed and brought to market.

Having not long ago gone into a local, commercial retail electronics store to purchase a radio for an old car that belongs to a relative, I can tell you that I had literally hundreds of different models to choose from. The fact that the car had come with a radio to start with didn't seem to be harming the competitive marketplace one whit. Cable equipment suppliers could just as easily show that the features and functions that they have brought to the marketplace have done no more harm than that. CED

Have a comment?
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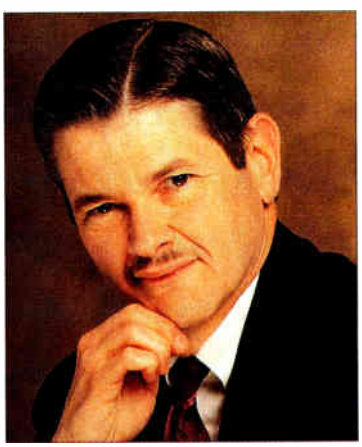
Circle Reader Service No. 11

Competition alert! Ether operators move in



By Jim Farmer, Chief Technical Officer, Antec Technology Center

A new competitor is looming on cable's horizon–in fact, this group is already active in a number of franchises. Based on the name of the signal delivery medium, the "ether," we have sought a connection between these competitors and the people who developed the networking standard known as "Ethernet." Though the name would seem to imply such a connection, no evidence of a link exists. The IEEE was instrumental in developing technical standards, and the EIA has established some standards used by these people (EIA 170, 250, etc.). They have a trade organization in Washington, located near the FCC on M Street.

Expensive headends

Transmission via ether, which is used in place of hybrid fiber/coax to carry signals to the subscriber, is based on work done by a theoretician named J. C. Maxwell, who developed a set of four equations which describe how video and audio signals can be transmitted through the ether and other media. These equations are presented in a number of textbooks, sometimes in differential form, sometimes in integral form. The impedance of the ether is 377 ohms, which is much higher than that of coaxial cable.

These competing operators must build a complete headend for each channel programmed, which gives cable operators a competitive advantage. The restriction of one channel per headend has limited the growth of the ether industry. However, the ether operators have generally invested heavily in their headends and are able to command significant shares of the audience in their franchises.

Each headend consists of an earth station receiver, some switching equipment and local ad insertion equipment. Local origination is done in all but the smallest systems. Programmers allow the local operator to insert his own programming during certain time slots. The signal is routed to a modulator for transmission to the subscribers. The modulators are expensive, large and consume a lot of power. Picture carrier levels often exceed +120 dBmV! Typically, the video and audio are modulated separately and combined at the headend combiner. The signals are transferred to the ether, which forms a passive distribution system, using a large metallic transducer.

Several types of set-top convertors are used, depending on the needs of the subscriber and his willingness to pay for the set-top (ether operators are not required to supply set-tops–the subscriber buys his own). The basic set-tops are very simple, crude devices made primarily of metal tubing, which convert the ether signal to a channel that can be tuned by the TV. The set-top convertors have impressive CTB, CSO and X-mod specs; in fact, distortion is usually unmeasurable. Depending on conditions, CNR may be better or worse than what cable operators deliver. Reflections, though, are a serious problem. The subscriber can experience multiple reflections of high amplitude.

Other subscribers elect to purchase a device that is mounted outside the home and which can supply signals to all the TVs in the house. Ether operators don't charge for additional outlets and are not expected to supply internal wiring.

As in the cable industry, the ether operators are generally separate entities from the program suppliers, though the suppliers do own some operators. Generally, the program suppliers are not paid by the operator, but instead, make their money from advertising. The local operator does get local avails, from which he derives most of his revenue. (He gets a nominal amount from the program supplier, but claims it is not enough to live on.) It is rumored that some cable program suppliers also supply programming to ether operators, but usually, it is not the same programming supplied to cable.

Fortunately, the FCC has already asserted the right to regulate the industry. Thus, ether operators are subjected to certain impediments in doing business. The ether operators are not allowed to carry as many channels as are cable operators. In fact, the FCC requires that each channel in a particular franchise be carried by a different ether operator. They seem to be involved in some sort of cooperation, which allows subscribers to subscribe to the channels of multiple operators. The same operator often owns franchises in several cities.

Competitive picture quality

Though fewer channels are available than on franchised cable, the output of their set-top convertors is broadband, and all TV functions, such as remote control and volume control, are available. Watch and record scenarios work much better than what can be achieved with cable's set-tops. With a good set-top, the quality of an ether operator's pictures is very competitive with cable's, and can be better, under good conditions. The best results are obtained with the devices mounted outside the house–something like a NID (network interface device)–except that the devices are rather big and, some believe, ugly.

In summary, ether operators have some advantages and some disadvantages compared with legitimate cable operators.The cost of their headends is very high, especially on a per channel basis. They must cooperate with each other, as each is only allowed to carry a single channel on the system (though several systems may be combined at the set-top and appear to the subscriber as a single system). On the other hand, the cost of the in-home equipment is very low, and the operators have convinced the subscribers to pay for it.

As more can be learned about this competitor, this column will keep you informed. CED

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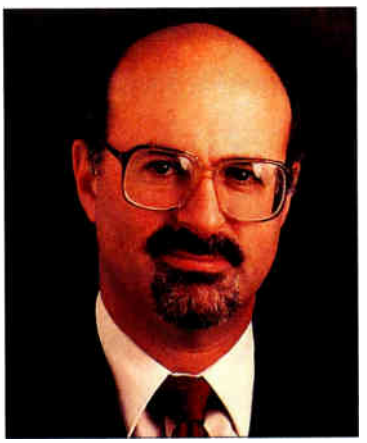
Circle Reader Service No. 12

Commercial availability and patents



By Jeffrey Krauss, set-top boxer and President of Telecommunications and Technology Policy

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

The 1996 Telecommunications Act has made a lot of changes to the Communications Act of 1934 affecting the cable industry. One change is the addition of a new Section 629, which requires the FCC to promote "commercial availability" of cable set-top boxes. This section was added by Congressman Bliley, who represents the Richmond, Va. area. One company that is headquartered in Richmond is Circuit City, a company that wants to sell cable boxes in its stores. Get the connection? If this section means what I think it means, and what Circuit City wants it to mean, it creates a direct conflict with the nation's patent laws. Let's look at the new law, and you'll see what I mean.

Section 629

Section 629 requires the FCC to adopt regulations that "assure commercial availability" of convertor boxes, interactive communications equipment and other equipment used to access services. It applies to services offered on cable systems, MMDS, DBS, SMATV and all other multichannel video systems. It also requires system operators to separately show the charges for such equipment if they rent it to customers and prohibits them from using service revenues to subsidize equipment charges.

However, it also prohibits the FCC from adopting regulations that would jeopardize the security of such services. And it allows the FCC to waive the regulations, if that would promote the development or introduction of a new or improved service.

Simply put, Section 629 seems to require that customers can own convertor boxes, if they want to. So what's the big deal? If the cable system sells addressable descramblers, why is that different than renting them? The cable system gets the revenue up front, rather than spread out over time, still knows who has the boxes, and can control them from the headend. But that would not satisfy Section 629, because it says that the equipment must be available from vendors not affiliated with the multichannel video operator.

Well, suppose the manufacturer (Scientific-Atlanta or GI or Philips) opens up a retail store in town and starts selling boxes. That would satisfy security concerns, so long as the manufacturer notified the cable operator of the name and address of the buyer and the serial number of the box, so the cable operator could still control the box from the headend. It would appear to satisfy the statutory requirement that the vendor be unaffiliated with the cable operator. But you know, I don't think it would satisfy Circuit City.

Circuit City would like to sell the box, and it doesn't want to have to buy it from S-A or GI or Philips. It wants to buy it from competing manufacturers. Or perhaps it wants to manufacture it itself, through its Patapsco Designs manufacturing subsidiary.

If that's what the law requires, then here's where the patent conflict comes up.

Patent laws

The U.S. patent laws give the patent owner a temporary legal monopoly over his invention. The patent owner does not have to license anyone to manufacture or distribute products using the patent. Where the patent owner chooses to license his patent, he may "exact royalties as high as he can negotiate with the leverage of his monopoly," according to one Supreme Court decision. Another Supreme Court decision has held that the patent laws are more powerful than the antitrust laws; even where the patent gives the owner a monopoly in a market, the antitrust laws do not require the owner to license the patent to potential competitors.

The purpose of this monopoly is to spur innovation and invention. Inventors have more incentive to develop new products and services if they can profit from them. If others could steal their proprietary techniques and use them in products, why bother to try to invent and innovate?

That, of course, is exactly what Circuit City and the other electronics retailers would like to do. They would like to incorporate the proprietary techniques used in addressable cable boxes into products that they can manufacture and sell.

So we appear to be heading in the direction of compulsory patent licensing imposed by the FCC, as it tries to implement Section 629. The FCC, as it responds to Congressman Bliley, may decide that "commercial availability" means that S-A, GI and others must license their patents to other manufacturers, so that multiple manufacturers can make boxes that work with proprietary systems. This would not be limited to video services, by the way; it would also apply to program guide services (e.g., StarSight, TV Guide and Prevue), digital music services (Music Choice and DMX) and game services (the Sega Channel).

But the FCC does not have any authority to require compulsory licensing of patents. It has in the past adopted standards that incorporate patented technology (color television patented by RCA; telephone jacks and plugs patented by AT&T), but in those cases, the patent owners offered voluntarily to license their patents. The same circumstances will apply to digital HDTV. But why should S-A or GI volunteer to license their set-top patents to others?

To the courts

You can see where this is heading: straight to the courts. But so is much of the rest of the 1996 Telecommunications Act. Meanwhile, you might want to tell the FCC what you think about "commercial availability" of set-top boxes. You can send e-mail to FCC Chairman Reed Hundt at rhundt@fcc.gov. CED

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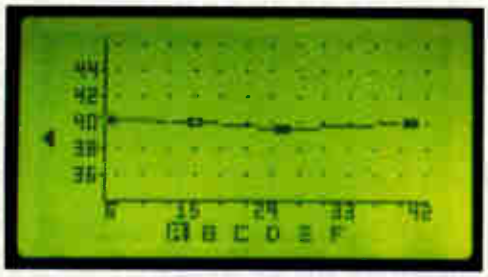

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Circle Reader Service No. 13

Pitfalls of selling set-tops to consumers

By Walter S. Ciciora, Ph.D.

Have a comment?
Contact Walt via e-mail at: wciciora@aol.com

My last column speculated on some of the consequences of the potential passage of the Bliley Amendment in the 1996 Telecommunications Bill. The potential has become reality. We now have a requirement that the FCC create rules. It is important for all involved with in-home equipment to become familiar with this section of the law and to participate in the formation of the FCC's rules.

The section of the law reads as follows:

SEC. 629. Competitive availability of navigation devices

"(a) Commercial consumer availability of equipment used to access services provided by multichannel video programming distributors.—The Commission shall, in consultation with appropriate industry standard-setting organizations, adopt regulations to assure the commercial availability, to consumers of multichannel video programming and other services offered over multichannel video programming systems, of convertor boxes, interactive communications equipment, and other equipment used by consumers to access multichannel video programming and other services offered over multichannel video programming systems, from manufacturers, retailers, and other vendors not affiliated with any multichannel video programming distributor. Such regulations shall not prohibit any multichannel video programming distributor from also offering convertor boxes, interactive communications equipment, and other equipment used by consumers to access multichannel video programming and other services offered over multichannel video programming systems to consumers, if the system operator's charges to consumers for such devices and equipment are separately stated and not subsidized by charges for any such service.

"(b) Protection of system security. —The Commission shall not prescribe regulations under subsection (a) which would jeopardize security of multichannel video programming and other services offered over multichannel video programming systems, or impede the legal rights of a provider of such services to prevent theft of services.

"(c) Waiver—The Commission shall waive a regulation adopted under subsection (a) for a limited time upon an appropriate showing by a provider of multichannel video programming and other services offered over multichannel video programming systems, or an equipment provider, that such waiver is necessary to assist the development or introduction of a new or improved multichannel video programming or other service offered over multichannel video programming systems, technology, or products. Upon an appropriate showing, the Commission shall grant any such waiver request within 90 days of any application filed under this subsection, and such waiver shall be effective for all service providers and products in that category and for all providers of services and products."

Commercial availability

Very clearly, it is the law of the land that the FCC has to make regulations, in consultation with appropriate industry standards-setting organizations to assure the commercial availability of set-top boxes for all kinds of cable services. It is clear that the commercial availability of set-top boxes will not limit the cable operator's right to also offer these devices. The law, as written, seems to offer the option of sale or lease by the cable operator. The important point is that the subscriber must be aware of the charges, and that these charges are not subsidized by any service offerings.

The good news is that Congress recognizes the importance of protecting system security and the rights of service providers. There are only two ways to accomplish this. The first is to create a signal security system which is so secure that it cannot be broken. The second way is to separate out the signal security system and not allow subscribers to own and access it. In the latter case, the service provider is free to replace a breached security system without imposing financial loss on the consumer.

It is impossible to guarantee that a signal security system cannot be breached. The only alternative is for the entity attempting to guarantee the signal security system to place sufficient funds in escrow to cover the full costs of recovery from a breach.

In the area of new technologies which are still in their formative stages, service providers or equipment manufacturers may request a waiver of the rules for assuring commercial availability of new technology still in its formative stages. So, for example, while standards are being settled for the hardware required to deploy a new cable service, non-standardized implementations used for market research or early introduction of the service may be granted a waiver.

There are a number of unanswered issues. Just a couple of them are considered here. The first issue concerns the rights of the cable equipment manufacturers. The law applies to cable operators, not equipment manufacturers. But the business of the equipment manufacturer may be potentially impacted in a negative way. The design of set-top boxes involves patents and intellectual property. It is not clear what happens when some of that intellectual property is involved. There is no legal requirement for the cable equipment manufacturer to license intellectual property. This may inhibit a cable operator's ability to comply with whatever rules are created.

Another issue involves equipment which is no longer manufactured, or whose manufacturer is no longer in the cable supply business or any other business. What are the cable operator's burdens in these cases? For example, the Qube system or the Oak scrambling systems haven't been manufactured for many years. CED

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Mitigation of lightning-induced ingress

Active pulse cancellation

By David Fellows, Senior Vice President of Engineering and Technology, Continental Cablevision

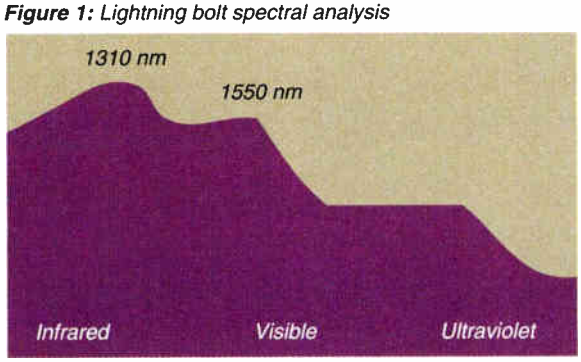
In areas of high lightning, the flash from the thunderbolt has been observed to induce optical impulses in fiber-optic cable, potentially limiting reliable transmission of analog and digital signals. This paper discusses an active pulse cancellation technique which mitigates this effect. Any architecture which uses fiber, especially passive optical networks and fiber-to-the curb, must use these or similar measures.

Background

Cable television systems have embraced the use of fiber optics since its introduction in AM applications in the late 1980s. Fiber backbone and Cable Area Network architectures have given way to Fiber-to-the-Serving Area, and node sizes are now typically 500 homes or smaller. Passive optical networks have been installed, pushing fiber even deeper. However, there is a growing fear that at some point this is too much of a good thing, and coax tree-and-branch is just being traded in for optical tree-and-branch. Studies by CableLabs have shown that reverse path noise is limited by electrical impulse noise. Use of more fiber cuts down amplifier cascades and normally reduces reverse noise.

Impulse ingress, however, is relatively unrelated to node size. This demands a closer look at the benefits of more fiber.

Figure 1: *Lightning bolt spectral analysis*



The problem

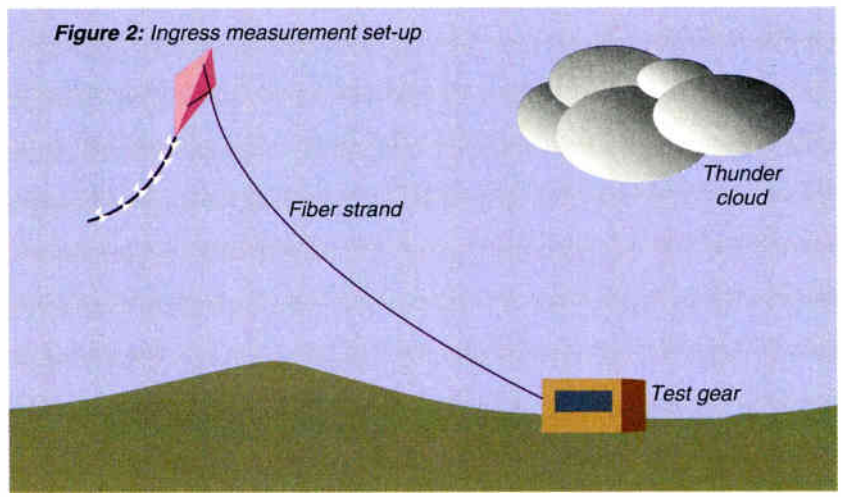
Anyone who has been caught in a thunderstorm can attest to the brightness of lightning bolts. John Walsh (Time Warner, Orlando) once arranged a lightning storm for my benefit that has left me impressed to this day! Lightning strikes the earth 100 times a second; more than 8 million times a day!

In areas such as Jacksonville and Orlando, there is a deadly combination of lots of fiber and lots of infrared light

The spectrum emitted by lightning is broad, covering the entire visible range from 410 nm to 710 nm, and continuing into the infrared. This is plotted in Figure 1. The strong infrared content should come as no surprise because the air surrounding the lightning bolt is heated to 2,500 degrees. The expansion and collapse of the air molecules due to this heat is what causes thunder.

It should not come as a surprise, therefore, that the strong signal at both 1310 nm and 1550 nm has been observed to cause optical impulses–light leaks into the fiber and interferes with the signal content. Raynet has demonstrated a passive optical tap for years, which injects and extracts light from an intact fiber. Also, anyone who has used a fusion splicer with local injection/detection measurement of the completed splice

Figure 2: *Ingress measurement set-up*



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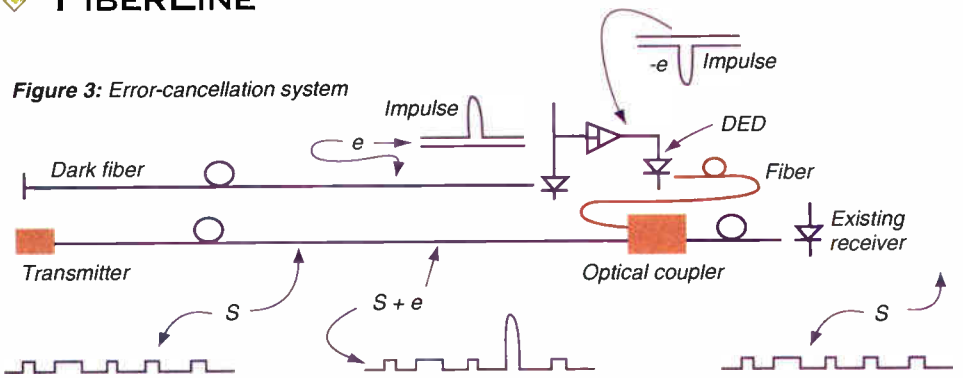

Figure 3: Error-cancellation system

knows that light can leak into an intact fiber.

At first, people said, "Go fly a kite" and so to further examine this effect, the experimental set-up shown in Figure 2 was assembled. Unfortunately, the fiber used was left-over Corning Titan fiber donated to the cause, and the titanium coating conducted electricity and blew up the test equipment! The inescapable conclusion is that in areas such as Jacksonville and Orlando, there is a deadly combination of lots of fiber and lots of infrared light. It is speculated that this is the primary reason that the BellSouth Fiber-to-the-Home trials in Heathrow and Hunter's Creek, Fla. have never been heard from again.

Mitigation technique

Once the impairment root cause was identified, and disbelief suspended, the mitigation technique became obvious. A dark fiber, running parallel to the signal fiber, acts as the collector of a pure ingress signal. As shown in Figure 3, the signal fiber carries the signal S, and the optical ingress signal e. The dark fiber only picks up the error signal e. Error cancellation is thus possible. If the cancellation is done electrically, the optical impulse will overload the signal receiver, because of the much higher level of the optical impulse, and reliable cancellation does not take place.

The annihilation does not generate the side-effects that normal matter-antimatter collisions do

Therefore, it is preferable to have the cancellation take place in the optical domain. This is accomplished as shown in the rest of Figure 3. The error signal is received by a PIN diode (properly biased so as not to overload), and the signal is inverted by an amplifier. For cancellation to take place in the optical domain, anti-photons need to be generated to cancel the photons of the error signal in the signal fiber. Because photons have no mass, the annihilation does not generate the side-effects that normal matter-antimatter collisions do. The anti-photons are generated by a dark-emitting diode (DED).

The DED is shown in Figure 4. A normal laser diode is doped with the rare-earth metal erbium for operation at 1550 nm, and with

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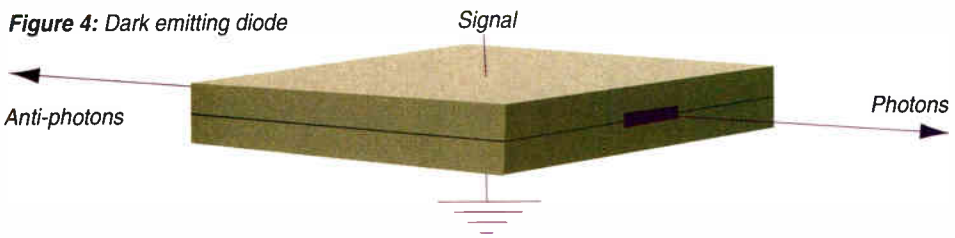

Figure 4: Dark emitting diode

either praseodymium or neodymium for operation at 1310 nm. Photons are emitted at the front facet, which is the normal facet for signal collection. Anti-photons are emitted out the rear facet, and for the purposes of impulse control, this is the facet that is connected to the fiber. This fiber is combined with the signal fiber, and the resulting cancellation is fed to a normal fiber receiver.

Note: for those who are more comfortable treating light as a wave instead of a particle, the anti-photon is the equivalent of a wave 180 degrees out of phase with the error signal, resulting in cancellation between the two.

Summary

Heretofore, system architectures were measured using the (Tom) Elliot factor, which is the weight of sand used per customer (the sand in the fiber, plus the sand in the silicon chips). Now it is apparent that there is a need to add the Fellows factor, which incorporates the transparency of the sand used. The good news for the cable industry is that the phenomenon described herein is the Achilles' heel for Fiber-to-the-Curb, or, heaven forbid, Fiber-to-the-Home.

One would have to be an idiot to try these techniques . . .without an intellectual property license

Some in the cable TV industry may argue that by introducing a method of correcting the optical ingress phenomenon, this paper represents the savior to these approaches, but one would have to be an idiot to try these techniques. Without an intellectual property license, I mean.

Besides, I work for an RBOC now. I call upon CableLabs to extend this body of work and tackle two important issues: control of ingress because of Fourth of July fireworks, and determining why anti-photons only exist on April first. CED

About the author

David Fellows is senior vice president of engineering and technology, Continental Cablevision. Fellows also serves on *CED's* editorial advisory board. In addition, he has a great sense of humor.

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Circle Reader Service No. 19

Analog still has a place in a digital world

Hybrid analog/digital boxes will be the transitional vehicle

By Jeff Prsha, Product Manager, Analog Business Group, TV/COM

Like the rest of American business, the cable television industry has seen a wealth of technical innovation in recent years. On the positive side, increased bandwidth capabilities, practical two-way communication to set-top decoders and the possibility of ever-expanding customer services have captured the imaginations of both cable providers and consumers.

On the other hand, satellite digital DTH services (e.g., DirecTv, AlphaStar, Echostar) are knocking on the consumer's door with the promise of hundreds of channels and ever smaller receive antennas. In the face of this dilemma, the industry has logically asked the questions: "What fundamental advantages does the hard-wired link to the customer provide?," and "How can technology be leveraged to maximize the benefits to both the provider and the consumer?"

The digital horizon

Few mediums have been hyped more in recent years than "The Broadband Network," a.k.a., cable TV. Leading that wave is the banner crying that cable TV must go digital to compete. What is rarely focused on are the primary reasons for the success of cable: flexibility and control. To be economically feasible, the DTH services launched in the U.S. were forced to be digital systems. In order to offer enough attractive programming and optimize transponder space, there was no alternative but digital compression. Additionally, for practical reasons, satellite footprints tend to cover all of the U.S., making it difficult to tailor programming regionally. This means the sheer magnitude of the project makes startup costs astronomical.

Cable services are largely unfettered by the bulk of these issues. A 550 MHz cable system has an approximate capacity of 80 channels (leaving room for upstream and control channels). Typical systems only populate 51 channels, largely because there is just not enough revenue-generating programming. Unused bandwidth is a luxury that DTH cannot afford. Cable systems also lend themselves to segmentation, allowing branches to be added or sold off as best fits the needs of the provider. Because of its inherently regional nature, cable allows delivery of all local stations to subscribers.

The historical quality of analog cable TV distribution has been its own worst enemy. The steady improvement in television receiver quality has emphasized noise problems in analog cable systems. Improvement of TV distribution quality through digitizing the signal has been a promise of the fully digital network. The perception that digital is better has permeated modern life.

The use of MPEG-type digital compression, however, results in what is termed a "lossy process," meaning

PHOTO BY JAVIER DAUDEN

some information is lost during the compression/decompression operation. The amount of loss is dependent on the data rate of the digital program stream and the amount of motion in the picture. Typically, to maximize the number of channels in a given bandwidth, not only is the data rate decreased, but also the picture resolution is decreased slightly from standard TV.

A rule of thumb within the industry is that a 12 MHz data rate is required to deliver a full motion/full resolution NTSC image (using MPEG-2 compression). Data rates less than this begin to produce artifacts from the compression process. If upgrades to the cable systems such as fiber trunks (or the extreme, Fiber-to-the-Curb) are installed in the evolution toward a digital network, the analog signal quality will enjoy a corresponding improvement. As a result, beginning the upgrade to the eventual digital cable system can provide customers with signal quality improvements while still operating in the lower cost analog realm.

The most significant hurdle faced by the digital revolution is the economic barrier. It is a safe prediction that digital cable will not move beyond the experimental stage until it makes good economic sense for all involved (the equipment manufacturers, the cable operators and the consumers). The current $300 to $600 price tag associated with digital set-top boxes puts them at three to six times the cost of the existing analog products. While the price of the headend equipment is amortized over the total number of subscribers, the cost of replacing existing, functional analog equipment with digital equipment at roughly 10 times the expense is still significant. At the present time, there is no cost savings associated with a digital conversion in a cable system. While costs are falling, they will have to plummet considerably before digital cable networks move beyond the experimental stage and become a practical reality.

Accepting the above as true (which has become increasingly popular in the past few months), manufacturers, operators and consumers are all looking for ways to provide an economic alternative to a fully digital network until that network becomes financially viable. There is little doubt that we are looking into a digital future. In the early 1970s, a digital watch or a four-function calculator cost hundreds of dollars. Today, either can be bought for just a few dollars. We should fully expect that eventually the cost of digital TV will follow the same decline. The immediate concern is how to manage that interim until that cross-over point arrives.

The issue becomes a marketing question: what will it take to continue to grow cable systems with increasing competition from DTH? What services are consumers looking for that a cable network can provide? The flexibility furnished by the physical link to the customer, the operator's control over the network and the local relevance of the programming/services provided must be maximized to exploit the weaknesses of competitors like DTH.

The physical link to the consumer is often touted as the on-ramp to the information superhighway. At issue is whether consumers trust the vulnerability of a cable network for secure transactions such as home banking. Clearly, the security of the link must be proven to consumers if these secure services are to form a new business base for cable networks. Depending on the system topology, it's possible that one individual's financial transactions would be routed (encrypted or not) to every subscriber on the network. Suddenly, the incentive for compromising the network's security increases geometrically.

Advanced services

In addition, switching technology to handle large amounts of bi-directional data must mature rapidly enough to prevent rush-hour "stop-and-go" traffic during peak demand. Certainly, the topology of current networks originally designed for television distribution would quickly bottleneck during prime time. For these reasons, it is likely that dedicated phone lines will continue to be used for the bulk of private/secure services.

Given that home computers are not likely to be replaced by set-top boxes/TVs and that these computers will remain connected to phone lines for secure transactions, the television/set-top terminal will remain the primary interface to the cable system. As a result, successful services provided in the near future must be regionally relevant, not require high security and provide information compatible with television's inherent restrictions (resolution and interlace, primarily). Such services include

At the present time, there is no cost savings associated with a digital conversion

TV/COM's analog products

local traffic and weather conditions, local recreational information, restaurant guides, program guides, etc.

Arguably, services such as phone books, movie listings, etc., could be offered. However, the practical utility of using the television for these purposes must be weighed against picking up the phone book or the newspaper–it is doubtful that either of these publications will be replaced by a television function in the near future.

The key to economically providing interactive, digital-like services will be in advanced analog set-top terminals. These units further expand the flexibility of the cable system by allowing the system operator to tier services with non-addressable set-tops, basic addressable set-tops, on-screen-display addressable set-tops and advanced terminals.

The first generation of advanced set-top units allows the box to grab an addressed frame of video. This allows frames generated at the headend to create the "look and feel" of a digital, interactive network which is still fully compatible with all existing system equipment. Interestingly, providing up-to-date information for these services is a larger impediment to implementation than providing the hardware, particularly on a regional basis. Since local applicability of these services is essential to compete effectively with a nationally focused DTH system, their success is closely tied to the mechanism which maintains the information. The advanced analog box is a particularly price sensitive item and must support useful interactive services at a significant cost advantage to a digital network. The matrix in the table identifies cost and performance features of the various media used to deliver service to the consumer.

Service type	Basic analog	Advanced analog	Digital cable	Digital DTH
Feature				
# of channels	100-120	100-120	200-300	200-300
Program guide	Minimal	Yes	Yes	Yes
Internet access	No	Yes	Yes	No
Security risk	Low	Medium	Medium	High
Pay-per-view	Yes	Yes	Yes	Yes
NVOD (IPPV)	No	Yes	Moderate	Yes
VOD	No	Minimal	Yes	No
Set-top cost	$80-120	$100-150	$300-600	$500-700

Accepting that the future is digital, what is the most practical bridge to that future? Forward compatibility is often cited as an upgrade path from an analog cable system to a digital network. At face value, forward compatibility sounds reasonable, until the uncertainty of system configuration is considered.

Forward compatibility is only possible if the future configuration is already frozen. Freezing the future precludes the possibility of incorporating the very advances which will make the economic realization of a digital network possible. How can a manufacturer claim forward compatibility to compression standards on the horizon? Beyond the practical issues of compatibility to the unknown, including the provisions for such an upgrade drive the system costs upward in today's dollars. Therefore, a set-top unit with inherently limited upgradeability will cost more in the long run.

The only practical solution follows the lead set by the computer industry: backward compatibility. Digital systems which offer compatibility to their analog predecessors will allow operators the capability of upgrading individual subscribers as their system *transitions* from analog to digital. The hybrid set-top unit will bridge the gap backward to the analog past.

It remains to be seen if the average consumer is really enticed by the prospect of 200+ channels. As the program providers are looking for reassurance regarding security, the picture quality is largely the same, and the system is more expensive, digital cable's time has not yet come. Predicting when the economics of digital networks will drive a conversion from analog requires more than a marketing crystal ball. Estimates range from five to 10 years.

Part of the explanation for this uncertainty is that networks will not switch from analog to digital; they will transition. The hybrid analog/digital box will be the vehicle for this transition. It will allow system operators to manage the transition speed in the manner most relevant to their system. There is no doubt that the future of television is digital, and within the U.S., HDTV is likely to drive the last nails in the analog industry's coffin.

For the immediate future, however, all practical indicators show that analog cable systems are alive and well, and with some digital prosthetics, are likely to live a long time. CED

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Technical Operations Manager, Harron Cable, New York Region

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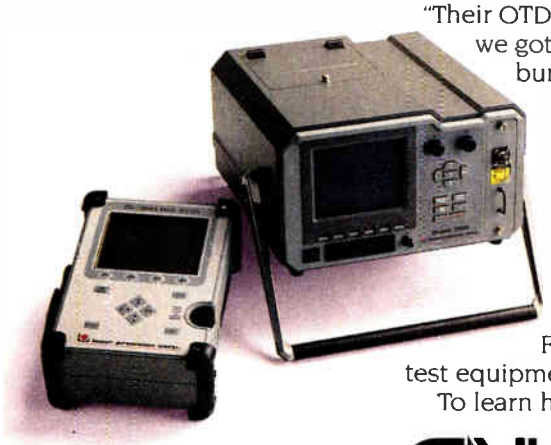

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Circle Reader Service No. 21

Finally, here comes the digital video set-top

Spate of RFPs pushes the process

By Roger Brown

Although digital television is off to an admittedly slow start, a number of new initiatives are pushing set-top manufacturers and component developers to develop new approaches that will ultimately result in lower-cost units, paving the way for mass deployment. More specifically, as recently as last month there were at least four different requests for proposals (RFP) on the street, and at least one integrated chip manufacturer announced a new, three-chip silicon solution specifically designed for digital set-tops.

The upshot is that soon, a new pecking order for set-tops could turn the whole industry upside down and relegate a 1-million unit order toward the bottom of the priority list.

Indeed, when one considers that millions of cable TV subscribers were supposed to be viewing satellite-delivered digitally compressed programming by now, it's perhaps ironic to realize that instead, millions of viewers are watching digitally encoded commercials that are inserted by the local cable system.

As a result of numerous frustrating delays associated with the development of the digital transport network–and more specifically, the digital set-top box–the cable industry will not be the first to deploy digital compression, as was promised several years ago. With the exception of Time Warner in Orlando, the cable industry has yet to deploy digital set-tops in any meaningful numbers.

Meanwhile, competitors have struck. DirecTv, the direct broadcast satellite service, has already sold more than 1 million units and is stealing as much as 2 to 3 percent of cable TV's marketshare in some places. And now, the likes of Tele-TV, US West Communications and americast are all girding to order millions of set-tops, which could displace MSOs like TCI and Time Warner out of the top spot.

Likewise, DBS newcomer AlphaStar last month opened its digital earth station in Oxford, Conn. and is completing its system integration process. AlphaStar took over a satellite tracking and telemetry site formerly owned by GE Spacenet and spent another $40 million upgrading the facility. AlphaStar is scheduled to begin beaming MPEG-2 video that is Digital Video Broadcast encryption compliant by the end of March 1996.

AlphaStar has been testing its digital reception equipment for several months via Skynet's 402R satellite located at 89 degrees west longitude.

Big changes coming

Cable operators have had to watch these announcements and, through gnashed teeth, admit that they have missed being on the cutting edge when it comes to digital deployment. Although the industry has already spent millions to deploy digital ad insertion equipment (see story, p.48), it's only flirting with the digital future it will eventually learn and come to love.

But all of that is about to change.

As of last month, at least three different network operators had formal requests for proposals on the streets seeking fully-featured set-tops for "significantly less" than $400, and

With the telcos issuing RFPs for digital set-tops, the market for such units could be flipped on its head, some fear.

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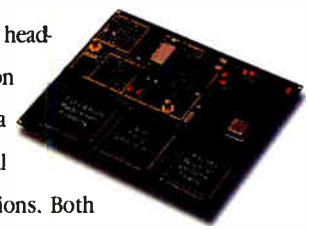

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one integrated chip manufacturer was hailing the arrival of the $300 digital set-top as a result of chip integration.

In addition, General Instrument is finally prepared to ramp up production of its DigiCipher system, having successfully demonstrated the system during the Western Cable Show in Anaheim, Calif. last December. During that demo, video was uplinked from TCI's National Digital Television Center, received by Multivision in Anaheim and sent to a working digital set-top located in the General Instrument booth on the convention floor.

The company intends to ship a quantity of test units to TCI and other MSOs beginning in this quarter, according to Dave Robinson, vice president and general manager of digital network systems at GI. After that, production units will begin to roll off the assembly line in the second half of the year, he says.

At least 10 different cable operators years ago signed letters of intent to purchase the set-tops, and most remain poised to do so. One that isn't, however, is Time Warner Cable, which last month sent out a 123-page request for proposals for a real-time, two-way set-top box it is calling "Pegasus." The hybrid box will be able to receive both analog and digital signals and will feature an interactive program guide, a real-time return channel and rich two-dimensional graphics.

Time Warner Cable sent out a request for proposals for a set-top box it is calling "Pegasus"

Time Warner intends to purchase between 500,000 and 1 million of these Pegasus units, beginning in the first quarter of 1997, according to Mike Hayashi, vice president of advanced engineering at Time Warner Cable.

Time Warner needs the new set-top to position itself as the primary provider of both digital and analog entertainment, communications and information services in its service areas, according to Jim Chiddix, senior vice president of engineering and technology at the MSO. This set-top, along with the ongoing plant upgrades to hybrid fiber/coax architecture, represents the "first phase" of Time Warner's interactive digital systems deployment strategy.

Specifically, Time Warner is requesting a set-top that is heavily based on accepted standards, such as MPEG-2 transport. Further, it must have a central processor that performs at least 25 million instructions per second (MIPS), has a minimum tuning range of 750 MHz ("although we'd like to see it hit 860 MHz," says Hayashi), is graphically rich (a minimum of 8-bit color with a wide range of special effects capabilities built into the hardware) and has an upper limit of 4 megabytes of "unified" memory. Oh, and Time Warner wants all that for "substantially less than $400."

With this set-top, Time Warner hopes to capitalize on the trend toward "shared" memory, as opposed to dedicating a fixed amount of expensive DRAM to specific functions. In this scenario, the DRAM that is used for MPEG-2 decompression would also be used for applications and graphics if MPEG-2 decompression is not used or is used in lower resolutions, according to the RFP document.

But "probably the most important aspect of this box is the real-time two-way return," says Hayashi. Pegasus is expected to support several "forward application transport (FAT)" channels that run at 64- or 456-QAM, which transport 27- or 36-Mbps, respectively. In addition, a forward QPSK data channel is called for, as is a shared reverse QPSK channel that supports a minimum of 1.544 Mbps.

Responses to Time Warner's RFP are due by April 25.

While the RFP doesn't ask for a specific encryption and access control method, Time Warner wants to "take advantage of standards," says Hayashi. The MPEG standard allows for multiple types of conditional access. "This is a timing sensitive issue," notes Hayashi.

Time Warner actually hopes to leverage the transport technology it specified in the Pegasus set-top with high-speed data modems it hopes to deploy. "The transport system we have specified . . . has much in common with the kinds of transport that we believe will be viable for high-speed cable modem services," wrote Chiddix in the RFP's cover letter to vendors. "We believe there is an opportunity to capitalize on the investment in Pegasus by using the same device for the delivery of high-speed data services to a PC or a game device."

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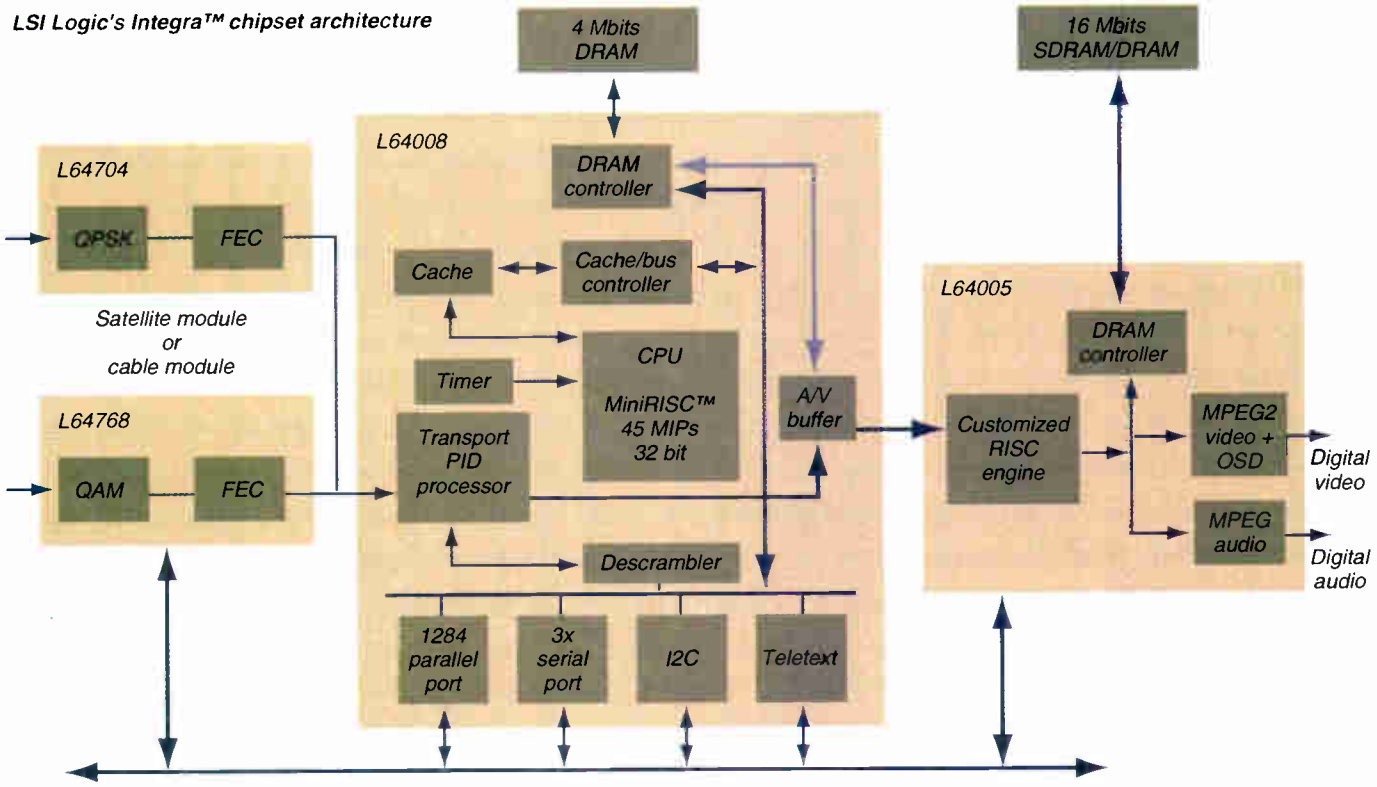
LSI Logic's Integra™ chipset architecture



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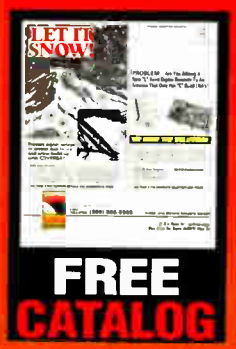

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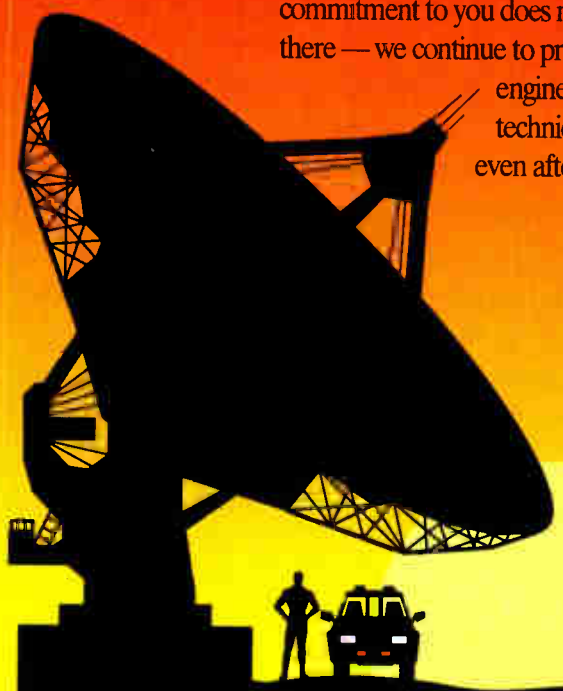

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Time Warner has been upgrading its cable networks feverishly to modern HFC design. The company's stated goal was to have its major urban clusters upgraded by the end of 1998. Since that statement was made, however, the company has acquired more subscribers–which could push that timetable out a bit, according to Chiddix. "We've been upgrading at the rate of 10,000 to 20,000 miles per year," he notes. "Last year we were Siecor's largest customer (for fiber optic cable) and I believe we might have been the largest fiber customer in the world."

Telco efforts are strong and deep

Meanwhile, the telco consortium known as Tele-TV also issued an RFP for its "Unity" digital set-top to 21 different manufacturers last month, to which responses were due March 21. This set-top, for which Tele-TV wants to pay about $300 each, is expected to integrate MPEG-2 digital video and audio with a PowerPC-like central processor and will support a RISC architecture to manage the user interface and execute server-based interactive applications like video-on-demand and other information and transaction services.

In addition, the box must have a minimum of 4 megabytes of RAM (over and above the 2 MB needed for full MPEG decompression) for applications, according to Craig Tanner, vice president of advanced technologies for Tele-TV Systems.

Tele-TV is a partnership between Bell Atlantic, Nynex and Pacific Telesis designed to spearhead entry into the video entertainment market.

Other features of the Unity set-top include a hardware accelerated graphics subsystem that will support three-dimensional graphics and the new IEEE-1394 digital interface for interconnection with personal computers and future digital consumer electronics, including camcorders and VCRs, says Tanner.

Tele-TV issued an RFP for its "Unity" digital set-top to 21 different manufacturers last month

The Unity box will consist of a core processor that is attached to a "network interface module" which will allow the platform to be attached to any network architecture, including HFC, asymmetric digital subscriber line (ADSL), switched digital video or direct broadcast satellite. Tele-TV got to this point about a year ago, having actually pared the list of potential manufacturers down to eight finalists, when the company switched its focus to developing a digital set-top for MMDS applications.

In fact, at the end of February, Tele-TV and Thomson Consumer Electronics formally signed a $1 billion contract where Thomson will supply up to 3 million set-tops beginning in the fall of 1996 and continuing through 1999. A number of Tele-TV's parent companies have made significant investments in MMDS companies in an attempt to quickly enter the video marketplace. With the advent of digital compression, MMDS systems that have been limited to 33 channels can now

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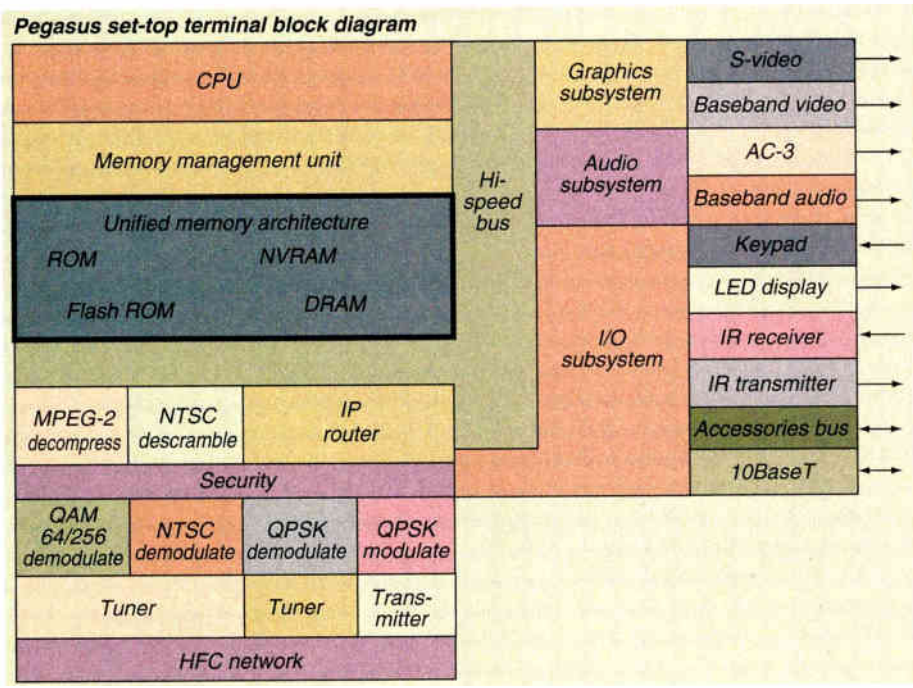
offer many times that number.

Specifically, Bell Atlantic and Nynex have invested in CAI Wireless based in Albany, N.Y., and Pacific Telesis acquired Cross Country Wireless, Wireless Holdings and Videotron Bay Area, which holds MMDS licenses across California.

As for the wired Unity set-top, Tele-TV has already held a one-day manufacturer's conference where a series of business and technical questions were addressed, says Tanner. "Nothing earthshaking was discussed, it was all pretty much arcane technical issues," he says.



In addition to those two, high-profile RFPs, US West Communications and americast, the consortium of Ameritech, GTE, The Disney Company, SBC Communications and BellSouth, had requests floating recently as well.

While Jody Miller, senior vice president of operations at americast, confirmed that the RFP was issued, she declined to provide any technical or market details, noting that the whole process was subject to non-disclosure agreements by all the participants. She did, in fact, express surprise that the trade press had learned of the RFP's existence, but said americast hopes to complete the RFP process and make a selection early in the second quarter of 1996.

US West, meanwhile, had issued an RFP and closed it without making a vendor selection, according to a company spokesman. Details of that RFP were also unavailable, but it reportedly was similar to the one issued by Tele-TV and detailed above. No information about the number of units involved or when purchase might actually occur was available.

Is the $300 box really here?

Are these network operators asking too much when they specify a $300 digital set-top? After all, Time Warner deployed a highly interactive box in Orlando that cost nearly 20 times that amount. And set-top manufacturers with long histories of engineering out costly items say it will be a while before digital boxes reach that price level.

But, clearly, steps are being made in that direction. LSI Logic turned a few heads last month when it announced a three-chip solution that could make the $300 set-top a reality.

Because it has reduced the number of chips needed to perform the digital compression and control functions from 10 or so chips to three and will make that chipset available for less than $75, LSI Logic argues that the set-top should cost no more than $300 because the remaining bill of materials–power supply, digital logic, 2.5 megabytes of memory and circuit boards–costs no more than an additional $75 to $100. (See figure on page 42.)

The company claims this "Integra 1000" solution can be used for cable, satellite and telco set-tops, regardless of what region of the world they are deployed in. Further, the chips are based on open standards, such as MIPS and MPEG-2, says Kishore Maghnani, director of marketing for LSI Logic.

The chipset makes use of "intelligent partitioning" between hardware and software and uses the shared DRAM concept to increase performance at costs that are lower than today's solutions, claims Maghnani. Also, the chipset will be driven by a lightning-fast microprocessor that performs 45 million instructions per second (MIPS), as opposed to today's set-tops that use micros that operate at about 5 to 10 MIPS.

Such a processor gives a set-top enough power to support a wide range of applications, and for content developers, the box "is a dream come true," says Maghnani, because applications that run over the processor can be written in C language instead of some complicated and cumbersome assembly language.

While cable operators generally cheered the LSI Logic announcement, set-top manufacturers openly chastised the company, taking it to task for attempting to set the price for a finished product.

GI's Robinson is one who is openly critical of LSI's aberrant behavior. "If it's so easy to build a $300 digital set-top, why don't they build it themselves?" he asks rhetorically. "The experts at building the boxes are not the chip suppliers."

Furthermore, Robinson says LSI's new chipset is far from being a breakthrough. "It's important work. It's essential work," he notes. "But is it a breakthrough? No. There are probably six to 10 companies all over the world working on the very same thing. It's the same approach we're taking in our own development."

David Levitan, vice president of strategic planning at Scientific-Atlanta, echoes Robinson's thoughts. "Three chips don't make a total system solution," he notes.

Others have said the same thing in the past, making note that many electronics companies that have significant success in digital consumer electronics or personal computers often become stumped when they have to integrate analog RF technology. "It's never as easy as these (manufacturers) would have you believe," says one executive who declines to be identified.

Nevertheless, Hayashi of Time Warner is pleased to hear of the development. "I'm delighted to hear they (LSI) are working on this," he says. "What we tried to put in our RFP is hopefully a good reflection of the direction the industry is taking. It's very encouraging.

"It shows the power of having good standards," continues Hayashi. "We can take advantage of all the other MPEG efforts." That would come as a pleasant surprise to some cable MSOs who fear that the combined buying power of groups like Tele-TV and americast will push them down in the pecking order. Watching how this plays out will be interesting. CED

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Digital servers (finally) starting to deliver

New servers increase revenues and operator interest

By Michael Lafferty

Remember interactive TV or near-video-on-demand? How about true video-on-demand? Believe it or not, fact may be finally catching up to those formerly fictional scenarios.

Recent technological advances and practical, revenue-generating applications of digital technology in a new generation of video servers are finally putting near-video-on-demand and a host of other interactive possibilities on many operators' strategic radar screens for the first time.

What's an operator to do?

The transition from analog to digital television is well underway. In the last two years alone, it's been estimated that nearly $70 million has been spent on digital ad insertion equipment. This year, the acquisition and deployment of this increasingly sophisticated equipment, much of which is also capable of doing far more than placing ads, is expected by some to nearly double 1995 sales totals.

Yet purchasing decisions in this crucial sector are far from easy. The convergence of computer technology, digital encoding/decoding and the constant, albeit uneven, upgrading of the cable plant tend to complicate, rather than clear up the situation.

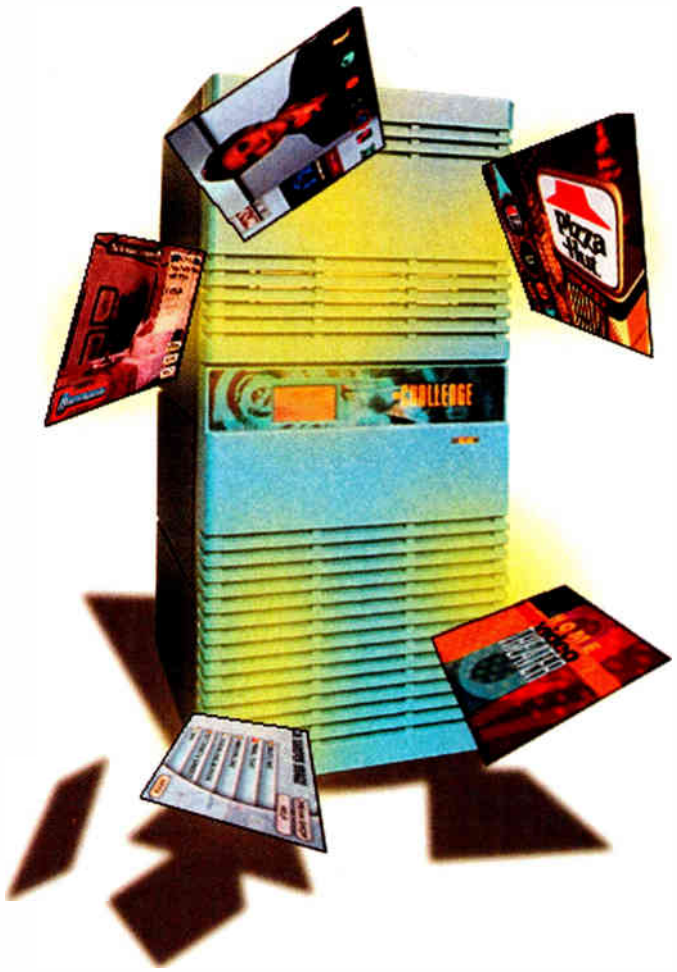
Those in the know keep their attention focused generally on four areas when comparing the growing list of digital video/media server product providers. Cost, of course, is no surprise. But it's not necessarily the primary factor for discerning digital shoppers. In addition, there's more than one way to calculate the cost-per-stream, and a low-ball price *now* may, in fact, cost an operator more in the long term.

Digital server flexibility can be judged in a couple of ways. How video streams are generated, processed and distributed seems to have fallen into two camps, both of which have vocal proponents and detractors. Operators can choose a "distributed" deployment (known in computerspeak as symmetric multiprocessing, or SMP), or a more "centralized" approach (aka as massively parallel processing, or MPP).

Another key flexibility issue is the ability of a video/media server and its attendant architecture to support end-user applications or software tasks, either individually or as a group. It also deals with the software programs it takes to provide those services, including network management, storage and recall functions, billing and tracking, and a host of other "nuts and bolts" applications that make a system work end-to-end. Then, operators are faced with the fundamental flexibility concern of just how "open" or "closed" a system actually is.

Another issue closely related to flexibility is a digital video/media server's scalability. Essentially, will the server system an operator buys or puts together now grow in a balanced way with an operator's needs so that more content is delivered to more end users as time progresses? It's no easy task to make that determination, and it's fraught with conflicting claims by manufacturers.

A final critical area is the reliability of a video/media server. This goes beyond setting up a variety of uninterruptible power supplies (UPS). It has to do with content redundancy through RAID (redundant array of inexpensive disks) arrays. It also deals with real-time fault tolerance (through hardware and software) to help prevent problems before they occur, as well as having the ability to swap faulty equipment as the system continues to operate.



Put price in perspective

While calculating cost-per-stream is a relatively simple mathematical matter, the numbers used in that equation need to be examined closely. Bob Hall, Continental Cablevision's new media projects manager, is in the process of evaluating various digital video/media server systems and warns other potential digital shoppers to actually verify the number of streams claimed by paying particular attention to just how large those streams are.

Hall notes some vendors may claim their server produces 32 streams. But, when you read the fine print, it turns out to be 32 1-Mbps streams. Because he's interested in machines that can produce anywhere from 3- to 8-Mbps streams, those 32 streams have suddenly become just eight 4-Mbps or four 8-Mbps streams.

When it comes to actually computing the cost-per-stream, Hall takes the initiative by dictating the parameters of his own virtual digital server system to vendors. "My

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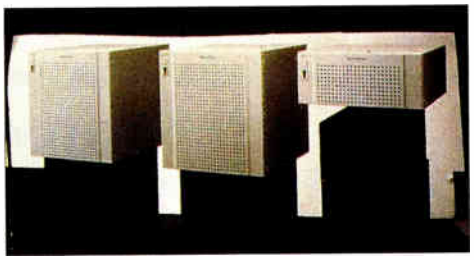

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baseline," says Hall, "is 32 analog channels at 3 Mbps and also 50 hours of storage content at 3 Mbps. That's actually probably a little bit more than I need, but it seems to be a nice set of benchmarks.

"The only other assumption that's made is that I be able to do two things. One is to play the same video file on all 32 channels at the same instant in time. And the other one is that I want 32 different videos playing to the 32 different channels (at the same time). The vendors have to be able to at least demonstrate to me in a lab that they can do that."

Hall says that it's hard for him to use cost-per-stream by itself because some vendors have features others don't. "It's very much like comparing apples and oranges," he explains, "because there are so many things that are different within a system. The serviceability. The maintenance. The 7 x 24 support that a company may or may not offer. Even how easy it is to fix something when it breaks is important."

Vela Research's Perspective 2000 for ad insertion, NVOD and other applications.

Flexible, scalable architecture a must

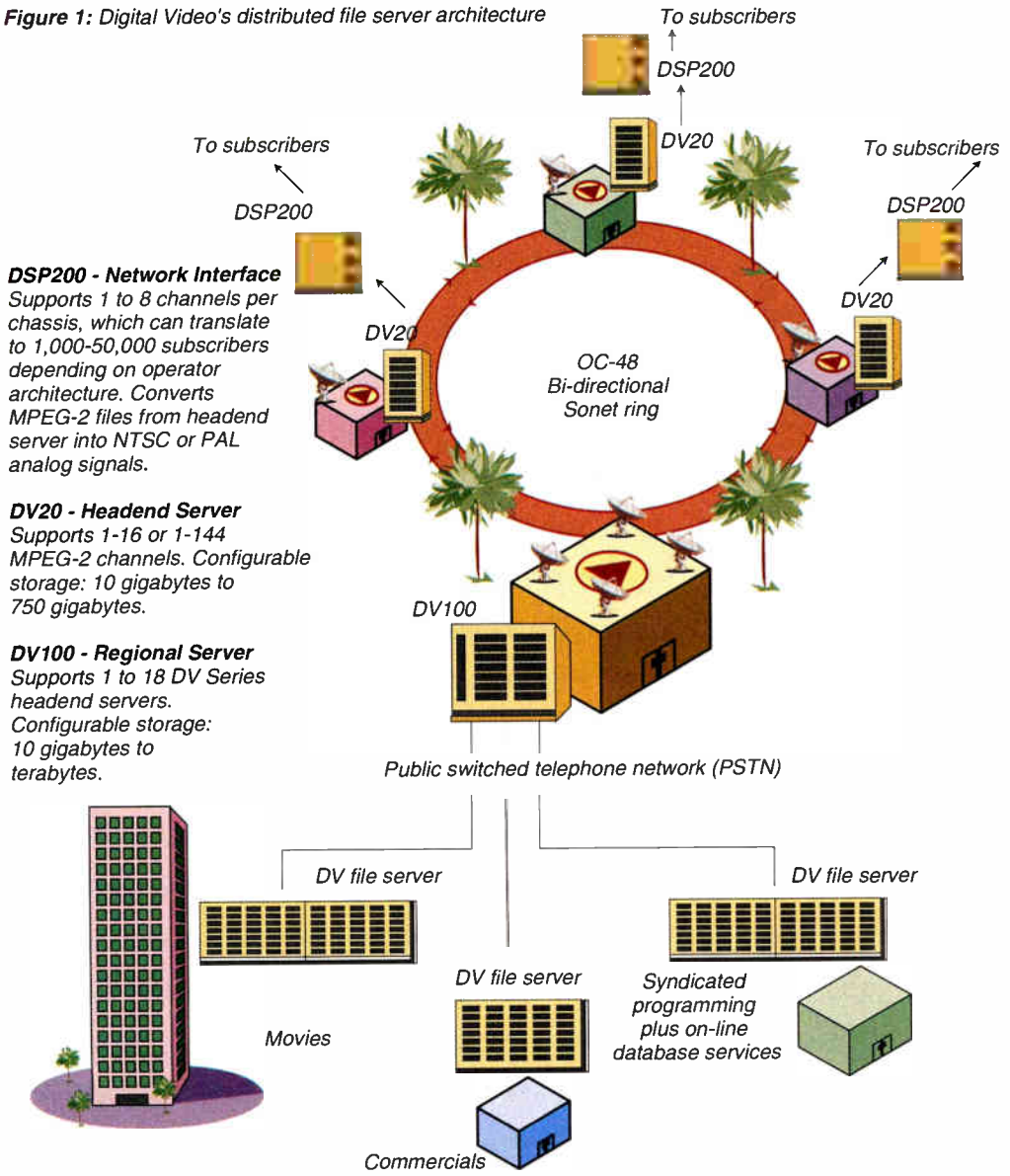
Coming to Continental with more than a half dozen years at Apple Computer, Hall says he's noticed an interesting trend among digital video server manufacturers. Those companies that come from a computer background, says Hall, tend to produce products based on open standards with "off-the-shelf" solutions, while those from video backgrounds tend to offer closed or semi-proprietary systems.

Remaining true to his computing roots, Hall is a committed open standards advocate who wants to avoid getting "locked into" a particular vendor. "At some point in the future," he says, "if the server I have isn't performing the way I need it to because now I need 100 streams at the headend, I want to be able to take that out and put something in its place. And I want to be able to do that without disturbing the set-top boxes, the upstream server or the network connection going into it. That's what an open, non-proprietary system will allow you to do."

When the imminent VOD nirvana was first discussed a few years ago, avid proponents were focused on just one distribution architecture. They described centralized servers feeding thousands of streams to video-starved consumers. Expensive, early solutions along that track dampened enthusiasm not only for that distribution scheme, but the whole interactive/VOD concept itself.

Since then, technological advances and the "morphing" of computer networks into systems designed to specifically process video have bolstered the case for a distributed architecture among most

Figure 1: *Digital Video's distributed file server architecture*



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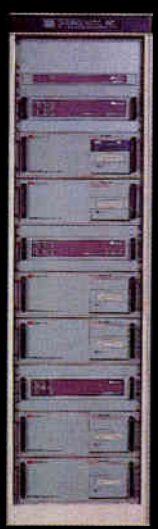

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current vendors. And Hall tends to agree with that approach. "Ideally, at least from my perspective, I want to have one machine where I put the videos into the system and then it goes through a hierarchical computer network down to the various regions where there's a library for that region. And then from the region, it goes to the various headends in a distributed fashion."

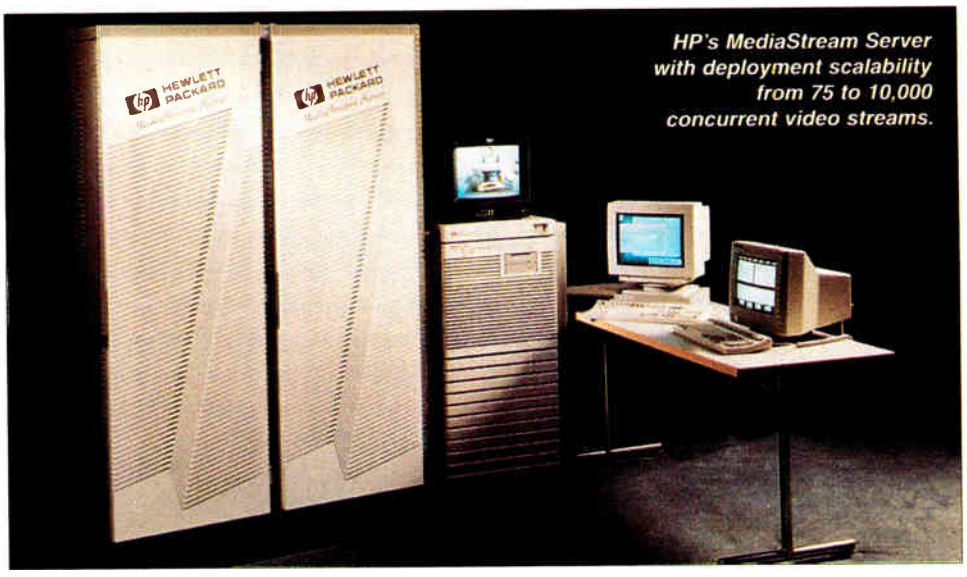
Yet the distributed architecture has potential bottlenecks that need to be addressed, Hall admits. He explains that operators "need to look at tradeoffs of quality versus the size of the files, and what it's going to take to load a system located remotely. When you have remotely located servers where you're trying to store content, the pipe that you have from where the video is to where it has to get to is critical." Hall notes that Continental is looking at a minimum 3 Mbps data rate bandwidth. For movies, they're evaluating 4 or 8 Mbps, and for live action sports, at least 8 Mbps or even higher.

Yet the centralized architecture is far from dead. One vendor, nCube, continues to hail its advantages and has brought some impressive technology to bear, according to its president and CEO, Ron Dilbeck. "We believe the more centralized approach is the right approach for a variety of reasons," says Dilbeck.

HP's newest generation Broadcast Video Server.

"One is that information doesn't have to be duplicated, which gets fairly expensive.

"But the other thing is the reality of having to manage systems. And having to manage a large number of systems today becomes rather difficult. There are certainly some remote management tools and the like, but at the end of the day having to manage these things, updating content, managing the content, making it a 7 x 24 operation, where you have to have very high availability on this type of thing, is a lot harder if you have them distributed across a network."



HP's MediaStream Server with deployment scalability from 75 to 10,000 concurrent video streams.

RAID storage arrays have become almost standard in most digital video/media server designs

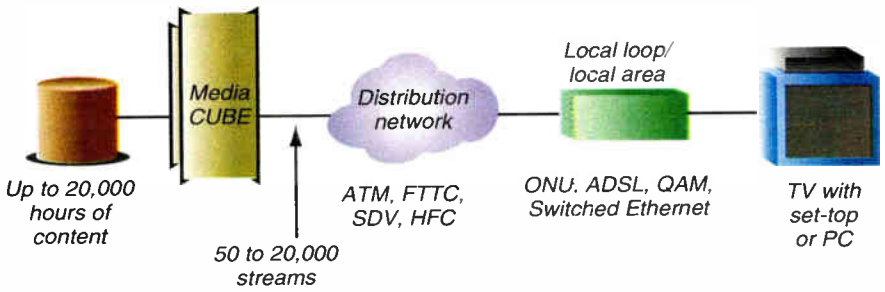
Content and systems management issues are critical factors whether it's a distributed or centralized architecture. Hall believes solutions to such questions lay in utilizing and adapting existing computer industry standard protocols like SNMP (Simple Network Management Protocol) to the digital video processing environment.

"It (SNMP) allows you to set up a machine that watches all the devices that can talk this particular protocol," says Hall. "When one of the devices starts to feel bad, the graphic of that device on the console will turn yellow. Typically a pager will go off. Then using SNMP you can get a diagnostic of the system and the faulty device.

"Most (digital server) systems are based on UNIX and have SNMP built into it. But they don't carry it to the next step, which means giving you detailed information that is unique to a video format—audio levels, video quality on specific channels, etc."

While operators, like Continental, continue to search out vendors who have or are willing to take the initiative to adapt and, if needed, transform existing computer protocols to the video server environment, they're also looking for server products that can be optimized for more than just one end-user application. To extend their usefulness, operators are requesting, and more vendors are supplying, systems that can process and deliver both short form video (ad insertion) and long form video (infomercials, programming, movies, etc.).

Figure 2: nCUBE's massively parallel processing architecture



RAID: A digital video fundamental

While manipulating, processing and distributing video content in the digital world is vital, having content to draw upon in the first place is even more important. RAID storage arrays have become almost standard in most digital video/media server designs.

Developed at the University of California/Berkeley in 1987, RAID storage technology is based on the concept of striping bits of content across a set of relatively inex-

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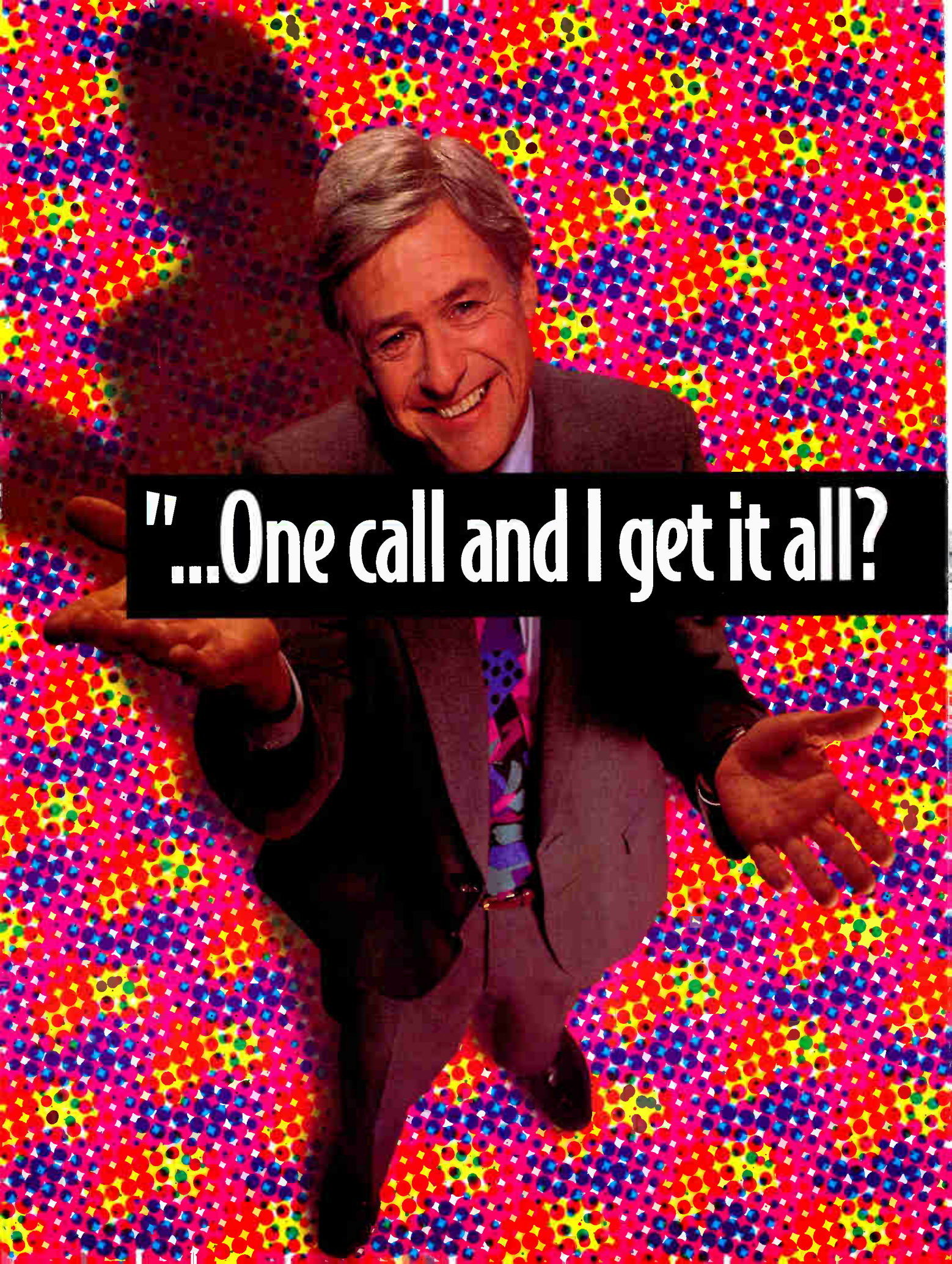
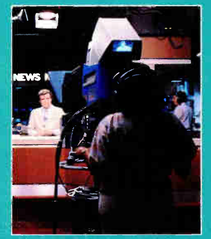

"...One call and I get it all?

DIGITIZING AND COMPRESSING VIDEO

1. Analog output

The video we view with our eyes is analog in nature. So, before a signal is digitized, it starts off in analog form. By definition, the amplitude of an analog signal varies continuously with no abrupt changes.



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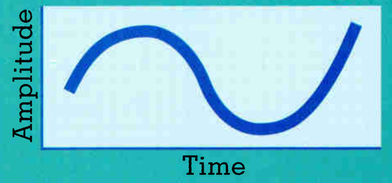
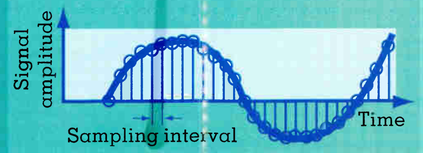


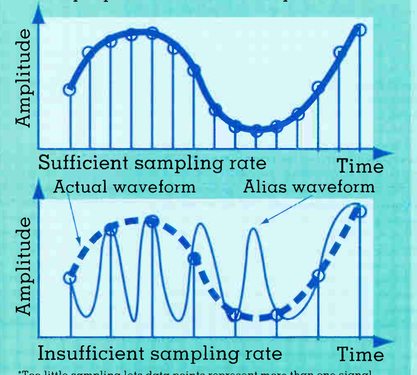
2. Sampling

The first step in the digitization process is sampling. A storage element, typically a capacitor, measures the voltage of the signal at regular intervals, capturing a "snaphot" of the signal's amplitude at several given points in time. The interval between samples is known as the sampling interval. In order to avoid errors and distortions, it is important to capture enough samples so that the signal can be accurately reconstructed by the decoder. According to the Nyquist theorem, the signal must be sampled at least twice as often as the highest frequency component in order to accurately reconstruct it. In NTSC video, where the signal is 4 MHz wide, the sampling rate must be at least twice that number. In practice, video is often sampled at four times the color subcarrier, or 14.318 MHz. As a result of this sampling, each pixel of the TV picture is defined.



3. Aliasing

If a video signal is not sampled often enough (more than the Nyquist rate), an artifact known as aliasing occurs. In this case, which is shown below, the decoder cannot faithfully reconstruct the original analog waveform, resulting in incorrect information. Ever notice how wheels on cars seem to spin backward on TV? That's because the camera actually "samples" life 30 times every second (creating a frame each time), which isn't often enough to correctly reproduce what actually occurred.



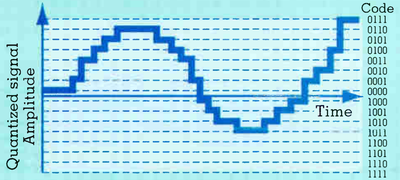
*Too little sampling lets data points represent more than one signal.

4. Quantizing

After a signal is sampled, each sample must be quantized, or given a known value so that it can be reconstructed. This process measures the amplitude of each sample and assigns an approximate value to it, which is then converted into a binary number during the coding process. To faithfully reproduce the signal, there should be a large number of different values, or "slices," available to choose from.

Pulse code modulation

Each quantized sample is represented by a unique N-bit code

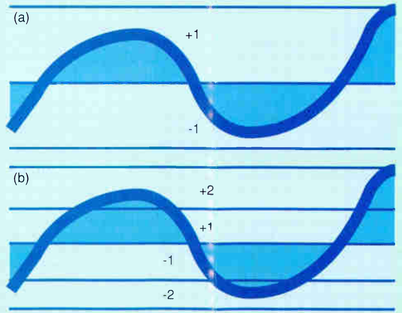


The code words are transmitted sequentially...

0000 0000 0001 0011 0100 0101 0110 0110 0110 0101 0100 0011 0001 1000 1001 1010 1010 1011 1011 1010 1001 1000 0001 0010 0100 0111...

5. Coding

For example, two-bit quantization actually slices the signal into four known values, while four-bit quantization divides it into 16 values, as shown below. In most video applications, eight- or 10-bit coding is used because they allow the signal to be sliced into hundreds of levels, making it possible to accurately represent the original analog waveform. With 8-bit coding, a video signal is sliced into 256 levels ($2^8 = 256$) and each sample is assigned one of the 256 different values, each of which is represented by a binary number consisting of eight digits.



6. Binary numbers

Each 8-bit binary number equates to one of the 256 different values that are used to represent a signal's amplitude. For example, the binary number 11010001 actually equates to the number 209 (see table below). The first binary number (the one on the left) is known as the "most significant bit" because it's value is highest; the last binary number is referred to as the "least significant bit" because its value is 1.

Binary number	1	1	0	1	0	0	0	1
Value for each binary position	128	64	32	16	8	4	2	1
Value of this 8-bit binary number	128	+ 64	+ 0	+ 16	+ 0	+ 0	+ 0	+ 1 = 209

7. The need for compression

The problem with using 8- or 10-bit coding to define these values is that the resulting

8. Pre-processing

The first step of the compression algorithm is the pre-processing function. During this time,

9. Motion compensation

Because there is often great similarity between each frame of video, it's more efficient to

10. Frequency domain decomposition

The MPEG standard then calls for the redundancy between adjacent pixels to be

11. Quantizing and coding

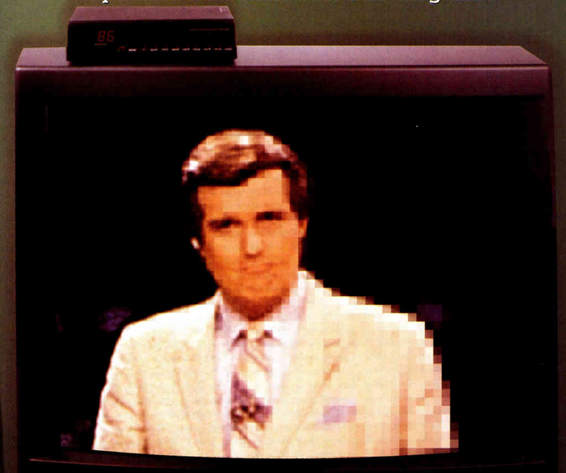
After quantization, which assigns discrete values to the output of the frequency domain

12. The final output

After being error coded (to account for possible errors that could occur during transport), the

Compressing & Digitizing Video

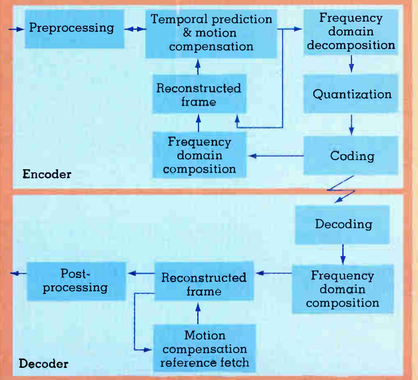
A pull-out wall chart from CED magazine



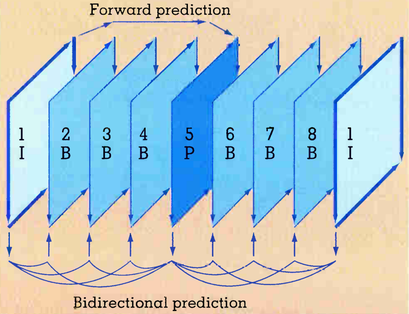
With the advent of the digital age comes a whole new lexicon and a need to understand how analog signals are digitized and compressed. Already, several of the larger cable systems have jumped into the digital fray by deploying digital video servers for advertising or pay-per-view applications. But many more are waiting until the digital set-top box bursts on the scene, delivering digitially compressed images right into the house. This chart is intended to educate those in the cable industry about how video is digitized and compressed before it is sent out over the network.

bitstream is huge. For example, if a NTSC picture is sampled at 14.318 megasamples per second (four times the color subcarrier) and 8-bit coding is used, the total transmission rate is 8 x 14.318, or 114.544 megabits per second. This would require a huge amount of bandwidth to transmit. So, somehow, the bitstream must be reduced in order to be usable. This is where MPEG and other video compression methods come in.

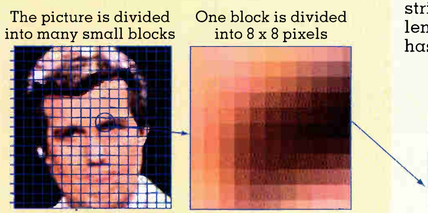
The intent is to remove the information that is the most difficult to code and is least important to the overall image quality. An example would be the crowd at a sporting event. When the camera pans from one side to the other, details such as facial features are removed because excessive motion is difficult to compress and is imperceptible by the human eye anyway.

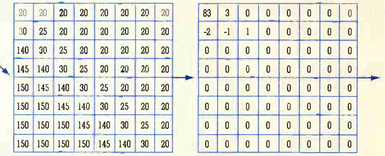


detailly code only the changes that occur from one frame to another. This is known as "interframe" coding. Sending information only about the changes dramatically reduces the amount of data that has to be transmitted. In the MPEG process, bidirectional prediction is used to help forecast motion. This step buffers several frames so that the preceding and succeeding images can be examined and compared to determine how much motion takes place and where the moving objects should be placed.



eliminated to further reduce the amount of information that has to be coded. By using a process known as discrete cosine transform (DCT), pixels are decorrelated from neighboring pixels so that only the minimum amount of information is transmitted. Other "intraframe" coding methods include predictive coding and vector quantization.





20	20	20	20	20	20	20	20
20	25	20	20	20	20	20	20
140	30	25	20	20	20	20	20
145	140	30	25	20	20	20	20
150	145	140	30	25	20	20	20
150	150	145	140	30	25	20	20
150	150	150	145	140	30	25	20
150	150	150	150	145	140	30	20

Decimal values of pixels

83	3	0	0	0	0	0	0
-2	-1	1	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Decimal values of pixels after DCT and quantization

decomposition process, the quantized information is further coded, typically using a lossless method known as entropy encoding. The most common form of entropy coding is Huffman encoding. Here, code words are assigned to frequently occurring combinations. As a result of this coding, it is common for large groups of zeros to be bunched together, as they represent high frequency information. In this case, the whole string of zeros can be coded as a group (run length coding) to cut down on the amount that has to be transmitted.

video is modulated and sent over the network. In the consumer's home, a digital set-top receiver reconstructs the signal, converts it back into an analog waveform using error correction methods to overcome transmission errors, and delivers it to the TV receiver. As a result of throwing away all the redundant information, the bitstream is reduced to between 1.2 Mbps and 7.5 Mbps, depending on desired picture quality.

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The publisher wishes to thank Vela Research and NCTI for their assistance in preparing this chart.

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pensive disk drives in a prescribed manner which provides ready access and high performance. At the same time, that content is replicated on additional disk capacity as a back up. There are seven levels of RAID configurations, RAID-0 through -6, whose main differences rest on how each does or does not generate the back up or parity content.

Digital servers represent a fundamental change in the way operators will be doing business

In the digital video server world, technology has centered on RAID-0, -3 and -5 configurations. RAID-0 stripes content across a disk array, but does not maintain any parity information within the array itself. RAID-3 stripes data at the byte level and generates parity on a separate disk drive in the array. With RAID-5, both "original" content and parity striping is distributed across all disks in the array. Some vendors have "enhanced" various RAID technology levels to improve performance and standby capabilities.

TWC's Full Service Network features Silicon Graphics' Challenge XL Processors and storage vaults which can house up to 96 drives each with 2 GB of storage per drive.

Digital servers herald new cable era

Despite all the questions about new video hardware and software, digital servers represent a fundamental change in the way operators will be doing business from now on.

IBM's manager Broadcast Solutions/Telco & Media, Peter Lee, says videotape "is a very understandable, physical medium" that today's broadcast professionals "physically and intu-

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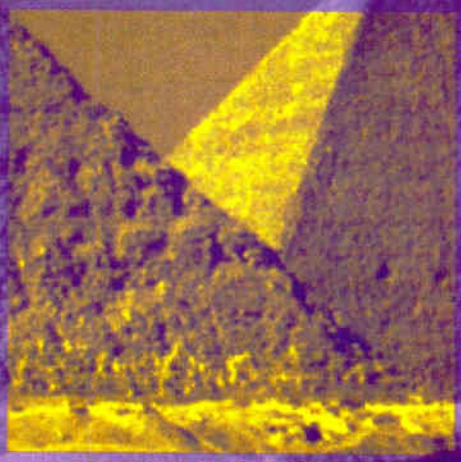

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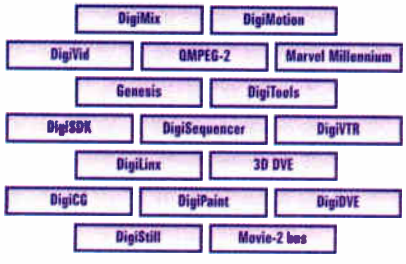

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itively understand." But the advent of digital video changes all that. Lee explains that cable pros have to grasp "what people who come from the computer side of things have taken for granted for so long, that it's a (data) file." As such, video is no longer a physical entity, but a virtual entity instead.

"If you look at the top 10 MSOs...they all understand that the headend of the future is...a computer center"

According to Jim Ludington, vice president of technology for Time Warner Cable's Full Service Network, while digital servers represent a phenomenal confluence of technology, they're also a harbinger of a convergence of people and talent in the very near future.

nCube's MediaCUBE Multimedia Servers and its nABLE interactive development system.

"They (operators) need to get some significant software and systems integration expertise," say Ludington. "Because it's not a hardware business that you're talking about. The cable industry is going to go from a hardware business to a software-centric business overnight when we enter into all the interactive services.

"We're going to have to find that talent somewhere, from converging industries. We're going to cross-pollinate, and that's where we'll find experts that are jumping the fences. If you can cross the boundaries and understand the language and the cultures of those three industries (cable, computers and telephone), you're a hot commodity."

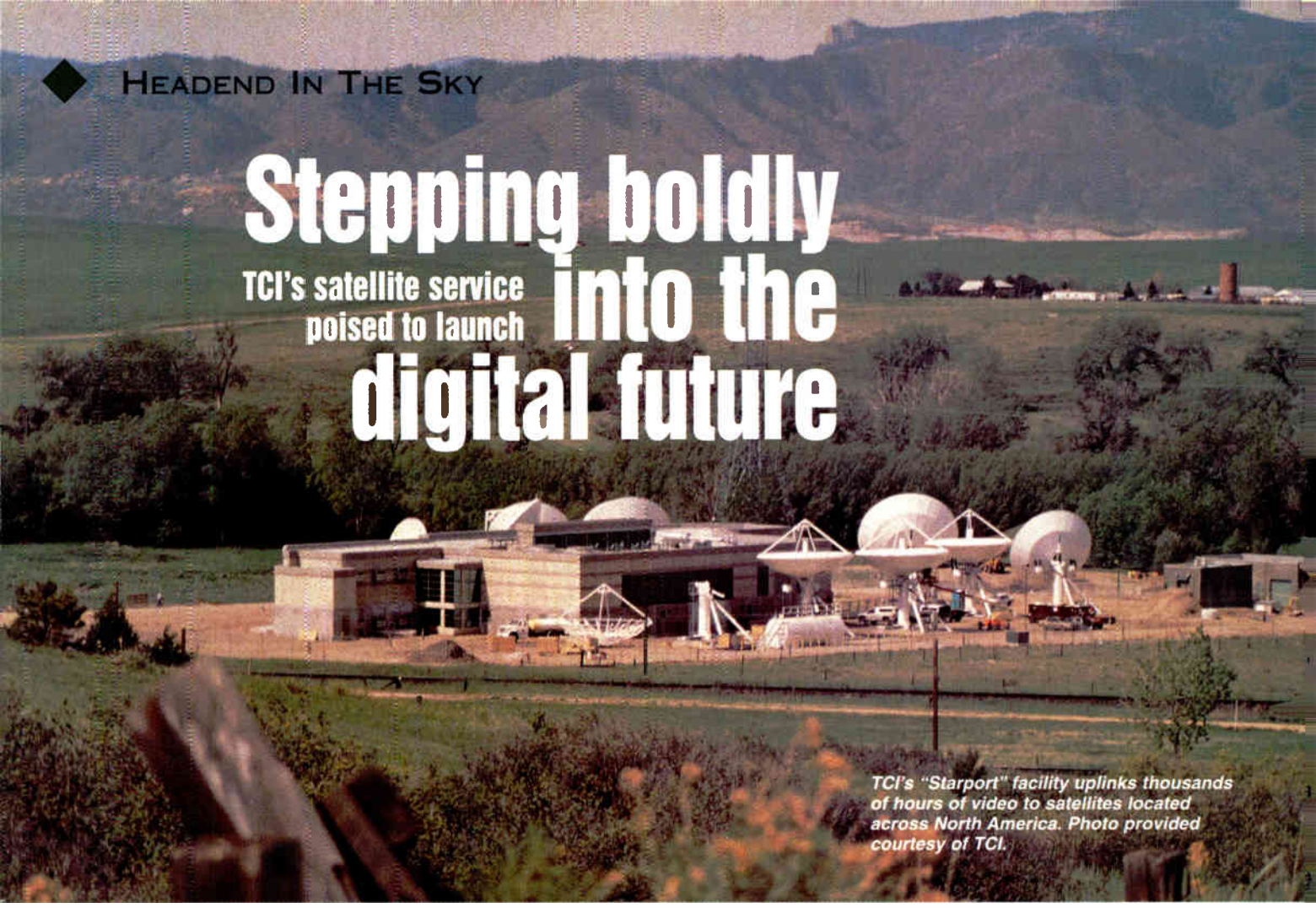
Continental's Hall concurs and holds himself and his company up as examples. "I think the companies that create teams of computer technologists and cable engineers are going to be much further along than companies that try to retrain either their cable or computer people," says Hall, noting that video server technology and its deployment is where the two come together.

"If you look at the top 10 MSOs and the top five or six phone companies that are looking at (digital) video," he continues, "they all understand that the headend of the future is basically a computer center.

"At Continental, we're very much taking a team approach. We're making ourselves the experts. We want to make the decisions on what products we use, where we want." CED

Stepping boldly into the digital future

TCI's satellite service poised to launch



TCI's "Starport" facility uplinks thousands of hours of video to satellites located across North America. Photo provided courtesy of TCI.

By Roger Brown

With two years and $150 million invested in a state-of-the-art facility, Tele-Communications Inc. is finally poised to enter the digital age later this year when its Headend In The Sky (HITS) facility begins beaming digitally compressed video to headends around the country.

Instantly, the advent of digitally compressed video channels can transform a run-of-the-mill, 36-channel cable system into a marketer's dream–a system of more than 100 channels and a full slate of movies that repeat so often they resemble video-on-demand service.

While TCI's own systems will certainly benefit from the HITS service, which promises to save the company millions by transmitting numerous channels over a single satellite transponder, the jury is still out about whether HITS will be a "hit" with other MSOs.

Huge facility

HITS is actually housed in part of TCI's sprawling 260,000-square-foot National Digital Television Center in Denver, where the company has spent tens of millions on digital equipment used to create, edit, transmit and receive video. The NDTC (as TCI insiders call it) is full of potential: it is home to five, full-service studios, each of which has a dedicated control room; numerous graphics workstations; on- and off-line editing suites; and 12 post-production suites.

Already, the center originates 15,000 hours of video programming and is the master control center for no fewer than 23 channels, including offerings from Request, Kaleidoscope and Starz!

TCI's top management has grand plans for the NDTC

TCI's top management has grand plans for the NDTC, hoping to make it the "hothouse" where original programming content is fostered and fed to help fill the vast number of new channels that will become available in the digital age. Although TCI has production crews in Los Angeles and New York City, overhead costs in Denver are 30 percent less than in L.A. or the Big Apple–which has already caused several top-flight video and film production crews to relocate to the Rocky Mountain region, according to BJ Raynes, director of market development–digital services at TCI Technology Ventures.

"There's probably no facility in the country that's as full-service as we are," notes Charlie Kennamer, senior director of engineering services at HITS. "From production to uplinking, this truly is one-stop shopping."

The NDTC is tied, via redundant fiber optic Sonet rings, to TCI's 37,000-square-foot Technical Operations Center in the "Starport" uplink center, located about 12 miles southwest of the NDTC. There, 19 earth station antennas up- and down-link programming to satellites. Given its unique geographic position, Starport can one-hop video across both the Atlantic and Pacific oceans.

But where TCI really hopes to recoup its investment is with HITS. Acting as a sort of video broker, TCI can receive satellite programming at the NDTC, digitally encode it and then beam it back over satellite to thousands of headends across the country. This strategy can save smaller cable operators from having to invest heavily in massive amounts of digital headend gear and bring new program-

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ming choices to even the most rural cable subscriber.

"It's clear the public has an appetite for more channels and higher quality video," notes Dr. John Malone, TCI's chairman and CEO, during a HITS promotional tape. He said the resounding success of DirecTv, Primestar and other direct-to-home satellite services shows that the public demands high-quality video sources.

TCI's National Digital Television Center, located in Englewood, Colo. Photo courtesy of TCI.

The costs of digital

In order to be a HITS affiliate, a cable operator will have to spend roughly $65,000 per headend, which will provide enough hardware to receive and transmit 50 channels out over the cable network. At about $1,300 per digital channel, that's actually less money than the $4,000 to $5,000 it costs to add each analog channel, according to Kennamer.

In order to receive the digital programming, three key pieces of equipment have to be purchased from General Instrument, which holds the patents on the DigiCipher II technology TCI has chosen to implement.

The first is a new Ku-band satellite dish that has to "see" Hughes' Galaxy VII satellite. Then, for each transponder, one "integrated receiver/transcoder" has to be deployed. This unit does most of the work. Its output goes directly to the "C6U" upconvertor, the output of which goes into the cable system's combiner and out over the network.

In addition, one "data collector" is needed if TCI performs the actual addressing and controlling functions. The data collector is essentially a "remote client" that polls each box and reports purchase information to the central host computer. If the cable operator chooses to retain control of the set-top addressing and control function, he needs to deploy his own addressable controller.

But TCI is fully prepared to authorize any operator's set-tops–for a fee, of course. By rolling the functions of its old TCI Addressable Center into the HITS Operations Center, the company already addresses roughly 600,000 analog set-tops that populate 350 TCI systems. "We've rewritten all the software and went to new hardware" to do that, notes Kennamer.

Where's the set-top?

Obviously, the key component to the system is the set-top box itself. Plagued by manufacturing delays, the set-top has actually postponed the launch of the HITS service, much to the chagrin of TCI officials. "If the vendors would have brought product to market a year ago, HITS would have been up and running," notes Kennamer. Currently, TCI plans to take delivery of its first set-tops in the next few weeks, which it will use to test the entire system. Then, set-tops will roll out to real customers beginning in the third quarter of this year, signaling the true "launch" of HITS service.

After repeated delays and slipping schedules, this time, "The delays are behind us," Kennamer believes.

Part and parcel with all the delays has been a perception that HITS isn't ready to go yet, either. Nothing could be further from the truth, in the eyes of TCI. "We want people to understand we are real, even if we're not up and running yet," notes Kennamer.

While that remains to be seen, TCI is actively shopping the HITS service to other MSOs. The company already has "a lot" of letters of intent from several different operators that "represent a lot of subscribers," says Raynes. Affiliates are "chomping at the bit" and constantly asking when the set-tops will be ready for deployment, says Raynes. "They're very anxious and very excited about this."

One company that is keeping close tabs on HITS is InterMedia Partners, which plans to deploy the service a short time after it launches, according to Ken Wright, vice president of engineering for the MSO that is partially owned by TCI.

"It's a good way for us to launch a near-video-on-demand product for those who might switch to DSS," says Wright.

"We're glad someone has stepped forward so operators can compete" with DTH services, agrees Tom Jokerst, vice president of engineering at Charter Communications. "I think it's critical if we're going to hold our customer base–HITS is a way to do that."

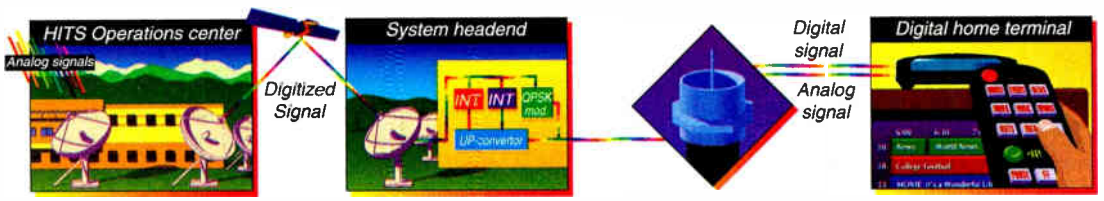
Indeed, many of the medium-sized MSOs are looking at HITS as a way to offer both NVOD and regional sports packages, much like DirecTv does now, which would slow the subscriber erosion that has already occurred. But at least one operator who runs several small, rural systems, believes HITS is a day late and a dollar short.

"It's two years late–and the industry's focus has changed," said one executive from a small operator who asked not to be named. He actually pointed to several downsides, including the cost of the set-top, the headend gear ("most of us wouldn't be adding 50 channels, so the cost per channel goes way up," he says) and the fact that there's no local flavor that comes with a national satellite service.

"HITS was originally conceived as a way to consolidate and eliminate headends, which would have saved us money," notes the executive. "But that hasn't panned out. If they went back to that original idea, that would be a good scenario."

Kennamer disagrees. "The economies of scale HITS brings are good for the entire

***How HITS works:** Signal delivery*



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Customer receives more choice, convenience and control.

With digital compression gear installed in the NDTC, TCI is ready to launch HITS.

industry," he says. "The only way digital compression makes (economic) sense is on a regional or national scale."

Education is key

As HITS moves closer to deployment, efforts have turned toward preparing and educating potential affiliates about the service–and about how life will change in the digital era.

Raynes believes TCI's test in Mt. Prospect has proven there's a customer appetite

"We're trying to get the industry prepared for this," notes Raynes. "Digital production is a whole new animal. It's an opportunity for operators to change the way they do business."

By that, Raynes means everyone–from installers to customer service representatives to the consumers themselves–needs to be educated about what the service offers and how it works.

To help that process, HITS has already hosted one day-and-a-half-long symposium on the subject and will likely host others. In addition, it will soon form an advisory board consisting of operator affiliates to help the launch go off–hopefully without a hitch.

Raynes believes TCI's "digital simulation" test in Mt. Prospect, Ill. has already proven there's a customer appetite for the type of programming HITS will offer. That test, which consisted of 60 channels of video, 24 of which were NVOD in format, resulted in buy rates nearly double of traditional pay-per-view, Raynes says. In addition, revenue per home increased dramatically, and the company was perceived to be better and more hi-tech, she says.

"But the education process is very important," she notes. "Installers have to be able to explain the service and make sure consumers understand it."

With HITS, TCI is "boldly going where no man has gone before." It just hopes someone is there when it gets to its destination. CED

Rogers: Canada's broadband veteran

Canadian MSO ahead of its time

By James Careless, Contributing Editor

When Rogers Cablesystems signed on its "Rogers WAVE" Internet access service last year, many people assumed that Canada's largest MSO was simply jumping on the digital bandwagon. However, Rogers and digital go back a long way: 22 years, to be exact.

So does Nick Hamilton-Piercy. He's watched cable's push into broadband from its infancy: first as director of engineering at Canadian Cablesystems Limited, a Toronto-based company, and then as senior vice president of engineering and technology at Rogers, after it bought out Canadian Cablesystems in the late '70s.

"At that time the first fad was bi-directional, two-way cable systems," recalls Hamilton-Piercy. "The FCC had made some indications it wanted cable plant to be two-way capable, and people started having the vision of what they called the 'global wired village,' and were saying 'how can we use this two-way cable to generate new revenue?' "

Broadband research in Canada

To answer some of those questions, Rogers, Canadian Cablesystems, Premier Cablevision and a number of other cable companies formed the Broadband Communications Networks (BCN) consortium in 1974. The group's goal? To test the potential of interactive broadband communications in an age when home computers were unknown, and the only way to produce digital television was to replicate multiple analog signals.

Using a small, hand-built, home-based text terminal, BCN began to experiment with interactive communications at the Canadian Cablesystems plant in London, Ontario. This system was chosen because it had been rebuilt to handle two-way communications over coax, at a whopping bandwidth of 300 MHz.

Of course, because this was 1974, the potential for delivering video games was quite limited. After all, "even Pong hadn't been invented then," says Hamilton-Piercy.

Hence the sort of interactive video games envisaged for BCN's test network were "ones where the customers could react to certain television images." Other options being considered were a "multichannel on-demand music" service, plus in-home monitoring.

"As far as communications was concerned, it was ASCII text communications from the home back into the cable plant and back again," he says. "Remember, there were no home computers, so it was all dedicated terminals. That was really the start of moving from plain old cable TV to a broadband network."

Rogers' next major foray into broadband research–again as part of BCN–came in 1979, when engineers started looking at a radical new concept: fiber optic transmission.

"The BCN group had heard about fiber optics and wanted to see how it fit in the Canadian cable environment," says Hamilton-Piercy. "So we built about a 10-kilometer digital fiber optic video link in London, Ontario, which was probably the first in North America, running at 322 Megabits per second. This had a number of digital video signals being transported from the hub to the headend."

The project wasn't cheap: "a million dollars plus," to be exact, with the funds coming from the consortium members. But the knowledge gained was priceless, even if–for the time–it wasn't very helpful.

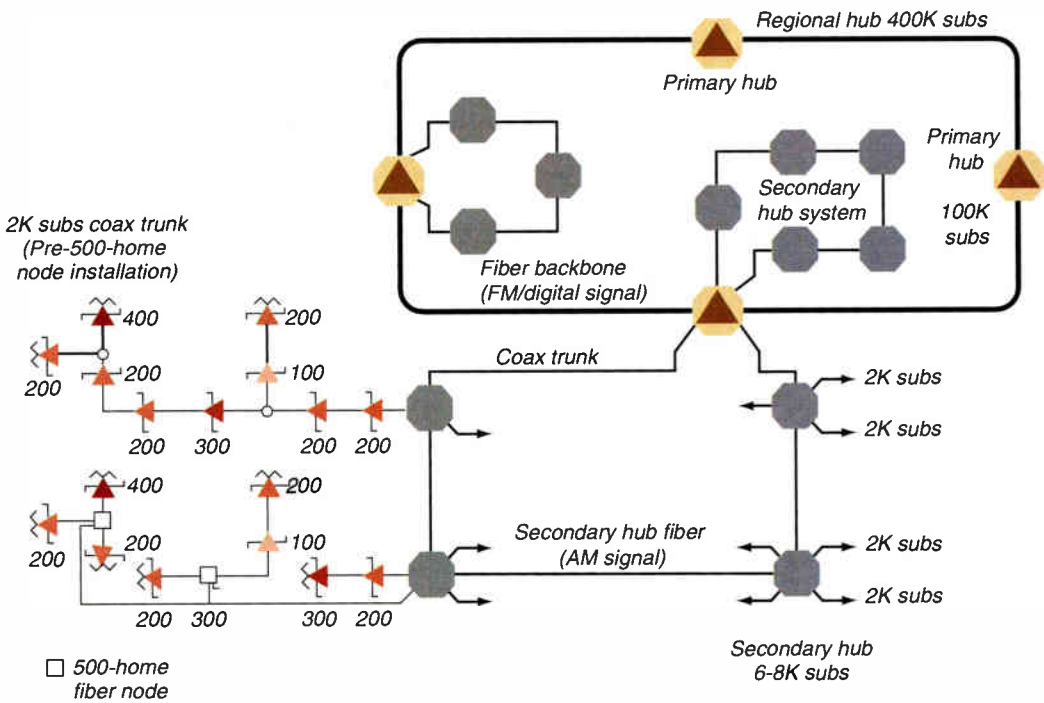
That's because "things weren't quite ready yet," says Hamilton-Piercy. "The technology was a little bit too early" for cable to consider deploying the overly-sensitive, highly expensive fiber optic cable that was available at the time.

The result was that "the project taught us a lot of lessons, and then was just put on hold," says Hamilton-Piercy. Rogers wouldn't return to fiber optics for another decade, when construction of its fiber optic distribution network began in earnest.

An early stab at information services

With fiber optics on the back burner, Rogers began to experiment with interactive information services in the early '80s, using a now-forgotten technology called "Telidon." At the time, Telidon was a Canadian technology her-

Figure 1: *Rogers fiber network architecture*



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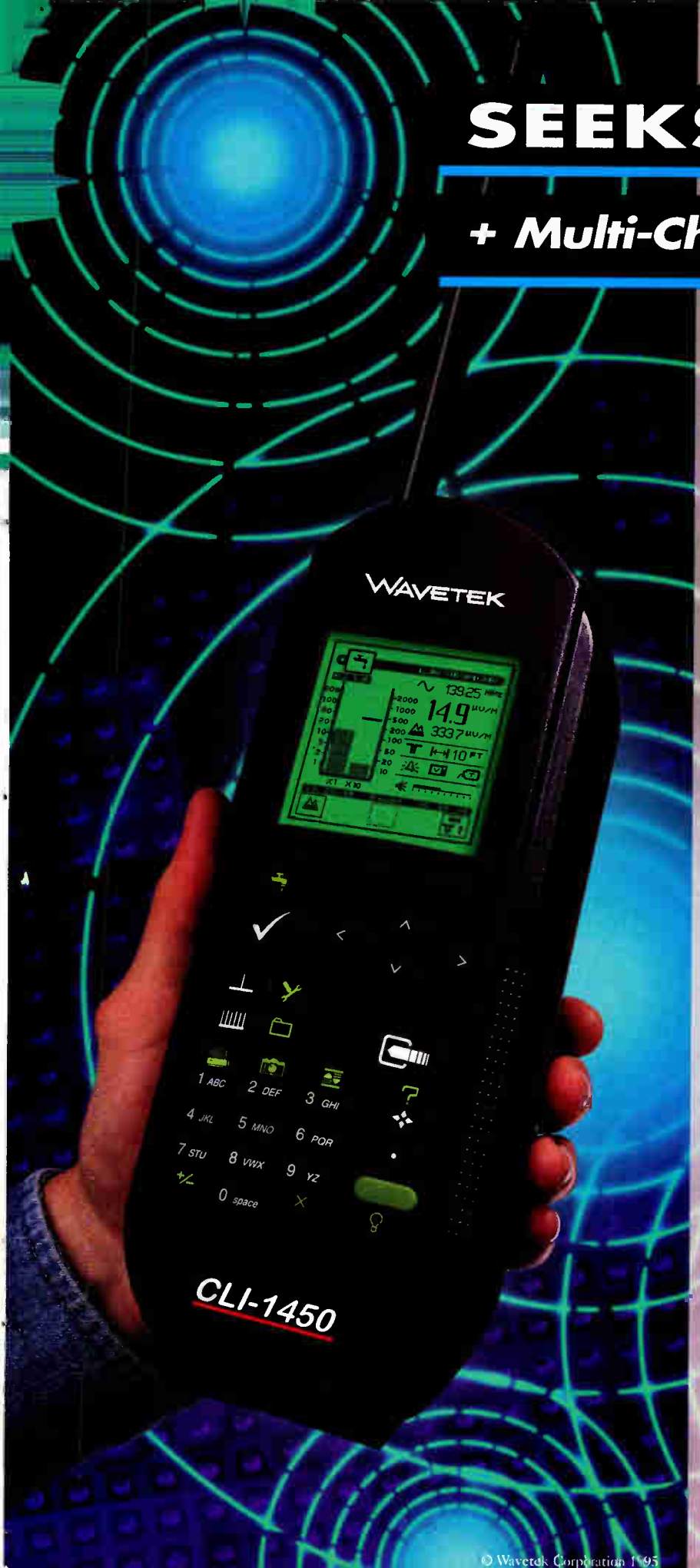

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The Rogers Interactive System was first deployed at the time of the 1980 Canadian federal election.

alded as the wave of the future. It was essentially a graphics-driven information text system–crude by today's standards, but extremely colorful–which was supposed to put on-line information in the hands of the general public.

Rogers actually rolled Telidon out in several of its systems–including Toronto–where it was used as an attractive alternative to the classic headend character generator. In Portland, Ore., it was used as a "true" interactive information service in conjunction with two-way cable, but the results of this application were mixed.

One major roadblock was Telidon's pricetag. Because the decoders were expensive, they were not installed in every home. Instead, Rogers engineers altered the network architecture by moving the decoder outdoors to the pole, allowing customers to share that decoder remotely from their homes.

As with fiber optics, Rogers was just too far ahead of its time. Although it was heading in the right direction, the technology just wasn't up to the challenge. Within a few years, the Telidon experiment was dropped.

"People realized that the terminals were too expensive, and they weren't prepared to pay sufficient monthly fees for renting them," he says. "And because the World Wide Web hadn't been invented at that time, there was not really that much content for people to access anyway."

However, the experience wasn't a total waste. Rogers learned a lot from Telidon, which some of its engineering staff put to good use when it helped develop hardware for the JC Penney Interactive Network in 1984. "Telaction," as it was known, was an at-home electronic shopping service. The pole-mounted hardware stored the product images, which could be viewed in the home via the cable connection.

During its foray into the United States, Rogers needed something different to set it apart during the "franchising wars" of the early 1980s. To acquire this edge, it set its engineers to the task of developing inexpensive, yet fully functional two-way cable technology.

The result? While Warner Cable had its interactive "Qube" system, Rogers came up with a less expensive but equally effective format known as the "Rogers Interactive System."

RIS was first deployed in London, Ontario at the time of the 1980 Canadian federal election.

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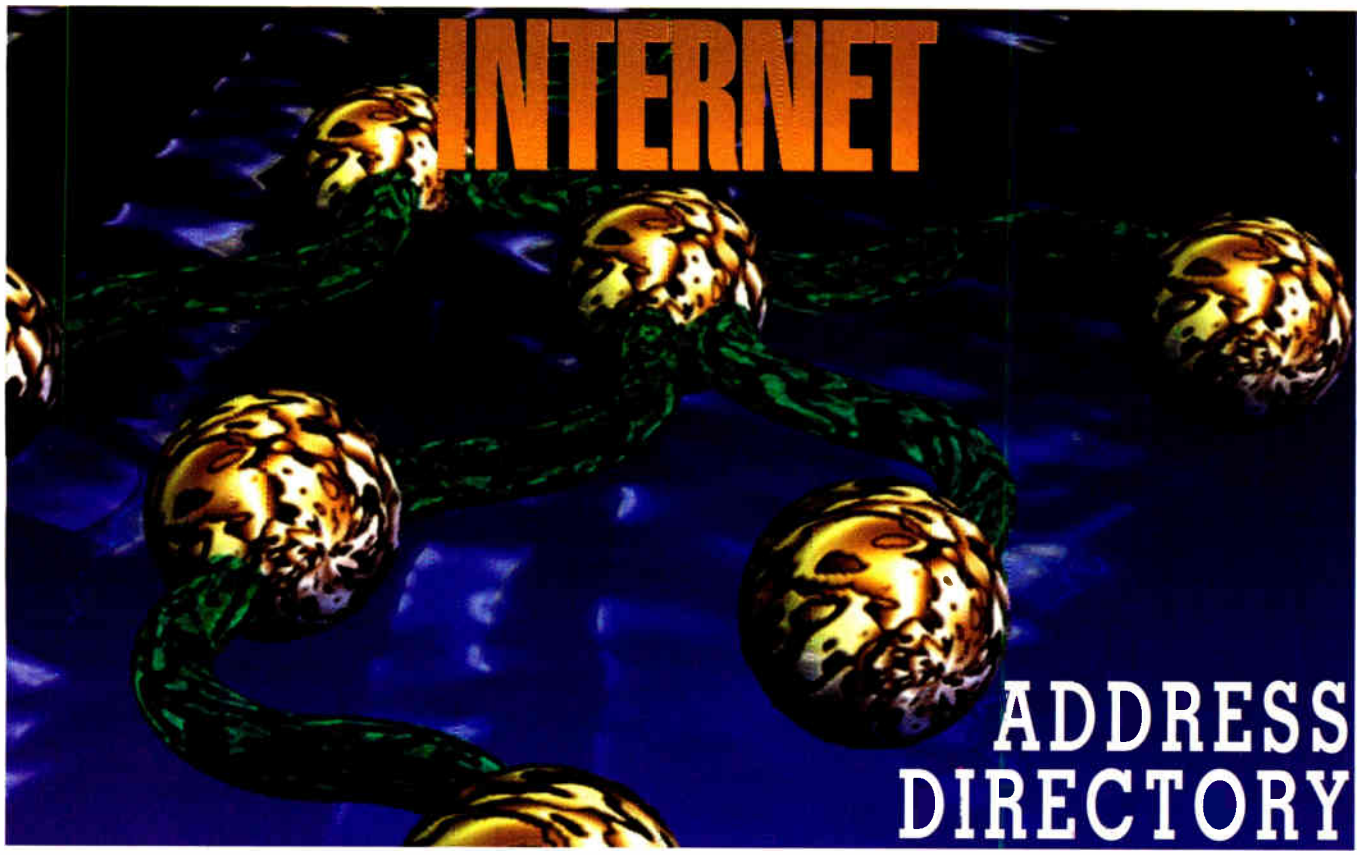

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CED

In a stunning public demonstration, 500 homes equipped with real-time interactive terminals cast their "ballots," which were then relayed live to the Canadian Broadcasting Corporation's TV election broadcast, and compared with the national popular vote. This demonstration was totally successful and put Rogers on the path to true, interactive television.

Eventually, Rogers Interactive System was widely deployed in Syracuse, N.Y.; Portland, Ore.; Minneapolis, Minn.; and parts of California. All told, Rogers gained substantial two-way experience by running thousands of miles of two-way plant, and supporting tens of thousands of in-home interactive terminals.

In addition, the company used its U.S. franchises in San Antonio, Minneapolis and Portland to move even further into two-way cable.

Specifically, Rogers worked with Zenith in developing real-time "impulse pay-per-view."

In fact, "Rogers was the first customer of the Zenith Z-Tac and Z-View system," says Hamilton-Piercy. And even though Rogers has since sold its U.S. properties, "I think it's still running."

As the '80s came to a close, Rogers finished building its U.S. properties, and was once more turning its attention back to Canada.

After conducting customer surveys, the company discovered that–after channel selection–the quality subscribers were most concerned with was reliability, says Hamilton-Piercy.

"So we said 'let's make sure the service doesn't go off. But if it does go off at all, it very quickly comes back up again.' The only way we could achieve that was [with] fiber optics."

But if the company simply replaced the existing coaxial cable with fiber and yet replicated the tree-and-branch architecture, it was setting itself up for continued customer satisfaction problems. After all, if it did fail, it would still take two to three hours to fix. "We said, 'that's intolerable, so let's make sure we have alternative routes getting to our customers,' which is why the rings got developed," says Hamilton-Piercy.

Hamilton-Piercy

These fiber rings are probably Rogers' most significant contribution to cable technology. In its simplest terms, the ring describes a circular network, rather than a tree-and-branch or hub-and-spoke design. In this design, the cable company actually has two connections to the network–because it's part of the ring–rather than one. (The Rogers design calls for a primary ring, which connects to secondary rings serving areas of 8,000 to 10,000 homes.)

The elegance of this solution to service failures is clear: should one area be isolated because of a line breakage in one direction, signals are automatically rerouted to it by sending them through the other connection, in the opposite direction. Automatic rerouting is facilitated because the system is two-way, allowing interactive status monitoring throughout the network.

Because they offer so much capacity, Rogers' fiber rings are also used for other purposes, such as providing private network data services (at T-1 to T-3 data rates) to large corporations, and cellular traffic carriage for Rogers CANTEL, the telephone company also owned by Rogers.

Today, Rogers has built 750 MHz two-way fiber rings throughout its Canadian operations,

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In a RIS demo, 500 homes electronically cast their ballots, which were sent to the CBC's election broadcast.

all offering fully redundant transmission paths to subscribers. The company is currently upgrading its 550 MHz coaxial distribution network to 625 MHz, says Hamilton-Piercy.

"It gives you 79 channels of analog–500 MHz–and then you have the rest of the spectrum for digital compressed signals and things like that. That way, we can have a coexistence of analog and digital signals quite satisfactorily," he notes.

Not surprisingly, the invention of the fiber ring has been applauded throughout the industry. Asked how it came about, he says, "It's one of these things where you get a group of engineers together and a white board, and it just happened. I got a citation from the NCTA, the Vanguard Award for Science and Technology 1992, but I'd say it was a team effort."

Launched on November 28, 1995, in the test community of Newmarket, Ontario (north of Toronto), Rogers WAVE is the most noticeable of the company's broadband products–one it's been working toward for the past few years. WAVE offers subscribers unlimited two-way Internet access at a speed of 500 kilobits per second (initially with Zenith cable modems), for a monthly rate of $C39.95 ($U.S.29.60). (The company has also established a site on the World Wide Web, at http://www.rogers.com.)

However, Rogers isn't just interested in the home subscriber market. Since May 1994, it has also been operating "Rogers WAVE @school," which is designed to provide Canadian schools with a 4 Mbps connection into the Internet, plus access to CD-ROM libraries housed at the company's headend. "Rogers WAVE @school brings technology alive in the classroom," says Rogers Cablesystems President and CEO Colin Watson, "and gives students and teachers highly sophisticated information services in seconds."

Currently being offered to a limited number of institutions in London, Ottawa, Vancouver and Toronto, @school will eventually be tied into 600 schools nationwide.

Rogers' other major broadband service project is "Rogers WAVE @work." Essentially, it's an application of the WAVE network for telecommuters who need high-speed communications to their headquarters. To date, the company has tested the system in cooperation with IBM Canada, which already has 1,100 employees working "by wire" outside of the office. The success of that trial is one reason Rogers decided to roll out WAVE commercially at the end of last year.

Rogers is still getting its feet wet in the consumer broadband market. Rogers WAVE, for instance, is still only available in Newmarket (subscriber base 16,000).

So far, only about 400 subscribers have signed up, but it's a number that thrills Nick Hamilton-Piercy, because it's twice what the company had expected to this point. As the company gains more expertise, more of its systems will "catch the WAVE."

"We may be enabling about 50,000 customers out this year, and then next year [will] be the real market push," says Hamilton-Piercy.

When that happens in 1997, Rogers will finish a task it started in 1974, namely, realizing the potential of broadband to generate new services and new revenues for cable. And make no mistake, those revenues are important: in fact, Hamilton-Piercy sees them eventually making up one-half of Rogers' income.

That's quite a payback for a technology that was once just an experimental curiosity. But it's a fair return, given Rogers' investment in broadband over the years. CED

About the author

James Careless is a freelance communications writer based in Canada.

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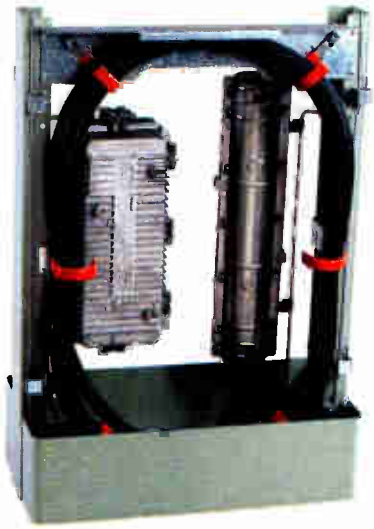

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HFC centralized powering: A unique approach

The SNET system ensures reliability

By Duane Elms, Director of Advanced Systems, Southern New England Telephone, and Tom Osterman, President, Comm/net Systems Inc.

Powering of hybrid fiber/coax systems remains a topic of much debate and discussion in the industry today. Operators are faced with the requirements of system reliability, concern about competition, constraints on capital and operating costs and the need to solve the powering dilemma as quickly as possible.

This article describes a unique centralized powering approach that is currently being deployed by Southern New England Telephone (SNET) for its HFC system.

Network requirements

While Connecticut, SNET's service area, was one of the first states to embrace competition in communications, the SNET upgrade has been driven more by cost, quality, growth and service issues rather than as a response to any particular competitive threat.

After evaluating all the available technologies, SNET engineers chose hybrid fiber/coax as the solution that most nearly met all of SNET's requirements.

In some ways, Connecticut can be considered a mature state, particularly in its development of useful land. Many Connecticut towns boast fiercely defended historical sections and high-value neighborhoods. This is particularly true in coastal areas. Connecticut's rocky nature limits underground development as well. As a result, more than 80 percent of SNET's plant is aerial.

The widespread deployment of fiber brings with it many challenges, not the least of which is power. Unlike conventional telephony, which provides a metallic conductor from the central office to the home, the HFC system uses optical fiber to carry information from a central location to remote distribution networks. These distribution networks contain optical-to-electrical conversion electronics, signal amplifiers, telephony support electronics and coax. The electronic elements require power–reliable power. SNET's approach to deploying HFC uses nodes that are intended to support about 200 homes. This means that there are powering requirements for about 10,000 locations across the entire state.

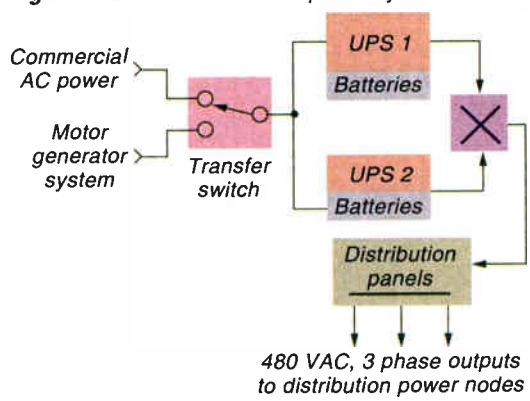
In addition to the sheer quantity, SNET engineers faced other challenges.

Powering requirements

Some of these other challenges included:

✔ Reliability–power was allocated a reliability requirement that translated into no more than five minutes of down-time per line per year statewide, resulting from power-related outages.

Figure 1: SNET central office power system



✔ Siting–rights-of-way for installing powering systems are simply unavailable in most of Connecticut's towns. When looking for locations to power an early trial, SNET was unable to even obtain rights-of-way along existing train tracks.

✔ Cost–powering costs, both deployment and operation, could not be allowed to change the overall economic justifications of HFC deployment.

More traditional distributed powering approaches generally place a power system at each fiber node. Examples of such systems include utility-based cable TV powering augmented with some nominal battery back-up, or larger power nodes using both battery and motor/generator back-up.

While the distributed approach is conceptually simple, makes efficient use of utility power and minimizes failure group size, an analysis of the situation convinced SNET engineers that in fact, neither of these approaches was feasible. Even if siting could be found, neither approach provided the reliability or maintenance characteristics required.

View of the various cable types used in the construction of the overall system. From the left, the cables are: six conductor branch cable with innerduct used for side branches, two conductor branch composite cable used for single node branches, 2/0 copper CLX used in underground ducts, 4/0 copper CLX used in underground ducts and nine conductor feeder cable used in primary aerial backbone.

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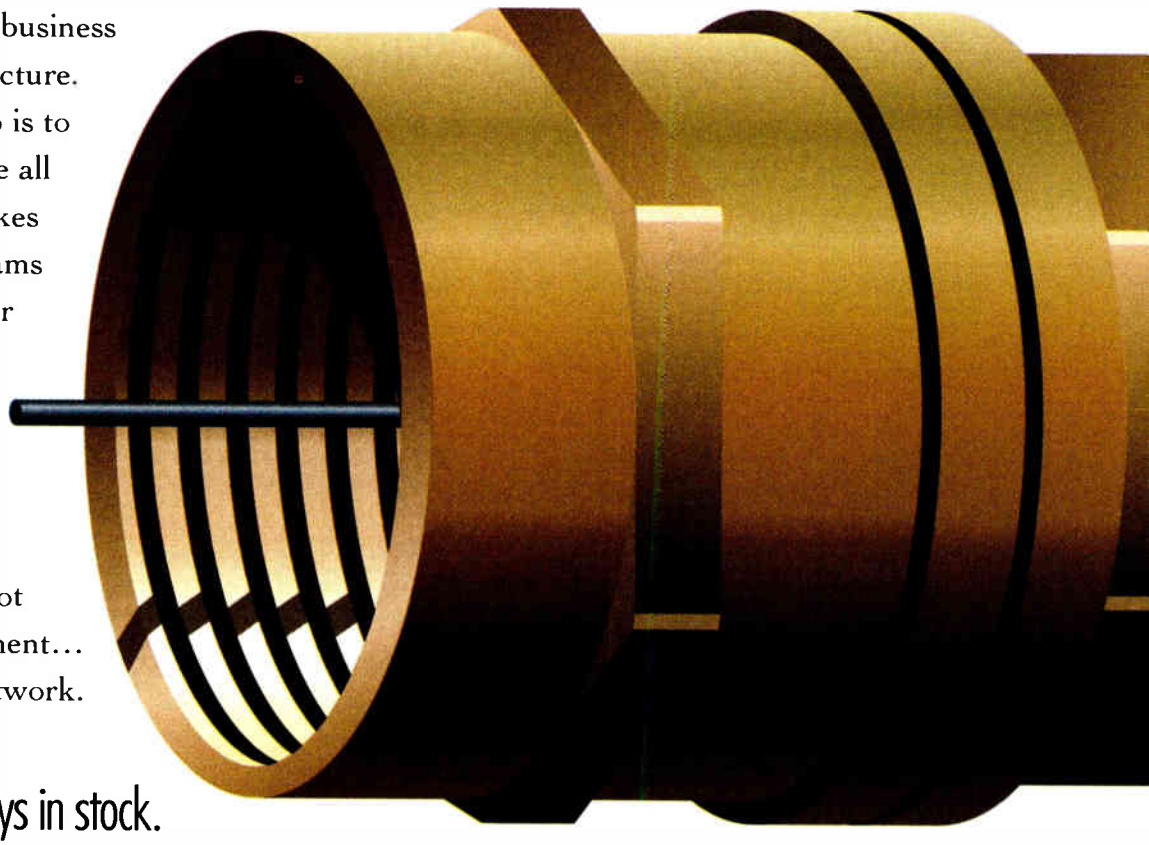

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Decision to deploy centralized power

After considerable review of existing powering approaches and in light of the difficulties unique to the Connecticut service area, SNET began to consider a centrally based powering architecture. Such architectures generally place larger power systems at centralized locations and distribute power to many nodes. The advantages of such a system include:

✔ Relatively inexpensive reliable power nodes in the distribution area

✔ Reduced problems with siting and right-of-way due to smaller housings

✔ Simplified maintenance (no batteries and motor/generators in the field)

✔ Economies of scale in large UPS systems for the central office

✔ Availability of standard components (UPS, generators, etc.).

There are, of course, some difficulties with feeding power from a central location to a large distribution area, including:

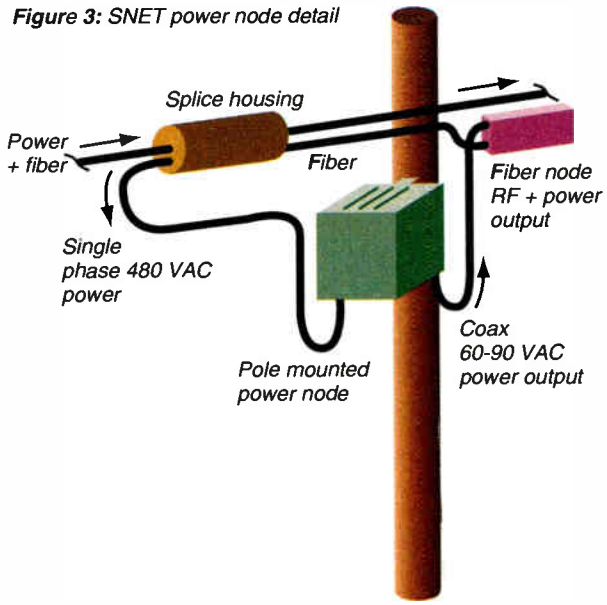
✔ Higher voltages must be used to achieve reasonable efficiencies when distributing power for longer distances.

✔ The power distribution system must be constructed with the power source at the central office, a transmission conductor system and a distribution interface device.

✔ On the average, a larger failure group can be expected due to the multiple powering feeds from the CO to the distribution areas. Good engineering can overcome most of these problems. Deployment of redundant UPS and back-up generators at the CO provide high reliability at the central power site.

This centralized approach, if implemented correctly, could prove to provide higher reliability than distributed approaches. Operators are well aware that distributed powering systems will not be practical if no acceptable sites can be found for the power node installations.

Figure 3: SNET power node detail



SNET network architecture

The new SNET HFC network is intended to be a highly reliable full service network. It is designed to carry traditional telephony along with data, analog and digital video, and special services. The network addresses the telephony needs of both residential and business customers and is expected to meet or exceed the reliability requirements associated with telephony. Telephone reliability is measured in minutes of downtime per line per year, and the normal target for a large system is roughly 53 minutes, or a reliability of 99.99 percent. Power, of course, is only allocated a small portion of this, typically five minutes per line per year, or 99.999 percent.

Currently, HFC equipment requires considerably more power than that consumed by traditional telephony equipment. SNET's coax sub-nets require between 500 watts and three kilowatts of continuous power. This means that a typical central office that supports 30,000 lines is faced with supplying an additional 300 kilowatts of power at the node. The phrase "at the node" is important because there are a number of sources of loss between the utility service at the central office and the power inserter at the fiber node.

Sources of loss include:

✔ Power factor of the UPS inputs–today's systems can typically achieve an input efficiency of 93 percent by the use of harmonic filters.

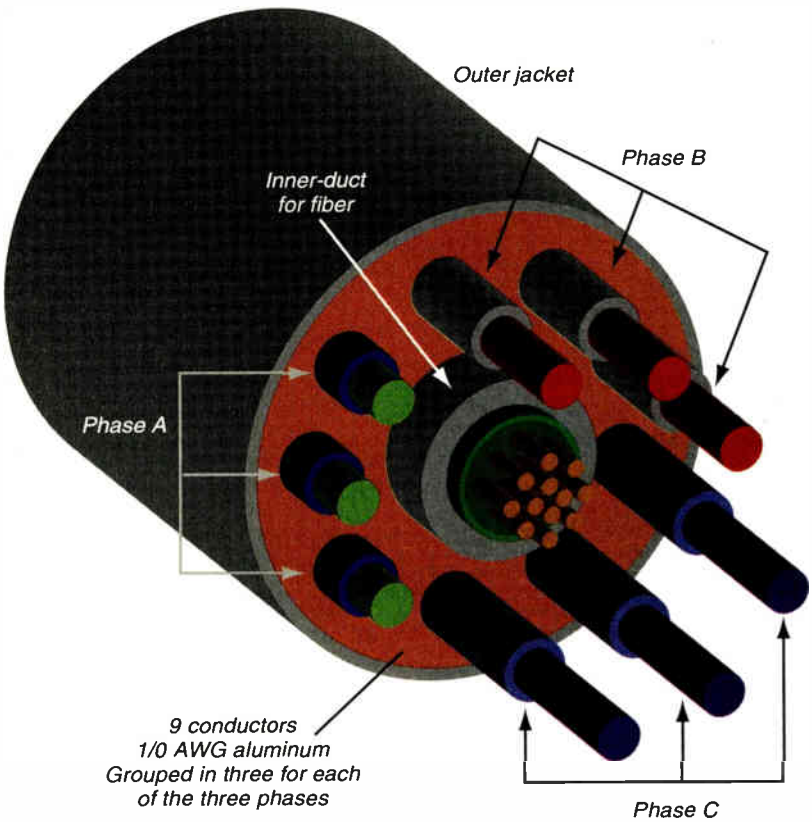
✔ Losses in the UPS systems–typically resulting in 90 percent UPS efficiencies.

✔ IR losses in the distribution system–limited by design to < 20 percent.

✔ Power factor losses in the distribution system–currently not measurable, but anticipated to be no more than a few percent.

✔ Losses in the power node–limited to about 6 percent through the use of a reliable and efficient controlled ferroresonant transformer system.

Figure 2: SNET hybrid fiber and power cable cross-section view



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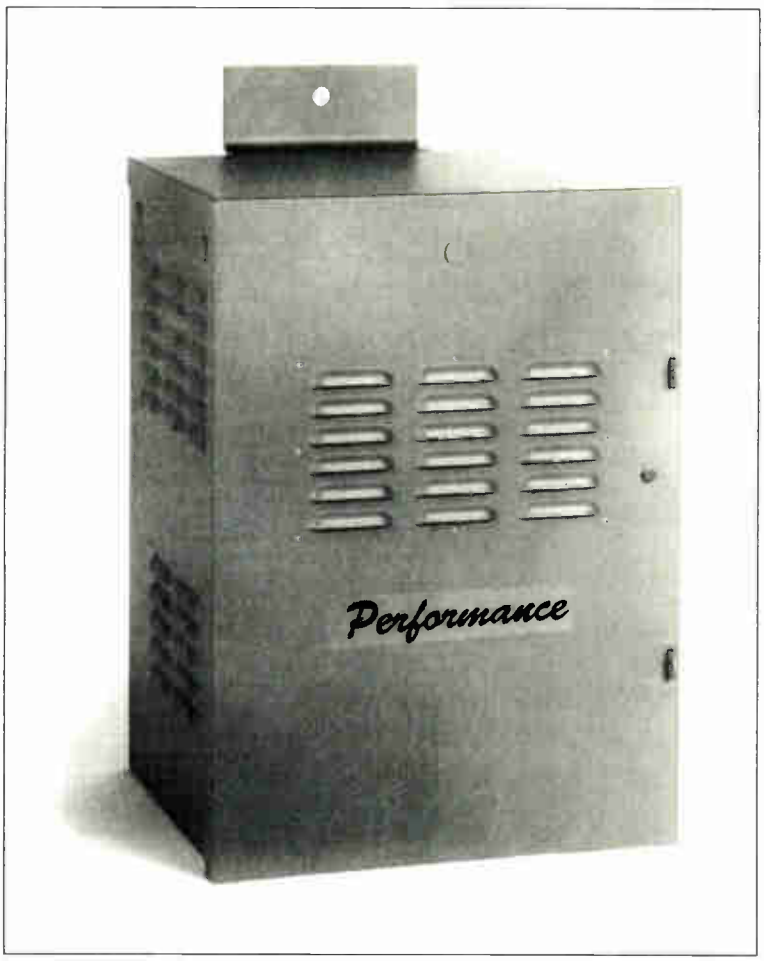

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Interior view of the pole-mounted power node designed by Comm/Net Systems. It shows the dead-front design along with the removable transformer module and circuit breakers.

Total efficiency is the product of all the contributing efficiencies. Multiplying the above efficiencies together results in an overall efficiency of about 65 percent, which means that the central office is required to provide the capacity of roughly 450 kilowatts.

Central office powering system

A reliable centralized powering system requires a highly reliable central power supply. Fortunately, within telephone companies, reliable central office powering is a well developed technology. Extending or replicating existing central office systems with redundant parallel UPS systems backed up by batteries and redundant motor generator sets can provide such reliable systems. Many of the components required in these new central office systems are catalog items. Modern high voltage AC UPS units are available from a number of quality suppliers, as are batteries, switchgear and motor/generator sets.

While space considerations, building configurations and total central office service requirements must be taken into account, upgrade of a central office to support a distributed powering system is a fairly easy undertaking with commonly available power equipment. (See Figure 1, page 72.)

The SNET power and fiber hybrid cable

The SNET communication cable is a hybrid cable combining fiber with the metallic conductors designed to transport the central office power. The main cable is constructed with an annular ring of conductors surrounding a central conduit through which fiber is pulled, completing the construction of the cable. The cable has a steel sheath covered by 110 mils of polyethylene insulation into which is embedded three colored longitudinal stripes.

The primary version of this cable contains nine 1/0 aluminum conductors which can be evenly allocated to the three power phases. When arranged in this way, the cable exhibits a nominal resistance of 0.067 ohms per kilofoot per phase. For branches off the main distribution lines, a similar but smaller cable has been developed that exhibits a resistance of 0.169 ohms per kilofoot. (See Figure 2 on page 74.)

Splice case, termination, distribution

There were a number of splicing issues to be overcome in designing the construction of the power system. With the fiber incorporated into the hybrid cable, provisions needed to be made to allow fiber splicing without exposure to power, and the hybrid cable is designed to allow exactly that. Using conventional splice enclosures, splices can be configured that allow fiber splicing to be done outside the enclosure containing any power splicing.

This is accomplished by allowing the central ducts containing the fiber cable to exit the power splice cases independently. Because slack for the fiber can be pulled when the fiber is installed in the cable, there is no need to modify the fiber splicing procedures. A number of splice configurations have been documented, allowing a variety of branch and through splices to be implemented.

Distribution power node design

The power node contains a number of specific features, including:

✔ Configuration. Pole mount housing with input voltage termination and four output feeders. Integral power transformer, interconnections, service bypass system.

✔ Safety. As with all aspects of this system, consideration for safety was paramount in the design of the power node. A dead front design was required and was achieved through the judicious use of barriers. Disconnects for the input power and breakers for the four output circuits were also provided.

The power node includes provisions for bypassing the internal transformer with no service break

Other safety features include: double isolation of input voltage section, single point ground and neutral bond point, input power disconnect with "lock out–tag out" provision and proper environmental protection.

✔ Reliable and efficient design. The power node is based upon a controlled ferroresonant transformer design with multiple input and output taps. The input taps allow the node to be powered from either the central office or the local utility secondaries. The output taps provide 60-, 75- and 90-volt, quasi square-wave, 60-Hz outputs that can be selected based on local conditions such as coax size, distance and voltage drop, etc. The 75-volt tap provides the opportunity to supply large rural coax networks in 60-volt builds. The controlled ferro was selected because of its high efficiency, high reliability and wide range of operating parameters. Because of the limited number of components and lack of any active semiconductor devices, MTBF is calculated to exceed 200,000 hours.

✔ Field service and maintenance bypass. The power node allows field maintenance by including provisions for bypassing the internal transformer with no service break. Manual switch gear allows a "make before break" transition after phase synchronization with an auxiliary truck-mounted inverter system. Once this transition is achieved, the transformer module in the power node can be disconnected and

repaired or replaced. After re-synchronization, the transition can be reversed with no loss of service.

This is a significant feature that compensates for the non-standby design of the distribution power node and operation with the strict outage limits of a broadband telephony system.

Powering amps, NIUs and telephony gear

Although there has been much discussion around what type of power should be provided down the coax to the RF amplifiers, fiber nodes, network interface units and telephony equipment, SNET selected conventional 60- and 90-volt, 60-Hz, quasi square-wave power.

This approach has a proven history of operating well with most active devices in the coax distribution networks. In addition, there is a proven long-term track record regarding corrosion activity of 60-Hz systems (unlike some of the newer low frequency designs).

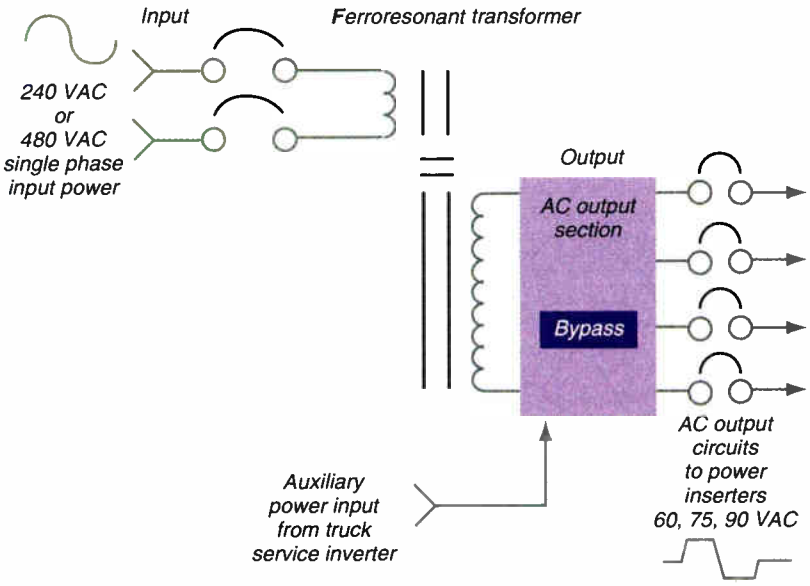
By using line frequency powering, power is easily and reliably derived from the higher voltage AC transmission conductors and is provided to the power nodes from the central source. In its simplest form, all that is required in the power node is a ferroresonant transformer.

Powering network stability and margin

There are many issues associated with any powering solution. Irrespective of the source of power, the power system must supply enough current to handle in-rush conditions at start-up and maintain a stable operating environment. In many designs, this is far from trivial.

A Bellcore study, performed at the request of SNET, modeled a typical large distribution network and power node. The actual input circuits of the active devices were included in the model which demonstrated that certain designs can fail under start-up conditions. For this reason, the power nodes are designed with considerable headroom in their operating parameters.

Figure 4: SNET power node system



As previously mentioned, there are losses associated with the transmission of power. In order to minimize these loses, the total voltage drop in a feeder network is limited to 80 volts, meaning that the lowest voltage that a power node will see is 400 VAC. The power node will regulate well below this value, so there is adequate headroom built into the basic design.

While up to 20 percent IR loss is allowed for a given distribution run, these runs are typically designed for less than 10 percent loss.

Southern New England Telephone did not want the powering system to be the weak link in the service chain. With redundant UPS systems in the central office, a strong distribution cable construction, a simple, robust power node and the ability to perform preventive maintenance on virtually all components of the system, it is expected that power will be the most reliable of the hybrid fiber/coax system elements.

Summary

Unique requirements demand a unique solution. Individually, none of the challenges faced by SNET in the implementation of its HFC system is unique. Still, the combination of requirements, environment, reliability, cost, siting, etc., present a real challenge to system powering. This new system is seen as a serious solution to a unique and challenging problem.

Reliability of HFC powering is very important. While there are a number of other approaches to powering HFC systems, none seem to provide the reliability of this approach. SNET's customers expect and demand a reliable phone system. In addition, the company expects to differentiate its other communications and entertainment offerings with superior reliability. From both a business and public trust point of view, reliability is something on which it cannot compromise.

Could this system be used by other networks? The situation for others may be different. It may be easier in some locations to obtain the sites and permits necessary to install self-contained power nodes. Ambient weather conditions may be such that batteries in the outside plant become less of a maintenance issue.

Natural gas may be widely available to power motor/generator sets. On the other hand, these and other issues may continue to dog fiber installations to the extent that some of the ideas and techniques presented here may be of use to others.

In any case, there is now a new approach available for others to consider. System designers can weigh the advantages of reliability, low maintenance and economies of scale with the disadvantages of higher utility costs and larger average failure group size inherent in this approach. Perhaps variants of the centralized power approach using different voltages and other transmission conductors could be considered. CED

Author's note: Currently, SNET is running a trial of its HFC telephony technology which is being powered by the approach described in this article. To date, the system has survived the Blizzard of '96 and six months of some of the most "interesting" Connecticut weather in years.

About the authors

Duane Elms is a director at SNET responsible for, among other things, developing the powering approach for SNET's HFC system. Tom Osterman is president of Comm/net Systems Inc., a broadband power system integrator, distributor and engineering consulting firm, and CEO of Millennium Power Inc., a power conversion system manufacturer.

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When will advanced television get off the ground?

Numerous factions are holding HDTV down

By Dana Cervenka

Consumers might be able to go down to their local electronics superstore to buy an HDTV set by the middle or end of 1997. And then again, they might not.

A number of political, technical, regulatory and legislative issues have helped to impede the launch of high definition television since U.S. broadcasters first became interested in the technology in the 1980s. Now part of a larger regulatory proceeding known as "advanced television (ATV)," HDTV is just one of the services in the ATV family, which includes "any television technology that provides improved audio and video quality or enhances the current NTSC television system," according to the Commission. ATV thus includes HDTV, standard definition television (SDTV) and a host of other services that are being proposed.

The holdups

To start with recent history, the FCC Advisory Committee on Advanced Television Service made its recommendations to the Commission in November of last year, essentially basing its characterization on the digital Grand Alliance system (see "Advanced Television–Final System Selection," in *SPECS International*, published by CableLabs, Feb./March '96). In December, the FCC invited experts and industry leaders to testify before the commissioners to expand the body of available information.

GI's Bob Rast

But after the hearings, the government closed down because of lack of funding, and the Blizzard of '96 hit Washington. And in the meantime, the issue of spectrum auctions for advanced television reared its head. Initially, broadcasters were to be assigned a second channel at no cost that was to be used for the transmission of programming in the HDTV format, the same programming that they currently transmit in NTSC. After a transitional period, they would surrender their analog channel to the FCC. But many broadcasters have expressed a desire to keep that channel for other services, including the transmission of several channels of digital, SDTV; various data services; and even mobile communications services (see "Capital Currents, *CED*, July 1995, page 12).

Many members of Congress are against the idea of simply giving a second channel to broadcasters for HDTV. And, there are those who would like to see the channels auctioned off.

Legally, only Congress–not the FCC–can decide to auction the spectrum. The Commission can only auction off the allocation if it knows that it will be used for subscription services, and not "free" TV; therefore, it's practical for the FCC to wait and see what Congress does before it moves forward.

What's more, the FCC simply has more pressing regulatory concerns at the moment. When the Telecom Act was signed, the Commission suddenly had to add 80 new rulemakings to its "to-do" list, all of which have to be completed within specific time allotments. Digital television soon dropped down on the list.

Paul Misener, a spokesperson for the Advisory Committee on Advanced Television Service, predicts that if Congress does not authorize auctions, though, that the FCC could license ATV stations late this year, or early next.

Then there are the broadcasters themselves, who do not seem to be of one mind about advanced television. In its Fourth FNPRM and Third NOI, the Commission acknowledges that the transformation into ATV broadcasting presents a lot of practical difficulties for broadcasters. "Sources of financing may be limited and their willingness to support the conversion is unknown...Given the different aspect ratio for ATV as opposed to NTSC, new studio sets may have to be designed and constructed in order for stations to originate programming."

In fact, broadcasters have mixed feelings about the digital revolution. While the big players who own multiple stations see the need to switch to digital to remain competitive, the picture is not as clear to small market broadcasters who wonder where they'll find the money to go digital, and who ask themselves why they should split their market by, in essence, competing against themselves, selling multiple avails.

"There are some people in cable who have felt that when it got down to the wire, the broadcasters would find a way to fumble the

ILLUSTRATION BY ROB PUDIM

ball before they got it across the goal line," notes Bob Rast, vice president, technical business development for the GI Communications Division of General Instrument Corp. "In fairness, I think it's a combination of the broadcasters and politicians."

Implications for cable

One of the issues currently up in the air is the resolution of the must-carry rules in general, and more specifically, what will the must-carry rules be for advanced television? Right now, the Supreme Court is evaluating the constitutionality of the must-carry rules. If those rules do survive, it's not clear exactly which transmissions will qualify for carriage. Some have predicted that cable operators might have to add as many as 20 new channels just to accommodate broadcasters' HDTV transmissions. But that, says Saul Shapiro, assistant bureau chief for technology policy with the FCC's Mass Media Bureau, is unrealistic, in part, because by utilizing the Grand Alliance system over the cable medium, a bit rate that's twice as great as that which can be achieved on a 6 MHz broadcast channel can be realized.

"I think that the worst case scenario is a 50 percent increase on the current must-carry requirement," explains Shapiro.

While the Commission irons out the regulatory fabric, the members of the Grand Alliance continue to work out the compatibility wrinkles. Early last month, General Instrument announced that its digital MPEG-2 television system was in compliance with the Advanced Television Systems Committee (ATSC) System Information (SI) Standard. "The product that we are producing for use in cable and satellite environments incorporates the same system information as the ATSC broadcast standard provides," explains GI director of technical business development Paul Hearty. "So that enhances interoperation between off-air broadcast, satellite delivery–both for distribution and to the home–and cable delivery to the home." The system information is a critical part of the standard, as it supports both network management, as well as user navigation through the program stream. Essentially, the SI Standard "defines the transmission parameters needed by digital decoders to acquire and process both digital and analog transmissions," according to the company. GI also announced that it is contributing software extensions to the ATSC SI Standard "into the public domain on a royalty-free basis." Access to the ATSC SI Standard can be obtained via the ATSC World Wide Web page (http://www.atsc.org), while GI's SI extensions can be found at the company's own web page (http://www.gi.com).

For GI's part, "Ultimately, there will be one product line that will exist all the way from high definition down to standard definition," adds Hearty.

And then there are the questions of compatibility and timetables. As the FCC has recognized in its aforementioned FNPRM, what happens when digital broadcasts must be sent over cable systems that are still "entirely analog in their operations, are partially analog and partially digital, or that are entirely digital"? As the FCC notes, the scheduling problem has implications for equipment in the headend, the transmission plant and at the subscribers' premises.

Multiple standards

And then there's a larger standards issue. While DAVIC, a consortium of companies which are trying to come to a consensus on technical standards, has chosen QAM modulation for its digital cable standard, the Grand Alliance picked VSB for broadcast transmission. Misener, however, believes that won't really hurt consumers. "A dual-mode demodulator [in a TV set] means a minimal price difference to the consumer," he says.

No matter what the regulatory outcome, it's clear that HDTV will remain earthbound for a little longer. Cable operators, for their part, are not waiting. While HDTV struggles to launch, MSOs are busy shoring up their plants in preparation for digital signals. CED

(Editor's note: please see "HDTV" on page 82 for a further discussion of obstacles to digital services.)

HDTV and SDTV: Obstacles to implementation A progress update

By Lawrence W. Lockwood, Technology Correspondent, and President, TeleResources

Finally, after eight years, the Federal Communications Commission has received the Grand Alliance's set of HDTV and SDTV recommendations. The FCC refers to it as ATV (Advanced TV). (See Table 1 for the HDTV/SDTV recommendations.)

Part of the recommended standards is the controversial modulation method to be used in HDTV and SDTV transmission. The Grand Alliance stuck by its previous position that it should be VSB (vestigial sideband) modulation. However, QAM (quadrature amplitude modulation) has been endorsed for digital video transmission by both the International Telecommunications Union (ITU) and the Digital Audio-Visual Council (DAVIC), so many believe that the FCC will rule on VSB, but probably with some kind of wording that will include the option of using QAM if desired.

Table 1: Final Grand Alliance HDTV/SDTV recommendations to the FCC

	Active lines	Horizontal pixels	Aspect ratio		Picture rate				Square pixels
HDTV	1,080	1,920	16:9		60I		30P	24P	Yes
	720	1,280	16:9			60P	30P	24P	Yes
SDTV	480	704	4:3	16:9	60I	60P	30P	24P	No
	480	640	4:3		60I	60P	30P	24P	Yes

I = Interlaced scanning
P = Progressive scanning

Broadcasters and HDTV

However, broadcasters are pressing for uses for the HDTV channels other than transmission of HDTV. When HDTV was conceived as an analog system, the FCC proposed to set aside an extra 6-MHz channel for each proposed HDTV broadcaster. Now that the transmission in the ATV channel is going to be digital, this will allow for multiple streams or "multicasting" of standard definition television (SDTV), broadcast of literally dozens of CD-quality audio signals and the delivery of huge amounts of as yet unspecified data. The FCC defines "SDTV as a digital television system in which picture quality is approximately equivalent to the current NTSC television system." Broadcasters would like to be able to charge for some of these services.

This is ironic, because in the mid-'80s, the broadcasters, sensing mobile radio's covetous eyes on unused TV spectrum, began the campaign to reserve this spectrum for the magic new world of HDTV–which at that time, was hardly much more than a proposal by the Japanese. In 1987, the broadcasters persuaded the FCC to establish the Advisory Committee on Advanced Television Service ("Advisory Committee"), which is chaired by former FCC chairman Richard Wiley.

This approach seemed safe because at that time there was no HDTV ready for acceptance. Now, however, eight years later, there is an HDTV system ready and waiting for FCC acceptance.

Hewlett-Packard's Kayak digital set-top

This puts the broadcasters in the same uncomfortable position that they were in back in 1953 when the FCC accepted the NTSC color standards. It was a no-win situation–broadcasting in color was expensive, but no advertiser would pay extra because there was no audience–i.e. no volume of color sets–and viewers did not want to buy new receivers because there were no programs in color. And this was with a compatible system, i.e., viewers could receive color programs in black-and-white on their monochrome sets. Obviously, because HDTV is incompatible with NTSC, a transition will be even more difficult.

The solution to transitioning to color was provided by General David Sarnoff, chairman of RCA, and a big investor in the development of color. He wanted to sell RCA color sets, so he directed NBC (a subsidiary of RCA) to broadcast programming in color, with RCA picking up the extra color tab until it could grow to be self-supporting. Unfortunately, there is no HDTV equivalent to Sarnoff today.

Even the FCC commissioners have differing views on how to implement HDTV/SDTV. FCC Chairman Reed Hundt is opposed to any mandate of the use of the spectrum for HDTV, while commissioner James Quello has stated, "I am at this time inclined toward–requiring that the predominant use of the ATV spectrum be for free-over-the-air broadcasting and a two- to four-hour per day minimum HDTV requirement be imposed." Quello also said, "If broadcasters are allowed to use some of the capacity for nonbroadcast subscription service, broadcasters should pay reasonable spectrum fees." Commissioner Rachelle Chong said, "Should a broadcaster desire to use its new ATV spectrum for a primary purpose other than free broadcast, I would ask whether such spectrum should be returned to the government and relicensed to someone who is dedicated to the primary delivery of free broadcasting?"

Obstacles to the recommendations

A number of objections to the technology of the HDTV/SDTV recommendations have been presented to the FCC by organizations outside both the broadcast and cable TV businesses.

One such organization is the American Society of Cinematographers (ASC). ASC president Victor Kemper, in a letter to FCC chairman Hundt, said that the HDTV aspect ratio of 16:9 (1.78:1) is wrong–it should be 2:1. It is interesting to note that this comment comes from a business that has no single aspect ratio standard. Films are made in aspect ratios that vary from 16.65:9 to 21.6:9 (1.85:1 to 2.40:1).

Another organization is the Computer Industry Coalition on Advanced Television, led by Apple Computer Inc., whose members are Microsoft Corp., Intel Corp., Compaq Computer Corp., Hewlett-Packard Corp., Tandem Computers and Silicon Graphics Corp. The coalition, in testimony to the FCC, complains that the recommended standards are

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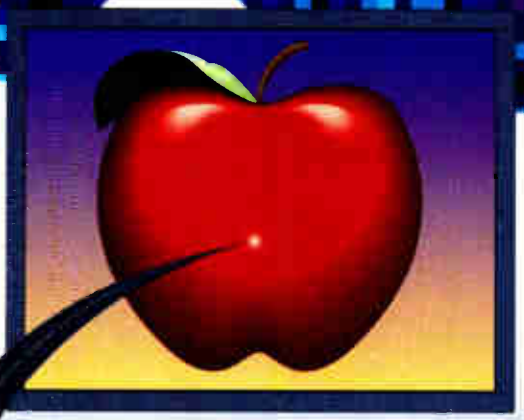

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not totally compatible with computer industry standards. This again is from an industry with multiple display standards, e.g. CGA, enhanced CGA, EGA, Hercules, VGA, super VGA and XGA. The coalition objected strenuously to any inclusion of interlaced scanning, stating that all scanning should be progressive. Square pixels were included in the ATV recommendations specifically to facilitate the capability of combining computer generated text and graphics with digital HDTV video. Grand Alliance members and FCC officials have indicated that the coalition is a Johnny-come-lately, saying that the PC industry had ample opportunity to shape the HDTV spec during an FCC advisory panel's three-year negotiations. However, coalition members have hinted that they will take their case to Congress if the FCC doesn't resolve the issue to their satisfaction.

Wiley (the advisory committee's chairman), in an article on the HDTV standards process published in the IEEE[1] wrote, "in order to accommodate the differing requirements of various affected industries, the Advisory Committee has continued to recommend a dual-scanning format for both HDTV and SDTV. Ultimately, of course, the Commission will be required to make a final decision on this thorny issue."

Table 2: Broadcom digital set-top cost estimates

Set-top box components	1995		1996 -1997	
	$	%	$	%
Memory + µP (7 Mbytes)	$105-170	26%	$85-95	37%
Transmission (tuner, equalizer, QAM demodulator, FEC, etc.)	$140-150	34%	$65-75 With the BCM3115	22%
MPEG decompression, graphics and encryption	$85-100	22%	$45-50	20%
Enclosure, power supply, assembly	$70-80	18%	$50-55	21%
Total cost	$400-450		$230-270	
Retail price @ 35%	$615-692		$350-415	

However, there is yet another obstacle to HDTV public acceptance. For the average viewer to really differentiate the current NTSC and an HDTV picture, and thus generate consumer demand for HDTV, the HDTV picture at the average home viewing distance must be much larger than the NTSC picture at that same distance (greater than twice the size). The required large size displays for the home that are practical and economical are not currently available. (See references 2, 3.)

SDTV digital set-tops

The chaos (technical and economic) surrounding HDTV pretty much ensures that HDTV will not be entering American homes in any numbers for some time yet. However, SDTV's immediate future looks much brighter. As a matter of fact, versions of SDTV are already in American homes, e.g. DirecTv, USSB, Primestar and the upcoming EchoStar.

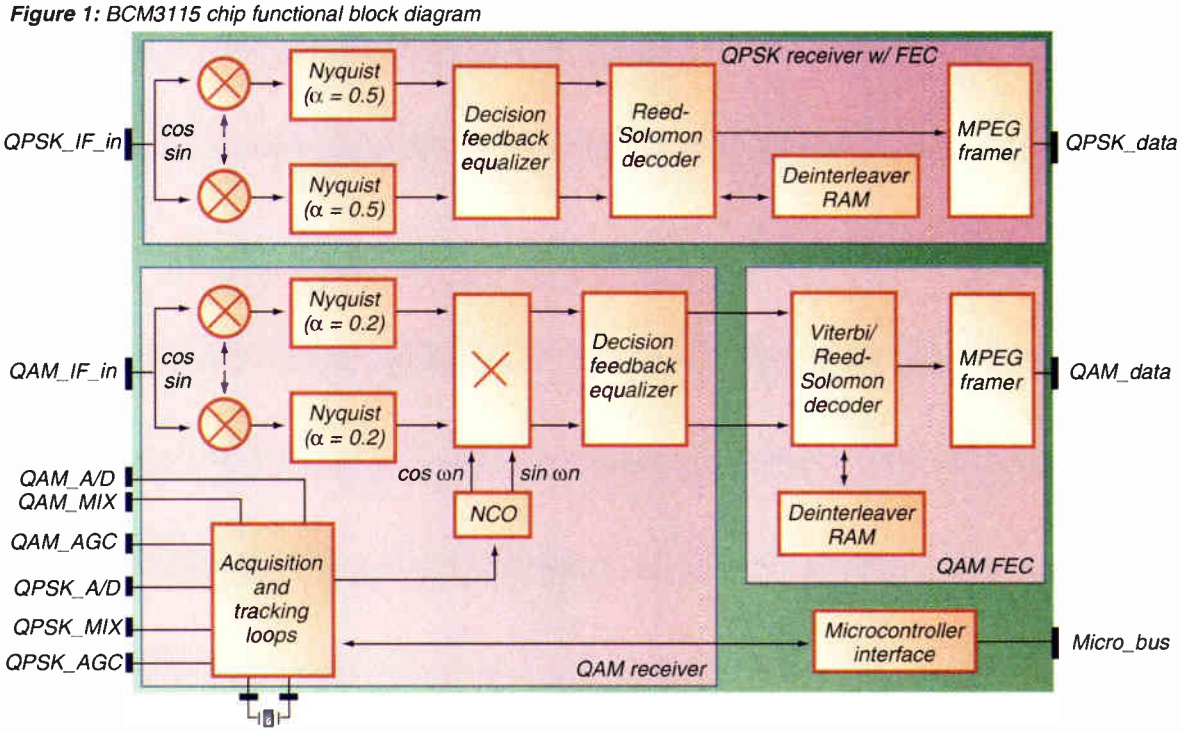
But what about digital video and cable TV–when will digital set-tops really be installed in homes in quantity? In a recent talk, Tom Elliot, senior vice president of engineering at TCI, said, with some reservations, that as far as TCI is concerned they will make their first appearance in 1996, with a more heavy roll-out in 1997.

One example of a digital set-top that was recently announced by Hewlett-Packard is called the Kayak. (See page 82.)

To date, orders for Kayak include 750,000 from TCI, 150,000 from Comcast and 100,000 from Cox. Until recently, cable TV systems have been supplied almost exclusively by a small group of cable TV manufacturers, e.g. General Instrument, Scientific-Atlanta, Zenith, etc. From now on, expect to see companies with little or no history of supplying cable TV systems, but with excellent backgrounds in electronic design and manufacturing, to be coming on the scene.

The Kayak set-tops are compatible with existing analog systems; the Kayak is tunable to 806 MHz, allowing for a substantial mix of analog and digital signals. The Kayak system operates in dual-mode decompression, supporting both MPEG-2 and General Instrument's DigiCipher II with MPEG-2 transport capability. The Kayak system features General Instrument's renewable DigiCipher II access control and entitlement technology and also supports baseband gated sync suppression analog descrambling. A significant feature of the Kayak is its ability to accept downloaded software upgrades and patches to keep software applications up to date without requiring a truck roll.

Figure 1: BCM3115 chip functional block diagram



QAMLink chip

An outstanding feature of the Kayak set-top is its digital receiver. Included in it is Broadcom Corp.'s BCM3115 chip that is a dual-channel receiver that demodulates three levels of QAM (16, 64 and 256) concatenated with Viterbi, Reed-Solomon FEC (forward error control). In the 64-QAM mode, the chip enables the 6 MHz analog channel to carry 30 Mbps digital data, and in the 256-QAM mode, a data rate of 40 Mbps. The chip is compatible with General Instrument's DigiCipher II technique and conforms to the ITU 64-QAM international transmission standard. The FEC consists of a 14/15 trellis code with a (128,122) Reed-Solomon code.

The chip also features a QPSK receiver with a 2 Mbps data rate control channel allowing cable TV systems to individually address subscriber set-top boxes with multi-tier service options and pay-per-view programming. In the Kayak, this out-of-channel service is placed in the frequency space between TV channels 4 and 5 (approximately 74 MHz). A fixed control channel eliminates wasteful use of downstream video bandwidth in every channel, and enables the QAM channels to be dedicated entirely for video delivery. The chip contains one million transistors. A block diagram of the chip is shown in Figure 1.

Tim Lindenfelser, vice president of marketing at Broadcom, says that the chip is priced at $70 in 1,000 piece quantities. Steve Tsubota, director of Broadcom's cable-TV strategic business unit, claims, "the level of integration that we have accomplished with the BCM3115 reduces the total cost of the transmission portion of the set-top box by a factor of two," and he supplied the set-top price estimates shown in Table 2.

Steven Hoffman, product manager for HP's Home Products Division, says that HP has not fixed a sale price for the Kayak set-top, but estimates that initially–before price reduction with volume–it might be in the $400-$500 range. However, HP announced a leasing program for the Kayak that would enable operators to acquire the digital set-tops for as little as $7 a month per unit.

Conclusions

There are so many problems associated with the HDTV/SDTV issues that not all can possibly be addressed here. One of great importance to cable TV system operators is the "must-carry" problem–will it apply to new broadcast SDTV signals? One of huge importance to broadcasters is whether or not the new HDTV/SDTV spectrum will be auctioned.

At the time of this writing, none of the many issues has been decided. If by some miracle any decisions have been made by the federal government by the time this is published, it will be interesting to relate the decisions to the present positions of the conflicting parties. CED

References

1. "Digital Television: The End of the Beginning," R. Wiley, *IEEE Communications Magazine*, December 1995.
2. "New Developments in Flat Panel Displays," L. Lockwood, *Communications Technology*, Dec. 1992.
3. "New Developments," L. Lockwood, *Communications Technology*, Sept. 1993.

About the author

Lawrence W. Lockwood is president of TeleResources, a consulting firm based in Arlington, Va.

Advances spell end to net bottlenecks

Bringing data to the desktop

By Fred Dawson

Major advances toward commercialization of cutting edge switching, optoelectronic and millimeter wave technologies are opening the way to an explosion in broadband services to the business community in '97.

At the switching level, manufacturers have begun incorporating newly standardized capabilities into ATM equipment, enabling carriers to move the technology into the core of the telecommunications infrastructure. And on the distribution side, dense wavelength division multiplexing is coming into its own just as regulators are preparing to unleash new classes of wireless transport in the 28-, 38- and 40-GHz regions that are sure to challenge entrenched fiber networks.

These developments come amid mounting pressure within the business community for extension of the computer revolution to the next level, which means breaking the public network bottleneck to get high-speed data to the desktop at affordable costs. Along with seeking multiprotocol connectivity for LANs and high-speed access to the Internet, business users are also looking for multimedia connections capable of supporting video.

"There's still a cost problem in the consumer market, but, in business, we're getting real customers who see a need for the use of video as part of the information they access from their servers," says Beverly Ulbrich, director of marketing for Sun Microsystem's interactive services group. "Our research shows over 50 million clients (in the client/server computing market) were video ready with decoder technology on board at the end of '95."

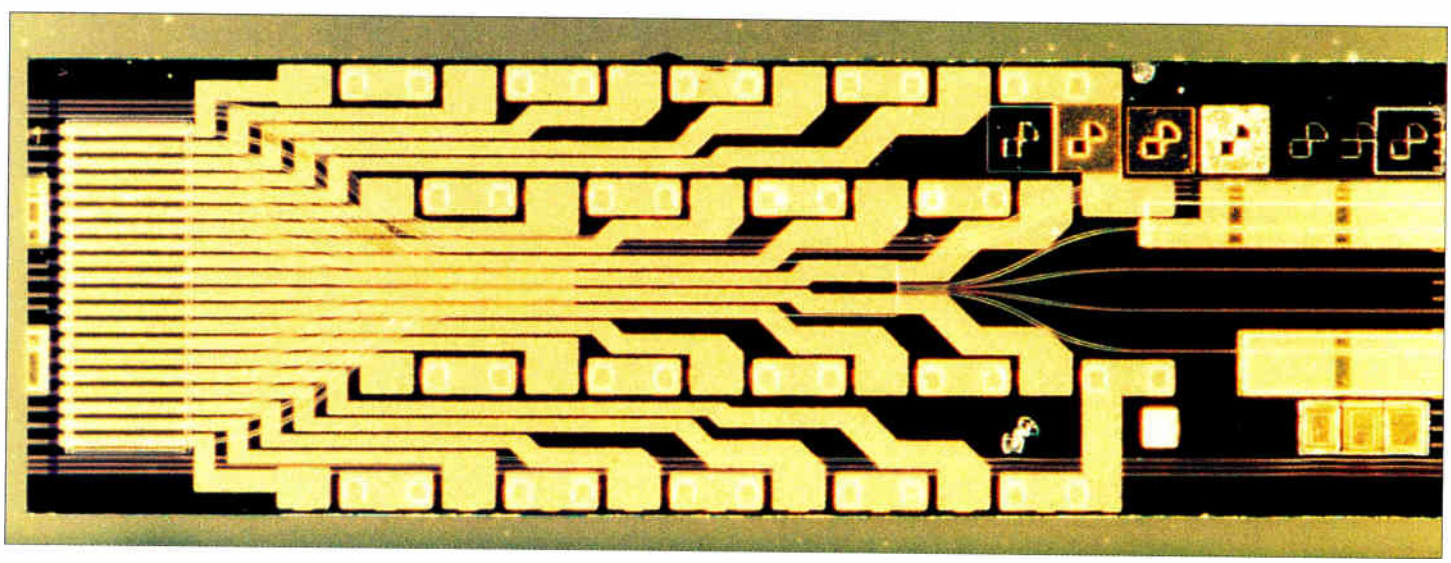
Demand for multimedia with video segments is especially strong in the finance and securities industry, where timely information is crucial, Ulbrich notes. In addition, corporate needs for easily distributed worker training materials across all business categories are driving widescale demand for video storage and distribution.

Asynchronous transfer mode

Meeting such demand starts with deployment of ATM (asynchronous transfer mode) switches. "The fulfillment of market demand for multimedia services can't be realized without deployment of a new network infrastructure," says Richard Jalkut, president and group executive of Nynex Telecommunications. "ATM is the only global standard that is capable of integrating local and wide area networks, which is the only way to achieve distribution of computer intelligence throughout the network."

ATM brings flexibility to the core network at a moment when carriers, faced with competition and new applications, must be able to react to churn and new demand quickly, says Randy Carlson, an analyst with The Yankee Group. "Ultimately, carriers are going to want to be able to operate a set of distributed switches in tiers which, from a network management perspective, look like a single switch," he says.

So far, in serving business needs for high-speed data connectivity, LECs have met competition from private networks and competitive access providers by emulating it, using ATM switches at the edge of their networks to port multiple data streams from high-end business customers onto high-speed Sonet links. But ATM has not penetrated into the core of the carriers' networks, nor has ATM network management been integrated into the operating support systems of the



8-Wavelength Laser Array. (Photo courtesy of Bellcore.)

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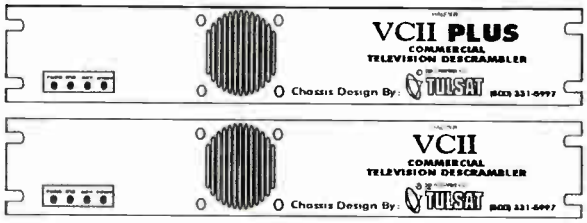

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larger network environment.

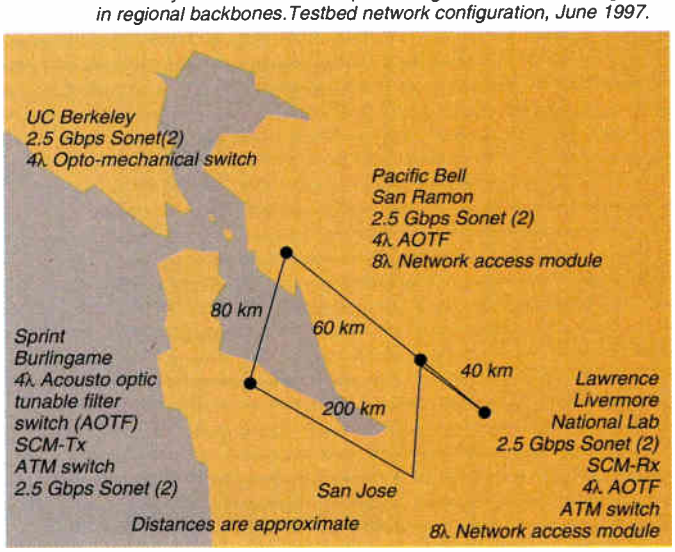
All that is about to change. For example, Nynex has been working with Newbridge Networks Inc., a leading supplier of ATM edge switches, in preparation for deployment of switches in the lower New York LATA by mid-year, with the goal of achieving deployment throughout its territories by 2000, says Edmund Thomas, executive vice president for R&D at Nynex Science and Technology.

Newbridge, which has teamed with Siemens AG to integrate ATM technology into public switched networks, has already begun using the advanced traffic management capabilities in the new 4.0 release of protocols issued in March by the ATM Forum, says Irfa Ali, vice president of marketing at Newbridge. But much work remains to be done.

"Moving deeper into the core of the network, a whole lot of issues need to be addressed," Ali says. "For example, signaling and billing elements of the switched network infrastructure must be incorporated into the new ATM products.

"If you look at the network today, everything is based on SS7 (signaling system 7) switching," Ali adds. "An 800 number is translated into a real number in an SS7 network, and that has to be part of the information carried in the ATM cells."

Figure 1: National Transparent Optical Network. A prototype network in the Bay Area of California representing future network designs in regional backbones. Testbed network configuration, June 1997.



Newbridge's edge ATM switches currently operate at up to 12.8 Gigabits per second, but the core backbone switches will have to operate at 100 Gbps. Newbridge's switches today can emulate T-1 and T-3 circuits, meaning such links can be routed between different users at different times, but, in the future, the core switches will have to handle DS-0 or individual voice links as well.

A key starting point in the evolution to core ATM switching is to move what is known as multiprotocol over ATM (MPOA) service, now a mainstay of edge switch capabilities, into the public network, which will allow carriers to route data on a switched basis "without using thousands of routers in a given market," as Ali put it. Equally important, the new products will support collaborative computing, tying disparate work stations together on a dialup basis across the wide area.

"This is the beginning of adding individual voice circuits to the ATM network, where voice is imbedded in the multimedia applications," Ali says.

Another important driver behind migration of ATM into the core network promises to be software distribution to computers. "The idea of downloading software cries out for a really good broadband infrastructure," says Thomas Rambold, president of Siemens' Broadband Networks Division.

Dense WDM

With the backbone switching support must come higher capacity in the pipelines to accommodate not only the emerging broadband service demands but also the surging volume in narrowband traffic brought on by PCS and wireline competition. Solutions to this need are racing toward commercialization in wireline and wireless modes in tandem with the '97 timeframe for broadband switching.

On the wireline side, carriers looking for a way to avoid laying more fiber in the wake of a decade of high capital spending have found a solution in dense wave division multiplexing technology, which is the combination of four or more wavelengths of light into a single fiber.

"You're going to see a lot of point-to-point dense wavelength division multiplexing systems (DWDM) going into operation later this year," says Chinlon Lin, director of broadband lightwave systems research at Bell Communications Research. Indeed, MCI has already put a four-wavelength system into operation on a long-haul trunk in the Southeast.

Equally important, Lin notes, optical routing of wavelengths, which avoids costly and time-consuming conversion of signals from photons to electrons and back again, is not far behind in the commercialization process.

"When we get to all-optical networks, we'll see major changes in application of fiber not only in the backbone, but in the distribution loop as well," he says.

What's in store is evident in a new prototype network now operating in the Bay Area of California under sponsorship of the Defense Department's Advanced Research Projects Agency and 10 other entities. Dubbed the "National Transparent Optical Network Testbed" (NTON), the system transmits lightstreams at 2.5 Gbps (OC-48) in multiplexed four- or eight-wave combinations, using an acousto-optical tunable filter switch to route the streams to different points in the network (see Figures 1 and 2).

The NTON, linking University of California at Berkeley and Lawrence Livermore National Lab sites to Pacific Bell and Sprint operating centers, operates over standard imbedded fiber at wavelengths ranging from 1546 to 1560 nanometers, with spacing of two or four nanometers, depending on whether a link operates at 4 or 8 wavelengths per fiber. Signal power is sustained with optical amplifiers, which have been specially conditioned with gain filters supplied by Nortel to maintain uniform ("flat") performance across all wavelengths.

"What we're seeing here is evidence that these types of capabilities are not far from the manufacturing

at 28 GHz slated for final authorization at the FCC this month, and for auctioning this summer, and a 40 GHz service class that could be licensed as early as next year.

While LMDS at 28 GHz has been pioneered in the U.S. by CellularVision of New York as a one-way cable distribution service, its real strengths lay in broadband communications, as is evidenced by preparations for service launch in Canada. Last month the government's Industry Canada department promulgated rules for authorizing what it calls "local multipoint communications services" in the 25.35 GHz to 28.35 GHz region, starting with two 500-MHz blocks to be licensed in 66 markets nationwide this summer.

Cable and telephone companies aren't eligible to apply for the first Gigahertz of spectrum but will be allowed to compete in the auctions. Billed as "Canada's third competitive choice," LMCS (local multipoint communications systems) will employ low-power transmitters in combination with small antennas to deliver digital TV, data and voice signals omnidirectionally at distances of up to three miles.

Leading the charge into LMCS is Western International Communications Ltd., a leading terrestrial and satellite broadcast concern based in Vancouver that has been testing the technology for two years. "We intend to apply for licenses in all 66 markets," says Douglas Holtby, WIC president and CEO.

As the only Canadian licensee of CellularVision's technology, WIC has had by far the most experience working with LMCS in Canada. "We have been operating over two (overlapping) cells in Calgary since '94," says John Quigley, vice president of WIC's CellularVision operation. "We're transmitting in FM, omnidirectionally, and have been running digitally the full period."

The company has operated General Instrument's DigiCipher as well as full MPEG-2 successfully, with quadrature phase shift key modulation employed to deliver 38 Megabits per second, or 12 to 16 TV channels in each 20 MHz FM channel, Quigley says. More importantly, he adds, "since April of '95 we've also been operating full duplex T-1 (1.5 Mbps) channels through the system to customer (premises)."

WIC's strategy, reflecting the common carriage requirements of the government's LMCS policy, is to build its business on the interactive digital communications potential of 28 GHz technology. "We're going to move into telecom right off the bat," Holtby says, adding, "I believe broadband data is going to be a much bigger business for us than TV."

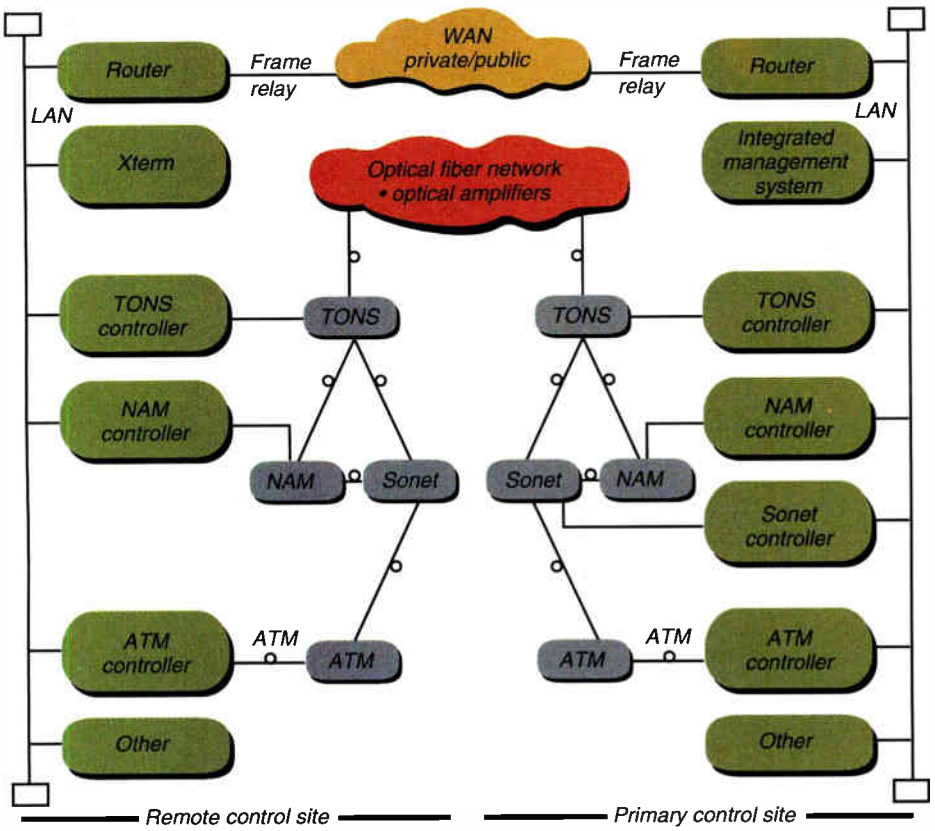
WIC has been working with Lockheed-Martin Canada, which has developed a transmitter/receiver that supports a two-way, point-to-point T-1 data stream as well as 200 channels of digital TV, Quigley says. The transceivers, which are small enough to carry with laptop computers and other portable devices, connect over a 10baseT link to the PC, eliminating the need for an external modem.

Quigley says WIC's Calgary cells overlap each other by 50 percent, demonstrating that the CellularVision technology can deliver interactive services using reverse polarization without creating signal interference. The company will use traveling wave tube amplifiers supplied by the Canadian subsidiary of U.S.-based CPI Varian at first, moving to solid-state transmitters once the technology can support a power level of one watt.

WIC, which has been working with a number of manufacturers over the past two years, expects to deploy LMCS systems at the rate of 10-12 cells per month, although this "will be a stretch," Quigley says. "Assuming Industry Canada follows its license schedule this summer, we'd want the equipment to be available to begin deploying cells by the end of the year," he says.

WIC's technical experience offers strong validation to the concept that millimeter wave technology is going to be a major factor in the broadband marketplace, whether for backhaul applications or for delivering multimedia to customer premises. With a number of telcos lining up to bid for LMDS spectrum against CellularVision and other entities in the U.S., it's clear the regional bottleneck will soon be a thing of the past. CED

Figure 2: NTON schematic.



process if the demand for them develops," Lin says.

One of the first commercial applications of all-optical network technology will come not in the U.S. but in the waters around Africa, where a consortium led by AT&T is planning to build a DWDM ring network that will connect individual countries that choose to run fiber to the ring.

"The really significant thing about Africa One (the planned network) is that it will extract each country's traffic optically, which is something that's only been done with prototype networks," Lin says.

Wireless

Coming out of nowhere to challenge wireline operators in the high-speed traffic wars to come are advanced wireless systems operating in the 28-, 38- and 40-GHz spectrum windows. One indication of the role such systems will play can be seen in the land-office business enjoyed by WinStar Communications, a supplier of backbone transport systems which holds licenses for 38 GHz operations in over 40 markets around the country.

The company is providing competitive access providers such as Teleport Communications Group in New York a low-cost means to extend broadband connectivity beyond the reach of imbedded fiber trunk and is lining up customers for backhaul support in the PCS industry, following the path taken by European carriers in PCS facilities interconnections.

"The technology offers a lot of advantages for PCS providers, giving us the opportunity to provide hundreds of low-cost links within the 1,600 square-mile region of an MSA (metropolitan service area)," says David Ackerman, executive vice president of WinStar. Winstar's links typically cost 10 to 15 percent less than those of local exchange carriers for comparable capacity, and they are quicker to implement then traditional microwave links, which typically require long waits for permits at the FCC, Ackerman adds.

Availability of multiple options for backhaul connections is important to the PCS industry, notes Graham Taylor, vice president and general manager for Florida operations at TCG. "Fiber to the base station can be an expensive component of the infrastructure, so it's important to look at more than one supplier," he says.

WinStar, based in New York, is licensed to operate four 100-MHz channels per market in 30 markets, the only 38-GHz carrier with multiple 100-MHz licenses, owing to new FCC rules that limit carriers to one license per market. WinStar obtained most of its licenses under former rules when there was little interest in the spectrum.

Where 38 GHz links were limited to four T-1 channels per 100 MHz of spectrum using four-level frequency shift key modulation, manufacturers are now producing links that can deliver one DS-3 link, or the equivalent of 28 T-1s, per 100 MHz. "Some vendors expect to offer OC-12 (600 Megabits per second) level capacity per 100 MHz within two to three years," Ackerman says.

With such capability will come point-to-multipoint transmission technology, allowing intelligent switching arrays where hubs serve multiple sites with broadband transmission streams. Such advances parallel the growing technical capabilities of other very high frequency transmission systems, including the local multipoint distribution service operating

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2-3 Planning for Cable Telephony. Produced by Scientific-Atlanta Institute. Location: Atlanta. Call Bridget Lanham (800) 722-2009, press 3, to register.

8-12 Broadband Communications Network Design. Produced by General Instrument Corp., GI Communications Division. Location: Hatboro, Pa. Call Lisa Nagel at (215) 830-5678; fax (215) 830-5602.

9-10 Fiberworks: Broadband Cable Television Technology (BCTT). Produced by Antec. Location: Antec Technology Center, Atlanta, Ga. Call (800) FIBERME for more info.

11 SCTE Satellite Tele-Seminar Program. To be broadcast on Galaxy 1R, Transponder 14, 2:30-3:30 p.m. eastern time. Topic: "NEC, NESC and OSHA Regulations (Part II)," from Expo '92 in San Antonio, Texas and "Interdiction and Other Signal Security Techniques (Part I)," from Expo '91 in Reno, Nev. Call SCTE National Headquarters (610) 363-6888.

15-19 Headend Maintenance and Performance Testing. Produced by General Instrument Corp., GI Communications Division. Location: Hatboro, Pa. Call Lisa Nagel at (215) 830-5678; fax (215) 830-5602.

16-18 FiberBase Product Training, produced by ADC Telecommunications Inc. How to create and maintain a relational database on a fiber distribution system. Location: ADC corporate headquarters, Minneapolis, Minn. Call (800) 366-3891, ext. 2040 to register, or for more info.

16-19 Fiber Optic Training. Produced by The Light Brigade. New, four-day class format. Location: Denver, Colo. Call Pam Wooten (800) 451-7128.

18 New England SCTE Chapter, Technical Seminar. Topic: High-speed data. Location: Best Western, Marlboro, Mass. Call Tom Garcia (508) 562-1675.

19 North Country SCTE Chapter, Testing Session. BCT/E and Installer Certification exams to be administered. Location: Columbia Heights, Minn. Call Bill Davis (612) 646-8755.

22 Analog Headend Technology. Produced by Scientific-Atlanta Institute. Location: Atlanta. Call Bridget Lanham (800) 722-2009, press 3.

22-24 Fiberworks: Digital Networks Training (DNT). Produced by Antec. Accredited by the IACET. Location: Antec Training Center, Denver, Colo. Call (800) FIBERME.

24 Inland Empire SCTE Chapter, Technical Seminar. Topic: Fiber Optic Basics–Fiber Optic Troubleshooting, with Mike Kelly of Antec, held in conjunction with the Pacific Northwest Cable Communications Association's Annual Conference. Location: Templins Resort, Post Falle, Idaho. Call Roger Paul (509) 484-4931, ext. 230.

26 Desert SCTE Chapter, Testing Session. Installer certification exams to be administered. Location: Colony Cablevision office, Palm Desert, Calif. Call Bruce Wedeking (909) 677-2147 for more information.

26 Wheat State SCTE Chapter, Testing Session. BCT/E certification exams to be administered. Location: Great Bend, Kan. Call Joe Cvetnich (316) 262-4270.

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4/28-5/1 Cable '96, produced by the National Cable Television Association. Location: Los Angeles Convention Center. Call NCTA Industry Affairs (202) 775-3669.

June

2-5 Canadian Cable Television Association's Annual Convention & Cablexpo. Location: Edmonton, Alberta. Call Christianne Thompson of the Canadian Cable Television Association at (613) 232-2631.

10-13 SCTE Cable-Tec Expo '96. Location: Nashville, Tenn. Call SCTE headquarters (610) 363-6888.

23-27 Supercomm '96. Sponsored by USTA and TIA. Location: Dallas Convention Center, Dallas, Texas. Call (800) 278-7372.

The issue: High-speed data

Tremendous interest in the Internet has propelled the cable industry on a quest to develop a standardized high-speed data modem that will leapfrog any deployable technology the telcos have in their arsenals. So what do you think?

The questions:

1. Are you personally presently subscribing to a commercial on-line service such as Prodigy or America Online?

❑ Yes ❑ No ❑ Don't know

2. How often do you sign on and surf the Internet?

❑ Daily ❑ 2-3 times/week ❑ Once a week ❑ Monthly

3. Does your cable TV system have any interest in providing data services over the cable network?

❑ Yes ❑ No ❑ Don't know

4. Has your system tested or deployed RF "cable modems" to allow this access to occur?

❑ Yes ❑ No ❑ Don't know

5. Does the local telco offer ISDN services in your franchise area?

❑ Yes ❑ No ❑ Don't know

6. Has your system been approached by local government, schools or anyone else to offer high-speed data communications?

❑ Yes ❑ No ❑ Don't know

7. Has your system actively tried to market such services to anyone?

❑ Yes ❑ No ❑ Don't know

8. Do you think datacom provision is a good way to compete with the local telco?

❑ Yes ❑ No ❑ Don't know

9. Do you think your system is technically capable of sending high-speed data?

❑ Yes ❑ No ❑ Don't know

10. How much would your system be willing to pay for cable modems?

❑ Under $200 ❑ $200-$500 ❑ Over $500

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RESULTS

The issue: 1996 construction plans

The telcos may have stalled their broadband plans, but DBS is out there, and telecom reform is pending, increasing the likelihood of more competition. This coming year promises to be exciting as MSOs begin to compete in the telephone local loop and add interactive capabilities to their networks. We'd like to know what steps cable operators are taking to compete in this new environment.

Cable system operators have a busy 1996 rebuild schedule planned, but don't look for many of them to be rolling out digital video compression anytime soon, according to our latest fax-in survey.

Of those planning rebuilds or upgrades, most will cost less than $5 million to complete, but all of them will include bandwidth expansion and the addition of fiber optic technology. In addition, a majority will include new headend gear–which isn't surprising if operators are adding bandwidth. Surprisingly, only one-third are planning to activate the return channel on their plants, and even fewer plan to add equipment that monitors system performance.

The issues that drive rebuilds continue to be the quest for additional channels, compounded by a need to fend off potential competitors and add new services. Franchise renewals figure in less than half of the rebuilds that are planned.

Considering the hyperbole that has surrounded digital video compression, it's interesting to note that more than half of those who responded have no current plans to roll out that technology–and only one-quarter expect to do that within the next 18 months or so. Instead, operators appear to be focusing on the provision of high-speed data and telephony services.

Congratulations to Kent Fink of Charter Communications, who won $50 for his entry. To qualify for a future cash drawing, fill out the questionnaire on the previous page and send it in!

The results:

1. Does your system have a significant plant upgrade planned for 1996?

Yes	No	Don't know
93%	**7%**	**0%**

2. If so, approximately how much money will be expended to perform the upgrade, not including labor?

Less than $5 million	$5 million to $10 million	More than $10 million
47%	**13%**	**27%**

3. What will the upgrade consist of? Check all that apply:

Bandwidth expansion **100%**	Addition of fiber optics **100%**
Activation of two-way plant **33%**	Status monitoring **20%**
Digital electronics **27%**	New headend equipment **60%**
Phone over coax **33%**	

4. If your system plans to expand bandwidth, what type of electronics are you planning to purchase?

550 MHz	750 MHz	1 GHz	Other
28%	**65%**	**7%**	**0%**

5. When was the last time your system was *significantly* upgraded with new hardware and electronics (excluding maintenance expenditures and plant extensions)?

Within 12 months **13%**	Within 3 years **0%**
3-5 years ago **20%**	More than 5 years ago **67%**

6. Why is your system being upgraded?

Franchise requirement **40%**		Need more channels **67%**
Competition **60%**	New services **60%**	Other **7%**

7. Does your system intend to roll out digital compression to customers in:

1996?	1997?	1998?	Later?	No current plans
0%	**27%**	**7%**	**13%**	**53%**

8. How interested is your system in providing high-speed data and Internet services?

Very	Somewhat	Not interested
60%	**33%**	**7%**

9. How interested is your system in providing telephony services over the coax plant?

Very	Somewhat	Not interested
47%	**40%**	**13%**

Your comments:

"We're a little off the beaten path and have a limited budget. We recently added 100 miles of fiber plant, however."

– Raymond Leone, American Cable TV, Hollywood, Md.

"There is so much change happening at once, it's hard to identify just what will work for a company and what is not necessary. Not everything is cost-effective."

– Jeff Nelson, Triax, Waseca, Minn.

"We expect a skilled labor shortage from the amount of upgrade activity. It will be interesting to see if we can keep up with current schedules."

– Randy Haugestuen, Time Warner, Kimberly, Wis.

Augat wins Cox contract

MANSFIELD, Mass.–The Communications Products Division of Augat Inc. has been awarded a two-year agreement to supply Cox Communications with coaxial connector products to be used in a variety of system upgrade projects. The agreement is valued at approximately $10 million.

"Cox selected Augat for the capabilities of our 'W' series coaxial connector, which employs a three-piece design," according to Larry Buffington, vice president and general manager of Augat's Communications Division.

C-Cor to supply Armstrong rebuild

STATE COLLEGE, Pa.–C-Cor Electronics Inc. will provide approximately 1,200 FlexNet 750 MHz trunks and 800 FlexNet 750 MHz Terminating Bridgers to Armstrong Cable Services for a 600-mile rebuild in Connellsville, Pa. The equipment, though currently powered at 60 volts, is equipped for 90 volt powering as well. Work has already begun on the project and is expected to continue until November 1997.

Corning receives Baldrige award

CORNING, N.Y.–Corning Inc.'s Telecommunications Products Division was presented with the 1995 Malcolm Baldrige National Quality Award flag during a ceremony in Washington, D.C. late last winter.

United States Commerce Secretary Ronald Brown presented the flag to Telecommunications Products Division (TPD) officials during the Quest for Excellence VIII conference. The annual event features the 1995 Baldrige winners who share in-depth information about their successful quality and business management strategies.

Corning was announced as a 1995 winner of the Baldrige award for excellence in quality management in the large manufacturing category last October. Corning formed TPD in 1983 to commercialize the optical-fiber product and process technology the company first developed in 1970.

IBM lends hand to Shanghai network

SHANGHAI, China–Shanghai Posts and Telecommunications Administration (SPT) announced that it has successfully completed an ATM public broadband network. The broadband network is based on IBM's Nways 2220 and 8260 ATM switches. IBM networking and telecommunications experts from Europe, Australia and Asia helped design and implement the network, which has the capability to provide telecom services such as video-on-demand, high-quality video conferencing, campus networks and high-speed data services.

Microware licenses browser from Sun

DES MOINES, Iowa–Microware Systems Corp. has licensed the Java programming environment and HotJava World Wide Web browser from Sun Microsystems Inc. Microware will port Java and HotJava to the company's OS-9 Real-Time Operating System, as well as its MAUI graphics API.

The combination of Java, OS-9 and MAUI will enable access to the Internet from a range of intelligent consumer products including wireless handheld devices, set-top boxes and other devices, beyond the constraints of a personal computer. DAVID and DAVIDLite, Microware's OS-9-based packages for interactive TV and digital broadcast, will also support Java. Currently, Microware's DAVID and DAVIDLite are licensed by more than 20 set-top box manufacturers for ITV and digital broadcast deployments around the world.

The license allows Microware to ship Java and HotJava as part of its Internet solutions for its OS-9 Real-Time Operating Systems. Java will be part of Microware's Real-Time Internet package, due out the second quarter of '96.

Medcom picks S-A's PowerVu for DTH

ATLANTA, Ga.–Scientific-Atlanta Inc. has been selected to supply its PowerVu digital video compression system for Telered, Grupo Medcom's Ku-band Direct-To-Home (DTH) satellite TV network. The network will distribute digital TV programming services for DTH broadcast to Mexico's more than 92 million residents. S-A has installed DTH systems for Orbit Communications in the Middle East/Europe, PrimeStar in the United States, and Indovision in Indonesia. The PowerVu system is MPEG-2/DVB-compliant and offers an integrated solution including a conditional access system that will be used to secure and package Telered programming.

Grupo Medcom will make use of its pay TV license for Ku-band to bring this direct-to-home network to Mexico. The Scientific-Atlanta PowerVu system enables Telered to offer a variety of television services. In addition to delivering DTH programming to individual households, the system can also serve as a program delivery mechanism for digital or analog cable systems or other forms of wireless pay TV networks. The PowerVu digital video compression system will provide more than 60 channels of video programming via seven transponders on the Solidaridad II satellite. The new Telered network operations center will use two S-A nine-meter earth stations in Mexico City to provide uplink capabilities to serve Mexico's more than 15 million television households.

Drake adds Multicom as distributor

MIAMISBURG, Ohio–The R.L. Drake Company has announced Multicom as the newest member in its network of authorized commercial product distributors. Multicom will provide customers in the southeastern portion of the United States with quicker access to Drake products and services.

Multicom stocks the entire Drake commercial product line and offers technical assistance to customers through in-house design consultation. The company has been servicing the southeastern portion of the U.S. as a stocking distributor for more than 13 years. They are located in Longwood, Fla. and can be reached by calling (800) 423-2594.

Semiconductor cos. announce deal

LINCOLN, Mass.–Samsung Electronics Co. Ltd. and SGS-Thomson Microelectronics have announced an agreement to cooperate on the development and sourcing of micro cores–key elements in many embedded applications including high-volume markets such as set-top boxes, multimedia PCs and mobile communications. The first step in the program is a license for SEC to use SGS-Thomson's D950 DSP core, coupled with a reciprocal second sourcing agreement for products based on this family of cores.

SGS-Thomson anticipates a significant increase in its share of the DSP market, while SEC is looking to strengthen its position in the digital logic market, according to a statement released by the two companies.

Spectrum to rep for ComSonics

HARRISONBURG, Va.–ComSonics Inc. has announced that Spectrum will market the company's test equipment product lines in a five-state area that includes Texas, Oklahoma, Louisiana, Arkansas and Mississippi.

Spectrum, which is based in Fort Worth, Texas, is a distributor/representative company that currently represents five manufacturers in its five-state area. The company will have five salespeople representing ComSonics' lines of signal measurement and leakage products.

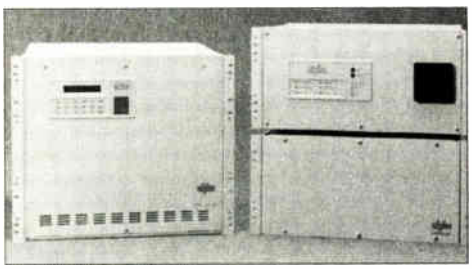
Arrowsmith named vendor of the year

AUSTIN, Texas–Arrowsmith Technologies Inc. has announced its selection by the Advanced Information Technology Division of TCI as vendor of the year. TCI presented the award at corporate ceremonies held last December in Denver, Colo.

TCI chose Arrowsmith's Fleetcon workforce management system to serve as the dispatch capability for its own subscriber management system, referred to as Summitrak. CED

Rack-mount versions of UPS

BELLINGHAM, Wash.–Alpha Technologies has expanded its line of UPS products to include rack-mount versions of its CFR Uninterruptible Power Systems. The new rack-mount systems employ the Alpha-developed



CFR-RM Series

controlled ferroresonant technology which further enhances the ferroresonant transformer's already natural isolation, surge and spike rejection characteristics. This is accomplished without the step-load or nonlinear load response problems associated with other hybrid technologies.

The CFR Series UPS systems correct for load-generated poor power factor and nonlinear current waveforms without costly add-on transformers or electronic correction packages common in PWM designs.

Circle Reader Service number 56

Polishing puck

ELMSFORD, N.Y.–Metrotek Industries Inc. is offering an all-metal ST puck for hand-polishing. The puck incorporates an ST receptacle that holds the connector in place for perfect polishes. Unlike "floating" type pucks, the Metrotek puck takes the guesswork out of polishing, according to the company.

Metrotek maintains an inventory of fiber optic components and accessories.

Circle Reader Service number 57

Oscilloscopes

BEAVERTON, Ore.–Tektronix Inc. has announced its new family of lower-priced InstaVu acquisition oscilloscopes. The new TDS 700A series and TDS 500B series of digital storage oscilloscopes (DSOs) give users both the confidence of an analog scope, and the power of a digital scope, at lower prices, according to Tektronix.

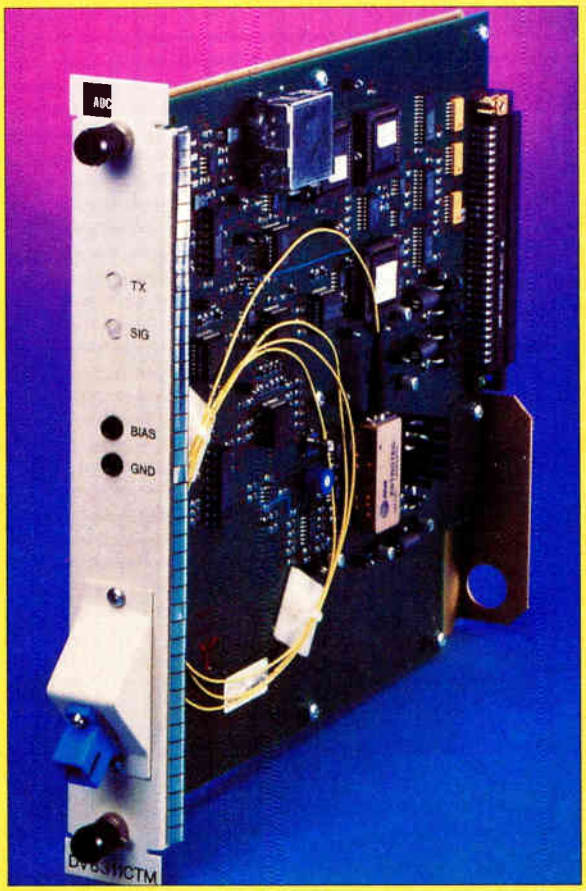
The company's proprietary InstaVu signal acquisition technology lets users capture up to 400,000 Wfm/s (waveforms per second).

The new TDS 700A series includes the TDS 784A, TDS 744A and TDS 724A, and features color displays, bandwidths up to 1 GHz, sample rates up to 4 GS/s and acquisition rates up to 400,000 Wfm/sec. The new TDS 500B series includes the four-channel TDS 540B and two-channel TDS 520B, both featuring 500 MHz bandwidth, up to 2 GS/s sample rate, monochrome displays and up to 100,000 Wfm/sec acquisition rate.

Tektronix has also announced two new oscilloscope probes. Both the P5205 high-voltage differential probe and the TCP202 AC/DC current probe feature the intelligent TekProbe advanced scope interface, which eliminates the need for an external power supply or control interface.

Combined with the new TDS 500B and TDS 700A digital storage oscilloscopes (DSOs), the new probes provide direct, correctly scaled measurement and display of differential voltage, current and instantaneous power in electronic circuits. The resultant waveform, whether it is displayed on the scope, printed out or stored on a disk, is annotated with the correct numerical value and unit of measure, such as V (volts), A (amperes) or W (watts).

Circle Reader Service number 58



Universal digital transport system

MERIDEN, Conn.–ADC Video Systems Inc. has announced a new product, the DV6300 Single Channel Digital Transport system, to join its DV6000 Universal Digital Video Transport product line. The DV6300 is a single channel transmission system designed to support a variety of video and telephony channels available today.

The DV6300 system is part of the DV6000 family, a 2.4 Gbps transmission system for uncompressed video transport. All existing DV6000 encoder

Tool organizer

TACOMA, Wash.–PAKTEK Inc. has introduced TOOLPAK, a backpack tool organizer which secures more than 100 of the user's most-needed tools, charts and meters. The TOOLPAK features three, nylon-coil-zippered

TOOLPAK backpack tool organizer

compartments; six panels that fold-out for easy tool access; more than 100 pockets which hold tools in place; a large map/diagram pocket; quick-release trouble-light loop; two, quick-access outer pockets; heavily padded, backpack-style straps; and attache handles for carrying unzipped or for storing. It is made from durable, puncture- and abrasion-resistant nylon. The device hauls like a backpack, opens like a zippered file cabinet and carries like a bag while unzipped, protecting tools as well as sur-

The DV6300, a single channel universal digital transport system

and decoder cards are interchangeable with DV6300 installations. This provides the versatility to transport any given signal type available today: baseband video, scrambled IF video, MPEG-2 compressed video, DS-3/DS-1, E-3/E-1, video carrier and more.

Single channels can be economically inserted into or dropped from a high-speed, DV6300 2.4 Gbps digital multi-channel stream to support point-to-point single channel applications: local video transport, studio to production house or transmitter interconnects and interfaces between live events and long distance networks.

Circle Reader Service number 55

faces, according to the company.

Circle Reader Service number 59

Network management

FOLSOM, Calif.–Objective Systems Integrators has debuted AccessCNM, an application which allows telecommunications carriers to offer comprehensive Customer Network Management (CNM) services.

AccessCNM allows telecommunications carriers to provide these services through its feature building environments and its capacity for customization. For service providers, the platform allows the provider to differentiate CNM offerings by building custom CNM applications; establishes customer network domains for security; keeps CNM loads predictable and at a minimum, despite the unpredictability of CNM traffic; provides customers with safe access to operational support system and network data; and isolates individual customer domains without revealing the carrier network configuration.

For end users, AccessCNM offers: the ability to manage the private and public network segments as enterprise; streamlined troubleshooting with easily generated reports and automatic fixes, even in multi-carrier environments; and the capability to alter data network configurations without the delays of a paper trail or telephone calls.

Circle Reader Service number 60

QPR monitor

NORCROSS, Ga.–Hukk Engineering has introduced the CR-1151 QPR Monitor test set, which enables users to monitor and test QPR-modulated signals such as those used for the Scientific-Atlanta implementation of DMX digital audio and the Sega Channel. Measurements include error count, bit error rate, errored seconds, severely errored seconds and level. Testing can be performed anywhere, from the headend to the subscriber's residence.

CR-1151

The monitor is portable, battery-operated, rugged and weatherized. The instrument eliminates the need for a TV monitor, Sega game adapter, Sega console, DMX set-top, 115 VAC source, and lengthy cable currently required for testing these digital services outside the subscriber's residence, according to Hukk.

Circle Reader Service number 61

Return loss test set

LACONIA, N.H.–The new ORL 3 Optical Return Loss Test Set from Noyes Fiber Systems is a fully loaded optical return loss set, optical loss test set, and optical power meter measuring up to +23 dBm. Results are stored and later downloaded to a PC for complete documentation.

ORL 3 Optical Return Loss Test Set

The ORL 3 is designed to test for reflections from connectors and components in the fiber link or assembly. Too many reflections can cause excessive Bit Error Rates (BER) in high-speed data systems and video ghosting on analog systems. Testing and correcting for reflections ensures peak efficiency now and better prepares for future upgrades. All ORL 3s include a carrying case, manual, serial cable, PC TEST! Software, reference cable, FC adapter cap, mandrel and AC charger.

Circle Reader Service number 62

IRD satellite receiver

MIAMISBURG, Ohio–The R.L. Drake Company has introduced a satellite television receiver capable of computer interfacing. The computer-controlled satellite receiver is well-suited for distance learning, institutions, nursing homes, teleconferencing and other applications requiring a satellite receiver to be controlled by computer and/or from a remote location.

Drake's ESR1824C employs a conventional RS232C interface, allowing the user to control all receiver functions via a personal computer. The receiver can be interfaced directly, or through a telephone modem at 9600 baud. The unit is also user-friendly to operate. The ESR1824C software emulates the receiver's remote control on the computer monitor. By pointing and clicking on this remote graphic, the user can command the ESR1824C to perform common functions like changing channels, adjusting volume and moving the antenna. More advanced functions, like setting receiver parameters, can also be executed by pointing and clicking.

The ESR1824C's software is also designed to accept commands from logically labeled hot keys on the keyboard.

Circle Reader Service number 63

Cable blocks

TREVOSE, Pa.–New hybrid fiber/coax cable blocks that offer flexibility of multiple configurations for different types of broadband cable construction are now available from General Machine Products Company Inc. (GMP).

GMP HFC cable blocks are available in two roller sizes, 1-3/8 inch and 1 inch in diameter, with a total of seven configurations in various combinations for maximum installation flexibility. They represent an affordable way for installers to safeguard their cable investment, according to GMP.

Incorporating unique features for strength and durability, GMP HFC cable blocks are totally compatible with all types of broadband cable used for voice, video and data.

The blocks are built with rugged, pliable non-marring rollers that rotate on permanently lubricated bearings. Rollers are precisely contoured to carefully support the coax, fiber or innerduct. Steel inserts within the box permit cable installers to slide HFC blocks along strands of cable for easy positioning.

When cable is pulled through the rollers, the bi-directional locking cam firmly secures the block in position. GMP HFC cable blocks can be installed and operated by a single individual.

Circle Reader Service number 64

People on the move

The cable technical community has been dancing the executive shuffle recently, as longtime veterans move to new posts. **Robert Luff** has joined TV/Com International Inc., a subsidiary of Hyundai Electronics America Inc., as the company's new president and CEO. A member of *CED's* editorial advisory board, Luff most recently served as chief technology officer at Scientific-Atlanta Inc. A veteran of the broadband communications industry, Luff has held positions with the FCC, NCTA, Jones Intercable Inc. and United Artists Entertainment. Luff replaces Henk Hanselaar, who will stay with TV/Com until early this summer as president emeritus and then leave to pursue other business interests.

Robert Luff

General Instrument Corp. has appointed **Edward Breen** to the newly-created position of president, General Instrument Communications Division, Eastern Operations. The organization is based in Hatboro, Pa. In his new position, Breen is overseeing three core businesses: Analog Network Systems, Digital Network Systems and Transmission Network Systems. Breen joined GI in 1978 and rose through a number of marketing and sales positions.

The company's separate San Diego, Calif.-based division houses GI's Digital and Analog Satellite, Commercial and Private Network and Telecommunications business. A president of that operation will be named at a later date, according to GI. In addition, the company announced the creation of three central service groups, which will provide functional support to both the Hatboro, Pa. and San Diego divisions. Those groups consist of Manufacturing, headed by **Robert Cromack**, senior VP, Manufacturing; Central Engineering, headed by **Carol Armitage**, senior VP, Engineering; and Information Technology Resources, headed by **Richard Sturgeon**, VP, Information Technology.

Compression Labs Inc. has announced the appointment of **Gary Trimm**, formerly senior vice president, as president and CEO. Trimm replaces John Tyson, formerly chairman, president and CEO, who has resigned to pursue other business interests. Trimm had served as senior VP of CLI and president of its Broadcast Products Group since joining the company in February of 1995. Previously, he had been involved in the general management of public companies, most recently as president of the subscriber systems and the North American divisions of Scientific-Atlanta Inc.

Antec Corp. has named **Jack Bryant** as president of the company's new Digital Systems Division. The organization is responsible for sales and product development for network management, and transmission systems and telecommunications services for cable TV operators. Included in the division will be the sales and support of Cornerstone products. Prior to this position, Bryant was Antec's vice president of marketing. He joined Antec in 1991 as director of sales and marketing for Regal Technologies and has more than 16 years of technical sales and marketing expertise.

Peter Fenner has joined Com21 Inc. as president and CEO. A former president and corporate officer of AT&T Transmission Systems, Fenner has been a member of Com21's Advisory Board and also joins the Com21 board of directors. He has more than 30 years of telecommunications industry experience with AT&T.

ADC Telecommunications Inc. has aligned its strategic business units under two major areas: the Broadband Connectivity Group and the Transmission Group.

Lynn Davis has been named president of the Broadband Connectivity Group, which is comprised of ADC's copper- and fiber-based systems for end-to-end network connectivity, and AOFR Pty. Ltd., Australia. **Frederick Lawrence** has been named president of ADC's Transmission Group, which includes the Enterprise Networking Group, comprised of ADC Kentrox and ADC Fibermux; ADC Video Systems, Access Platforms Systems Division; Network Services Division; Wireless Systems Division; and Shanghai ADC Telecommunications Equipment Co., Ltd. Additionally, within this group, two new division presidents have been appointed. **James Granger** has been named president of the Access Platforms Systems Division; and **William Martin** has been named president of the Network Services Division.

The Society of Cable Telecommunications Engineers (SCTE) has added **Ted Woo**, Ph.D., to its staff in the newly-created position of director of standards. In this capacity, Woo will advance the Society's efforts to present SCTE-developed standards to the American National Standards Institute (ANSI) for approval, according to a written statement released by the SCTE. Dr. Woo was previously manager of mechanical engineering at C-Cor Electronics. He also served on a 1992 ANSI/IPC Standards Approval Committee in the creation of standard guidelines for circuit board assembly.

Steven Hill has been appointed senior vice president for high-speed data services by Continental Cablevision. His position focuses on bringing high-speed data services to the marketplace via Continental's broadband telecommunications network. He joins the MSO from Houghton Mifflin Company, where he most recently served as executive vice president for the company's Trade and Reference division.

Kenneth Metz

Integration Technologies Inc. has announced that **Kenneth Metz**, a 14-year veteran of AT&T Bell Laboratories, has joined the company as executive vice president of engineering. Metz will lead the company's consulting group and will oversee project management of Integration Technologies' systems and applications engineering projects. During his career with Bell Labs, Metz managed system engineering activities supporting end-to-end interactive television and multimedia product development and services deployment for MSOs and RBOCs.

TCI Communications has appointed **Camille Jayne** as senior vice president of its new Digital TV business unit. Most recently, Jayne was president of BHC, a consulting firm specializing in strategic marketing planning. In a prior position as senior director of New Ventures at Ameritech, she pioneered product development work in electronic and interactive shopping across several distribution channels. CED

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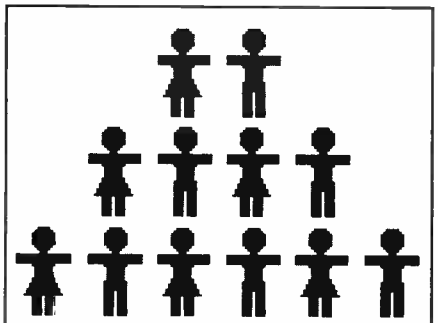

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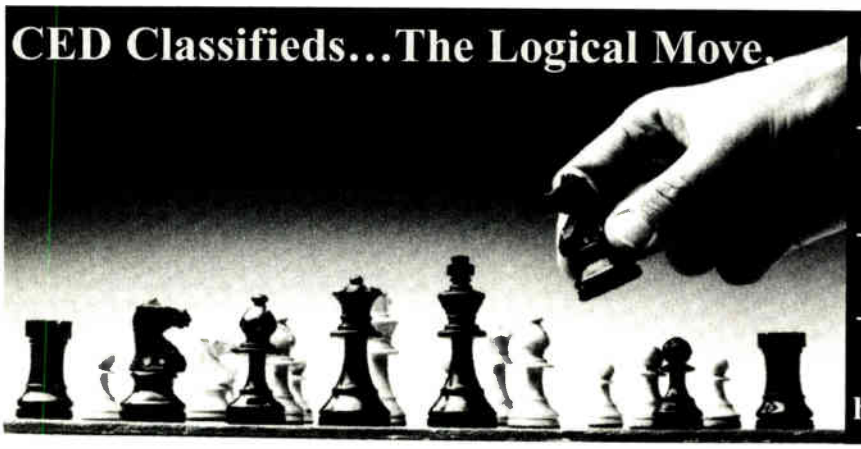

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Achieving 99.99 percent availability

By Archer S. Taylor, Director and Senior Engineering Consultant, Malarkey-Taylor Associates

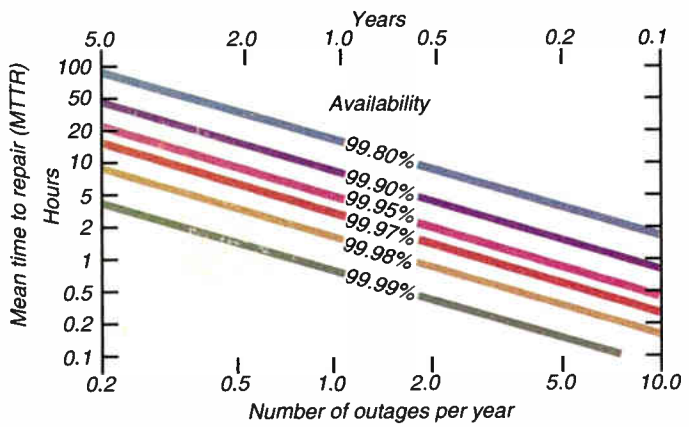
Some excellent papers on network reliability were presented at the NCTA Technical sessions in Dallas last May, and on network availability at the SCTE Conference on Emerging Technologies in San Francisco in January. Engineers and technicians responsible for planning and operating broadband networks need to become familiar with the concepts, as well as the causes and remedies, discussed in these solidly professional papers. The opportunities unleashed by the signing of the Telecommunications Act of 1996 impress upon broadband networks generally an enormous urgency to achieve dependable upstream transmission.

The authors of the papers make an important distinction between "reliability," a commonly misunderstood term, and "availability," the term which better represents what we really mean. **Reliability** is the probability that the network will perform acceptably, without repairs, over a specified period of time. **Availability**, on the other hand, is the percent-ratio of the time during which the network performs acceptably, either on average, or for individual cases, to the total time, including downtime. On the average, this is the ratio of "mean time between failures (MTBF)" to the sum of MTBF and the "mean time to repair, or restore, service (MTTR)."

In the 1989 Viacom Customer Service Survey (ONTRAQ), "excellent" customer ratings were reported for service with fewer than two total outages in a three-month period, equivalent to eight outages in a 12-month period. This survey was incorporated in the report of the CableLabs Outage Reduction Task Force in 1992. For an excellent rating, then, MTBF should be at least one-eighth of 8,760, or 1,095 hours. If four hours are required to restore service, including main power failure, as well as faults at the headend, distribution network, and CPE, as suggested by CableLabs, Rogers Cable, and others, the availability would be 1,095/(1,095+4) = 0.9964 (i.e., 99.64 percent).

Certainly, competition will demand better than eight outages per year, lasting four hours each (0.9964 availability). For an HFC network with properly monitored standby power supplies, a good status monitoring system and redundant headend facilities, assuring that no subscriber would experience more than one or two total outages per year would not seem an unreasonable objective. Even so, assuming four-hour MTTR, the availability would be only 0.9991 to 0.9995. The arithmetic illustrated in the accompanying chart leads to the conclusion that achieving the last few hundredths of a percentage point will be difficult and expensive. It will require either a substantial increase in MTBF or a substantial decrease in MTTR, or both.

Figure 1: *Mean time between failures (MTBF)*



Telephony vs. video requirements

Competition from DBS, digital MMDS, and perhaps telephone video dialtone (VDT) or its successor is likely to compel better performance than represented by two outages in three months' time. Technology for the standby power and performance status monitoring needed to reduce the frequency and duration of outages is at hand. However, there is no reason to believe that the video entertainment competitors are likely to achieve the "four 9s," nor does there seem to be credible economic motivation to do so.

On the other hand, the "four 9s" is not an unreasonable objective for telephone service, whether it be lifeline POTS or more sophisticated high-speed data service. Availability is critical, not only in life-threatening situations, but also in all but the most casual commercial and personal communications.

It ought to be feasible to consider the availability requirement for telephony independently from the requirement for entertainment video distribution. Separate upstream coaxial cables would provide more bandwidth and more flexibility in frequency management than is possible in the 5-40 MHz FDM architecture. "Sruki" Switzer told the 1995 NCTA Convention in Dallas that: "The present 5-40 MHz sub-low reverse path . . . is like building a super-highway with eight lanes in one direction, and a dirt track in the other." Using 900 to 1000 MHz for reverse transmission could obstruct future upgrade and development much as HRC has done. Moreover, separate coaxial cables for telephone and video between user premises and the optical node could help to concentrate the money and effort where it is most needed to achieve the four 9s.

The incremental cost of separate coaxial cables might be at least partially offset by the lower cost of a one-way video network. Remember the "AquaCar"? It was neither a good automobile nor a good boat. Would an integrated coaxial network turn out to be less than the best for either video entertainment or modern telephony? Think about it. CED

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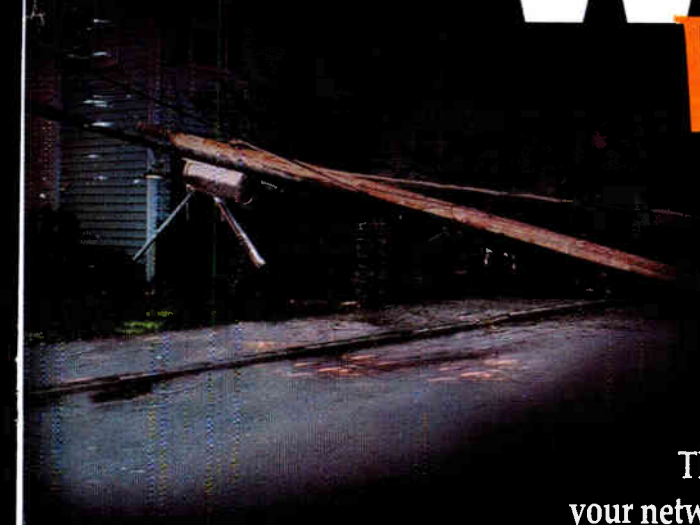

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