

# CEED

COMMUNICATIONS ENGINEERING & DESIGN  
THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

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## Cable: Fast forward into the future

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DECEMBER 1995

CEED

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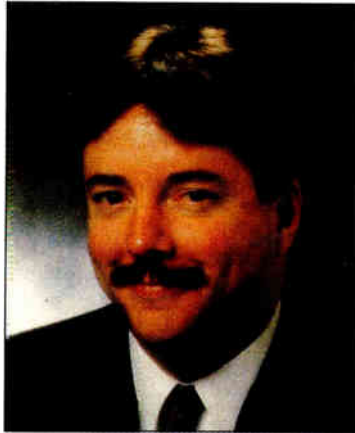
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Circle Reader Service No. 1



We chose this month's cover photo to reflect the theme of the 1995 Western Cable Show—and because it seemed like an appropriate image, given the pace of technological development that is impacting the broadband video market. Make no mistake about it: technology is rocketing forward, and network providers are invited along for the ride, if they're willing to go.



## Fast forward into the future

In fact, the focus on broadband technology has been heating up since the late 1980s, when MSOs slowly realized that fiber optics could provide many benefits, both operational and strategic. When those benefits came to fruition, it put cable TV network operators squarely in the race to become full service providers.

In 1991, digital video compression was the story. The advent of the digital age would vastly increase the number of available channels and allow consumers to "personalize" their TVs and give them instant access to myriad entertainment and information choices. While that effort has been delayed by a lack of product, it appears 1996 will be the year digital set-tops finally emerge on the scene.

Last year, telephony was the buzz. Every major MSO professed a desire to enter the local loop as a telecommunications provider in some capacity. Equipment suppliers began building hardware, the bulk of which will emerge from the labs next year. However, given the amount of capital necessary to construct highly reliable switched networks, and major challenges surrounding interconnection, number portability and other issues, telephony has become a long-term play that will require patience and significant investment.

Now, the focus is squarely on high-speed data provision. Once again, a lack of affordable product has kept network providers from rolling out service, even though there appears to be pent-up demand from both businesses and residential customers. But several trials and expected commercial roll outs will result in real products at lower prices.

What's missing in all these visions of grandeur is the interactivity needed to make it all come true. There is a woeful amount of active two-way cable plant, and even fewer technical people who have experience maintaining and troubleshooting such networks. The cable industry largely abandoned two-way cable systems years ago because they were expensive to maintain and were flawed technically. With fiber, return networks should be easier to maintain, but the hypothesis remains unproven.

Wouldn't it be great to simply press the fast forward button, hurtle through time and land in an environment filled with digital content, instant access to the Internet at tolerable speeds and true competition in the local loop?

Roger Brown  
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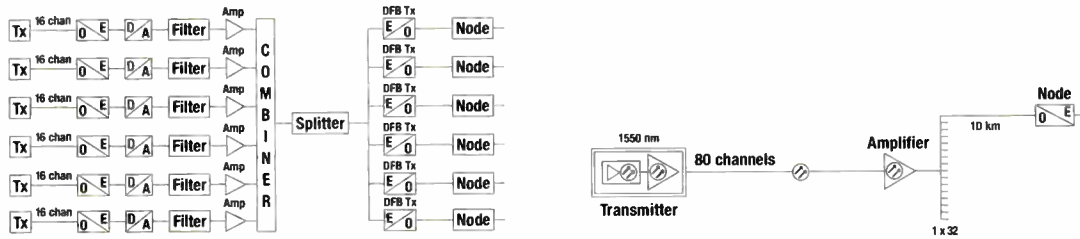
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## 42 Wireless companies face chicken-and-egg

By Dana Cervenka

Both LMDS (Local Multipoint Distribution Service) and IVDS (Interactive Video and Data Service) companies are taking the wireless road to interactivity, with varying degrees of progress. Which comes first: markets, regulation or technology? And what will wireless technologies mean to wired operators?



*CED magazine is recognized by the Society of Cable Telecommunications Engineers.*

## FEATURES

### 50 High-speed data over HFC

By Robert W. Harris, Nortel Broadband Access Networks

If cable operators are to capitalize on the pent-up demand for high-speed, affordable data service, they must have a frame of reference to evaluate data transport and processing products. This article discusses the key service and functionality elements necessary for success with data over HFC.

### 58 Set-top operating systems

By Roger Brown

There's a tug-of-war brewing over set-top operating systems.

### 64 Network management

By Pete Cona, GI Communications Division, General Instrument Corp.

As new multimedia services begin to place greater demands on telecommunications networks, support systems will be key to keeping those networks healthy. Standard interfaces and protocols will ensure compatibility at every level in the network.

### 1A Index of technical articles

This special section contains a complete alphabetical listing of all technology-oriented articles appearing in *CED*, *Multichannel News*, *Convergence* and *Cablevision* during the past year. Pull it out, file it, and use it as a reference tool throughout the year.

### 70 Mediation between systems

By Gerard B. Moersdorf, Applied Innovation Inc.

Sophisticated services will mean nothing if dependability is left to chance. Cable companies must quickly get up to speed on operational support systems, as well as the missing link that connects network elements with OSS.

### 76 Future cable networks

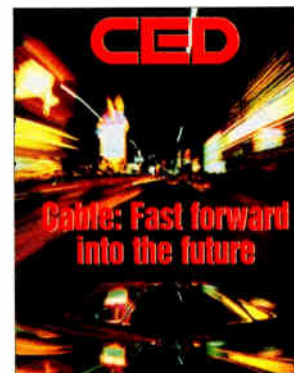
By Alan Stewart, Network Interface Corp.

Is today's hybrid fiber/coax network capable of handling advanced, multimedia services? Or will it stumble over the return path and its tree-and-branch topology? Tests conducted by Bellcore and other industry bodies reveal the answers.

### 84 Museum coming to Denver

By Michael Lafferty

The National Cable Television Center and Museum will be relocated to the University of Denver from Penn State. With that change in scenery will come new educational and industry programs to benefit the general public and the cable industry.



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Photo by Uniphoto.

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## New semiconductor developments promise to lower hardware costs

While most of the new product focus within this publication is on finished products, significant progress is being made within semiconductor fabrication houses that promises to reduce the cost of a number of digital video products, including the in-home set-top box and high-speed modems designed for use with cable plant. Over the past several weeks, major announcements from MicroUnity, AT&T and Broadcom could have a major impact.

In particular, it appears the huge gamble on MicroUnity's top-secret research and development effort to build a "multimedia chip" from the ground up will indeed pay off. According to early press reports, MicroUnity has developed a programmable chip that can process digital signals 100 times faster than products presently available, which could revolutionize applications like interactive TV, Internet access and data encryption. Chip prototypes are due next year, and deployment on a mass scale is expected to begin in 1997.

The \$100 million R&D effort undertaken by the Sunnyvale, Calif. company has been funded by a number of huge computer and media companies, including Tele-Communications Inc., Time Warner, Microsoft, Hewlett-Packard and others.

MicroUnity CEO John Moussoris said that today's microprocessors have been inefficiently designed for arithmetical computation and require other processors to modulate signals, process graphics and compress audio and video. The MicroUnity chip, on the other hand, was designed for communications from the ground up.

Because it is software programmable, the 1-GHz chip also promises to enable functions that presently have to be burned into the firmware and application specific ICs that reside within today's hardware. For example, new encryption codes could be embedded in the software, making it easier to be updated and distributed.

Meanwhile, a strategic technology alliance between Hewlett-Packard and Broadcom Corp. has resulted in a new digital transmission chip that promises to drastically reduce the manufacturing cost of digital set-top boxes by reducing the number of necessary chips.

The new Broadcom BCM3115 QAMLink dual channel receiver features both 64- and 256-QAM (quadrature amplitude modulation) and integrates concatenated Viterbi/Reed-Solomon forward error correction along with

QPSK demodulation, adaptive equalization and de-interleaving RAM into a single chip.

Broadcom's previous product required three QAM chips, plus chips for forward error correction, RAM de-interleaving and QPSK demodulation, to perform the same functions. "The level of integration we have accomplished with the (new chip) reduces the total cost of the transmission portion of the set-top box by a factor of two," said Steve Tsubota, director of Broadcom's cable TV strategic business unit.

As a result, the 100-pin device can now perform more than 1 billion operations per second and utilizes more than a million transistors (by comparison, an Intel Pentium processor has about 3 million transistors). The upshot? Suppliers of digital set-tops can reduce their manufacturing cost from more than \$400 to about \$250 each, according to Broadcom estimates.

HP intends to utilize the new chip in its first generation Kayak set-top, which is scheduled to be delivered to Tele-Communications Inc., Comcast and Cox in mid-1996. To support the initial roll-out, HP has already committed to purchase 500,000 QAMLink chips from Broadcom. The new chip, which is priced at \$70 in 1,000-piece quantities, is already being sampled by strategic customers.

The chip is the first to feature integrated forward error correction, which is critical to error-free network transmission. Error correction works by adding redundancy to the video payload to help detect and correct errors. The redundant information is used to set up mathematical relationships in the user payload; the receiver looks for the relationships, and if they aren't present, it changes the data to restore the relationship.

Compatible with General Instrument's DigiCipher II de facto standard for digitally compressed video, the chip features trellis and Reed-Solomon coding while an interleaving scheme corrects burst errors up to 88 microseconds in length. The chip achieves error-free performance with a signal-to-noise ratio as low as 22.5 dB.

Meanwhile, the QPSK receiver provides a dedicated fixed frequency, 2 Mbps control channel, which allows network providers to individually address subscriber set-tops. Broadcom officials say the fixed channel method eliminates wasteful use of precious downstream bandwidth in every channel.

Although Broadcom has already locked up one customer for the device, it plans to offer it to other network providers, including telcos, DBS providers and MMDS licensees, as well as suppliers of high-speed data modems.

Meanwhile, AT&T Microelectronics has developed a chipset that transmits switched digital video signals over ordinary twisted pair telephone wire. The chips are an outgrowth of a joint development agreement with BroadBand Technologies and will be integrated into BBT's FLX system deployment by France Telecom and into AT&T's SLC 2000 Access with FLX system that will be implemented by Southwestern Bell and Disney's Celebration planned community.

Also, Fujitsu is incorporating the chips in its FACTR system for Singapore Telecom, and NEC is said to be looking at the platform.

With the new Multipoint Broadband Access chips, digital bits of audio, video or data can be transmitted at 51.84 megabits per second, and QPSK return signals can travel at 1.6 Mbps. They are compatible with ATM and incorporate 16-CAP (carrierless amplitude/phase) modulation to deliver the signals at such a high rate of speed.

The chipset will allow any combination of up to six TVs, PCs, telemetry or remote-control systems to be attached and controlled by the switched network. The chips are now being sampled and will be priced at \$45 for a set-top; under \$40 for each home served by an ONU.

In a set-top environment, three chips perform the front end modem function, and produce separate MPEG-2 video and ATM data streams. In an ONU, three chips frame outgoing data, unpacking incoming data and providing the modem function for four video channels.

## SNET fires up network, develops new powering

While the cable industry apparently remains mired in legislative limbo, Southern New England Telephone continues to move on a fast track toward delivering integrated voice, video and data over a hybrid fiber/coax network—and it's patenting new ways to do it.

Even as the telco fired up voice service over the new plant at the end of October, it announced a new network design that could lower the cost of providing backup power in case of catastrophic failure (see figure, page 14). Specifically, the design uses a new cable design consisting of both fiber and copper, the latter of which is used to deliver power to nodes located deep within the network.



# After 29 Peaceful Years In The Cable Industry, Wendell Woody Helped Start A Revolution.



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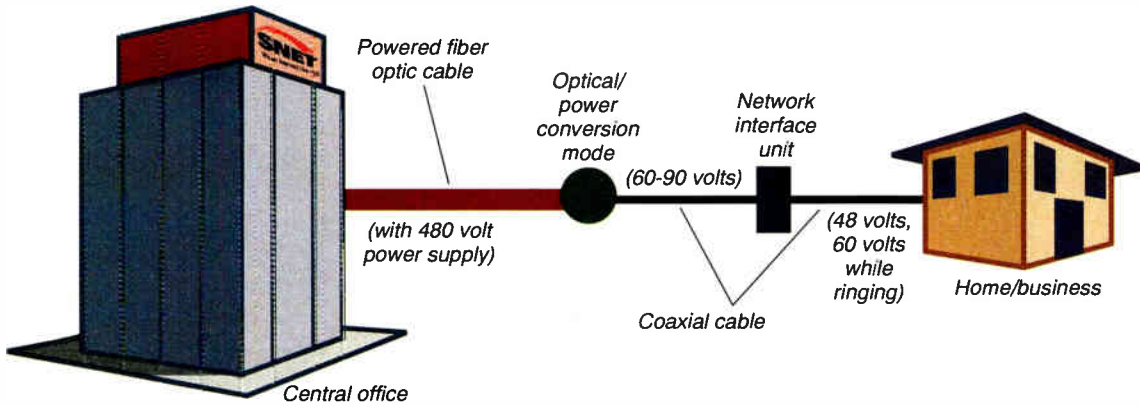
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The new cable consists of fiber strands in the center surrounded by copper cables. The copper is used to transport power, while the fiber carries the video signals.

The new cable will carry up to 480 volts AC from the central office to remote power nodes, where fiber cable connects to coax lines. At the node, a step-down power supply is used to provide low-power current (60 volts), which is common in today's telephony networks.

The unique design leverages existing battery technology and generators, which are located in the central office. It avoids having to rely on the commercial power grid and also avoids using a distributed powering architecture, which typically moves the lead-acid batteries and potentially noisy generators out into the neighborhoods.

By using the existing power architecture, SNET customers will continue to receive power independent of the local power company, making the network more reliable.

SNET officials said they plan to have 80,000 customers on the new network by the end of 1996, and 500,000 customers connected in three years.

## SeaChange jumps into video server market

After previously announcing a technology exchange and licensing agreement with Prevue Networks to develop new interactive television enabling technology, SeaChange Technology last month announced it has entered the video file server market with the introduction of the Video Server 100.

The new platform is based on the Windows NT operating system and features an Intel Pentium processor. The unit, which holds up to 12 disk drives, has a maximum bit rate output of about 150 megabits per second, according

to Edward McGrath, SeaChange vice president of engineering and chief technology officer.

The unit will come stocked with 12, 4-gigabyte drives, giving it a 48-gigabyte capacity in just six headend rack units. However, those drives can be upgraded to 9-gigabyte drives when those become more readily available in 1996, McGrath said. If more capacity is needed, additional units can be daisy chained together. In its most basic configuration, the server is expected to cost about \$20,000, SeaChange officials said.

The new server is compatible with SeaChange's ad insertion system, which has already been deployed by several cable



**The Video Server 100, from SeaChange Technology**

MSOs in more than 50 locations. The system's flexible software architecture accommodates various lengths of video for ad insertion, digital movie applications such as near video-on-demand, and others, company spokesmen said.

With the Video Server 100, SeaChange will support several networks, including T-1, Ethernet, FDDI, ATM and Sonet, as well as

the popular traffic and billing systems.

And already SeaChange has two customers for the new product, including Time Warner Cable in New York City and Prevue Network. Time Warner will use the server to add 24 more channels of digital ad insertion (for a total of 40 channels); Prevue will purchase hundreds of specially modified units to develop a new digital programming delivery system, which is scheduled to be rolled out to more than 3,500 cable headends.

Prevue will use the vast network to deliver both its existing products as well as interactive services, Prevue Express and a host of ancillary services and near video-on-demand capability. It can also be used by third-party users, including interactive service providers, home shopping programmers, on-line data services, infomercials and more.

## S-A unveils new fiber transmission system

Scientific-Atlanta has introduced a new fiber optic transmission system that promises to greatly enhance network reliability while allowing network providers to cost-effectively drive more fiber deeper into their systems for narrowcasting purposes.

Dubbed "System 70," the new platform is a complementary upgrade to the company's popular System 60 platform that features greater reliability, modularity and maintainability, while taking up less headend space than its predecessor, said Andy Meyer, director of marketing for transmission systems at S-A.

When compared to its present product, S-A has made a number of upgrades to its fiber transmission system, including:

- ✓ More modules per chassis. By removing power supplies from each module and placing it on the backplane, each chassis can now hold up to 10 modules, not just four;
- ✓ Adjustable optical power. Previously, lasers had to be specially chosen for a certain link and were set at the factory. By utilizing drive current attenuation, the number of laser choices has been reduced to about three families of product;
- ✓ New powering options. Whereas System 60 offered 120 VAC power with 24 VDC backup, the new system offers a universal AC supply or



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-48 VDC, making it compatible with all common worldwide powering options.

In addition, the new platform will soon be able to support 1550 nm technology, which is becoming more commonplace as operators collapse remote headends and interconnect systems to cover wider geographical areas.

## Probita develops solution to huge data file transfer

As the video networking industry begins its headlong plunge into the digital era, one challenge will be finding a way to distribute bits simultaneously to several different headends. But then again, maybe it won't be a problem. Software provider Probita Inc. has introduced its "Proclaim" software, which is designed to do just that.

For example, a regional advertising interconnect might want to distribute ads or an infomercial to some locations, but not others. The Proclaim product was specifically designed to transmit huge data files to specific, targeted locations over a variety of different transport mechanisms, said Don Burt, president of Boulder, Colo.-based Probita.

The software, which is presently capable of supporting more than 2,000 connected sites, can be upgraded to support an unlimited number of sites. Furthermore, it supports a range of different transport link technologies, including microwave, fiber rings, ATM network, frame relay, SMDS, ISDN (switched or dedicated), DDS lines, satellite or modems.

The new Proclaim software also features network management capabilities and can be integrated with Digital Equipment Corp.'s TeMIP network management platform. In fact, Probita and DEC have formed a strategic partnership to deploy, integrate and support the TeMIP system, which is popular among telephone switching systems, for cable MSOs and other video providers.

Within the TeMIP modular architecture, Probita intends to build application modules to identify possible failures in hardware and determine how to fix them; presentation modules to graphically display the information to CSRs; and will use TeMIP tools to develop interfaces to operations support systems.

## Stanford Telecom shows headend burst receiver

Maybe interactive TV isn't as dead as some people think. Stanford Telecom last month took the wraps off a new burst receiver designed for cable TV headend equipment.

The STEL-9244 provides demodulation functions that enable upstream signals transmitted by subscribers to be received by headend gear.

The board-level QPSK headend receiver has been designed to exist in a noisy and ingress-susceptible return channel. Prototype products have been tested using actual upstream echo profile measurements from cable networks, and signal degradation is typically less than 0.5 dB, according to reports from the company.

The unit operates within the 5 MHz to 40 MHz return band at 2.59 Mbps, which allows operators to efficiently use the return bandwidth for both telephony and data applications.

Stanford Telecom a year ago announced a companion product which provides either QPSK or BPSK modulation of upstream signals from a set-top or cable modem. Such robust modulation schemes are deemed to be necessary in return channels that could be plagued by noise and distortion.

The burst receiver is expected to be available in production quantities in April 1996.

## CED adds two to Denver office

To cap off a highly successful year, *CED* magazine is pleased to announce the addition of two new staff members in the publication's Denver headquarters.

Mike Lafferty has joined the editorial staff as an associate editor and will concentrate his efforts on writing about telecommunications and data communications issues as they apply in the broadband world.

Prior to coming to *CED*, Mike spent two years in Denver as a freelance writer and most recently was part of a team that put together the soon-to-be-released Jones Interactive CD-ROM encyclopedia on the information superhighway.

Alan Ring comes to *CED* as national accounts manager. Ring comes to *CED* from within the Chilton organization, where he served as a regional sales manager for *Energy User News* and *Instrumentation and Automation News*. Prior to that, he managed sales regions for several technology-based publications, including *Fiberoptics Product News*, *Lasers and Applications* (now *Lasers and Optronics*) and *Microwave Systems News*.

"I am excited to add these dynamic individuals to our team," said Rob Stuehrk, publisher of *CED*. "Mike's diverse background and Alan's experience with high technology will be a great asset to *CED* magazine and will help propel us to new heights in the future."

## Jottings

To correct a mistatement in the October "In Perspective," the frequency agile modulators in the Jones Alexandria, Va. headend were manufactured by Barco. In fact, the entire headend and control system consists of Barco equipment. *CED* regrets the error . . .

November must have been "old home" month. Two long-time industry veterans returned to their former employers last month in key leadership positions.

First, Steve Necessary parted ways with Antec after four years to return to Scientific-Atlanta as vice president and general manager of analog subscriber systems, and will direct the development of new analog set-tops and related system management equipment.

Second, Dave Robinson left his post at AT&T Network Systems to be vice president and general manager of the digital network systems business unit at General Instrument, where he worked for 10 years before going to AT&T in 1993. Robinson will manage the development and deployment of terrestrial digital technologies . . . Solidifying its role as the sole standards-developing body for the cable television industry, the Society of Cable Telecommunications Engineers (SCTE) has been recognized by the American National Standards Institute. Now that the organization has been accredited by ANSI, it plans to submit 16 standards developed by its interface practices subcommittee for approval, including drop cable and connector specifications, as well as several test procedures . . .

Got an idea for a technical paper? The SCTE is currently accepting proposals for technical papers and/or workshops to be presented at Cable-Tec Expo '96, slated for June 10-13, 1995 in Nashville. Abstracts are due by December 15. Fax submissions to: 610/363-5898 . . . Viacom Cable plans to test the Tellabs Cablespan 2300 cablephone system over its Castro Valley system to about 200 single-family homes, beginning next month. The six-month test will focus on delivering integrated cable TV and telephony services over the hybrid fiber/coax network. Viacom is the fifth MSO to test Tellabs gear, joining Time Warner, Adelphia, TeleWest and Time Warner/Advanced Newhouse . . .

The David Sarnoff Research Center and ACTV will jointly develop new digital products designed to "personalize" TV viewing options. ACTV software, which allows users to determine video and audio sources, will be combined with technology developed by Sarnoff, which includes video compression equipment, video servers, three-dimensional TV and distance learning technologies . . . **CED**



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# Tanner ponders technology for Tele-TV



Craig Tanner

Craig Tanner is a guy who likes order. All the details pinned down, and all the loose ends tied up in a bow. And that, he says, is precisely why he chose electronics

as a career. "You can design a circuit or a system," says Tanner, "and know precisely what it's going to do, and that it will do it for years, very reliably."

The value of order, precision and the scientific method were driven home to a very young Tanner one Christmas night long ago. His father, a precise and deliberate chemist, gave his son a chemistry set as a present. Not waiting for his father's guiding hand, the younger Tanner, on the sly, took the kit, snuck into another room in the house, and closed the door. "I took as many chemicals as I could, mixed them into one jar and shook them up," he recalls. "Something fizzed, and I wound up with black spots sprayed all over the walls. My father spent about three hours Christmas night washing those walls." So much for a career in chemistry.

These days, as the recently-appointed senior vice president, Advanced Technologies for Tele-TV Systems, Tanner will probably have all the order and structure he could wish for, working within the guidelines provided by three RBOCs: Bell Atlantic, Nynex and Pacific Telesis. Part of his job includes

evaluating the blitzkrieg of new technologies for delivering broadband services, making sure that Tele-TV picks the right technologies and vendors which will complement its internal development efforts.

"We are trying to put in a platform at Tele-TV that will serve as a base for the development of services not yet thought of," Tanner elaborates. The consortium's task, and that of other broadband, interactive service providers, is analogous to what happened with the World Wide Web, a computer network of networks, he explains. "The platform was a PC, a data network, some client software, some server software," notes Tanner. "But it was generalized enough and easy enough to use that there are now Web masters at many, many companies who are creating attractive pages and Web sites which reflect the company's personality and products."

Tele-TV's recruitment of Tanner was quite a coup; he has held engineering and management positions with a manufacturer (Sony Corporation of America), a major broadcast network (CBS Inc.) and a research and development consortium (CableLabs), where he served as vice president, Advanced Television Projects. After working in so many different environments, he's finding out a lot about the world of telephone companies. "Telcos are extremely strong in the information technology that surrounds the delivery of a signal and a service," he reflects. "That includes business support sys-

tems, the things that allow you to provide customer service, to market effectively."

Keeping with that theme, Tanner's strategic planning for the consortium includes a focus on signal quality issues. "It's not enough to just marginally beat VHS," he notes. "It's not enough to equal the quality of NTSC. We have the opportunity to provide video and audio quality that are substantially better. And HDTV is another level of improvement that's going to come."

## Making cable's voice heard

In fact, Tanner is well-versed in the issues surrounding quality and HDTV. During a six-and-a-half year stint with CableLabs, he went head-to-head with broadcast representatives participating in the FCC's Advisory Committee on HDTV, as he made certain that the cable industry's interests were considered in the HDTV standard. He also managed the issuance of CableLabs' RFP for digital compression systems, formalizing the industry's requirements and encouraging vendors to respond.

Not only has Tanner switched industries a few times during his career, but he's switched disciplines as well. Fresh out of college, he joined the engineering and development department of CBS in 1976, starting out as an audio/video design engineer. But in a twist that's atypical for most technical gurus, he was soon invited to put hands to keyboard and write copy, in a "technical PR" position as manager of information services. And simultaneous with finishing his MBA in finance, CBS asked him to join the investor relations department as director of shareholder communications.

"The reason they went after me for the investor relations department," says Tanner, "is that it was at a time when Wall Street was saying the broadcast networks were going to have their lunch eaten by the new media."

## A channel for every mood

Tanner is one of the fortunate few who has managed to marry two of his loves, electronics and entertainment, into one career. He and wife Valerie are avid watchers of suspense films with unexpected plot twists, like "No Way Out," with Kevin Costner. He also catches the occasional "Gary Shandling" show. What is less attractive about his chosen career path is how much time it requires Tanner to be on the road, and away from his wife and two children: Lindsay and Daniel. "I tend not to do a lot of other things on my own time," he adds, "simply because I like to spend time with my family."

From his experiences as a consumer of entertainment services, Tanner has composed a personal vision of the future of broadband communications. "The range of human moods is much broader than anything that can be encompassed by even 100 channels," he theorizes. "Television is going to be enormously enriched when you have access to things without having to plan too carefully.... Television will be so good, that it will be hard to tear yourself away from it, and do all the things that we have to do in life."

—Dana Cervenka



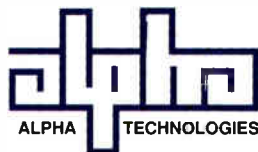
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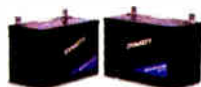
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# Net surfers need cable's bandwidth



By Wendell Bailey,  
VP of Science  
and Technology, NCTA

With the continued growth of the Internet (millions of regular users and hundreds of database sites) and the cable television industry's interest in offering high-speed data access to existing on-line services (such as Prodigy, AOL and CompuServe), an interesting shift in technology is beginning to take place. The cable industry has an outstanding opportunity to offer its subscribers new, high-speed services, but sometimes I think the rest of the telecommunications world knows only about cable's retail product and nothing about its network capabilities.

While cable operators can bring a new level of interest and capability to those who struggle along with a 14.4 baud rate or slower modem, there may be other ways that they can improve the situation. Several things have happened lately to bring into focus the real ability of the industry's native resources to change the world of telecommunications.

## A strain on the Net

It's nearly impossible to read a magazine, newspaper or book these days without coming across an article or letter about the amazing usefulness, value and plain growth of the Internet.

Likewise, one cannot read for long without seeing an accolade or two about the absolutely phenomenal interest in and growth of the World Wide Web. Lately, however, there is a new refrain. It seems that the very benefits that the availability of free-to-all Web browsers have bestowed on would-be net surfers have put a remarkable strain on the infrastructure of the Internet itself.

Yes, it appears that once everyone got a Netscape or Prodigy Web browser and found out how truly easy and fun Web browsing could be, that a sort of reverse chicken-and-egg cycle was initiated. As soon as a few people had easy-to-use Web navigators, a few more people put up home pages. As soon as a few people put up home pages, more people heard about them and got access to the Web (usually through Prodigy and AOL, but also by many other means), and more newly computer literate people became Web browsers themselves.

None of this in and of itself is all that unusual, but what is different about this sequence is that the traditional Internet users were (and perhaps still are) primarily text-oriented browsers. The new, enthusiastic Web junkies turn out to be a lot more image and sound fixated—and not just with simple graphics, but photos and even film clips.

As we all know, images are many times more capacity hungry than plain old text. This has put a new strain

on the basic Net connections. When this change in the type of Internet traffic is coupled with the geometric daily growth of new Web users, it all leads to trouble right here in River City, and that is nowhere good. Capacity needs are not just limited to the connection from the last server to the end user. Capacity is an important commodity in literally tens of thousands of links between one machine and the next all over the global Internet.

## Sophisticated users

All of this leads to the following series of logic tidbits. If the Internet is growing (it seems to be), and the greatest area of growth is in the World Wide Web (or so the newspapers say), and the users of the Web are growing their use of graphics, and the number of Home Page sites on the Web is growing in response to this demand, and those who are building their new sites are doing so that they have what the majority of Web browsers apparently want, then, the major need for the continued usefulness of the Internet is—drum roll, please—bandwidth!

There are a couple of places and/or ways to get bandwidth, and the cable television industry is sitting on the best, most efficient, most available source of the stuff currently known. If we were to think of the managers of the Internet network infrastructure as the customer of this substance, we could find ourselves as the vendor of the primary enabling substance in the continued importance of the Internet.

And the nice thing about this type of customer, for this type of service, is that it doesn't care what program is on or what channels the operator carries. They also have the ability to diagnose faults (frequently with sophisticated automatic software), and they understand technical problems in a way that cable's regular subscribers usually do not.

So I would suggest that cable companies which are looking at the issues involved in offering high-speed data service access to their subscribers also look into whether or not there is a need in their communities for high-capacity interconnect-type services.

## Cable's opportunity

Several cable companies have been offering this type of service for many years, but most of those connections are involved in the I-Net type of service, which pays very little.

Operators should give some thought to the connection between the customers they are seeking to connect up to on-line services, and the needs of the on-line services themselves to have improved inter-node linkage.

Now that the Internet is no longer going to be maintained by the U.S. government, those who will have to maintain it will be looking for ways to make it more robust, more reliable and more capable. Maybe the cable industry has a chance to meet some or all of their needs. **CED**





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Sometimes a subject cannot be adequately addressed in one column, so now, at the end of the year, a couple of soup pots must be stirred once more.

# Stirring the soup pots again



By Jim Farmer, Chief Technical Officer, Antec Technology Center

## Return Path

Last month, this column discussed some of the implications of blocking signals emanating from the home. This was based on the premise that something must be done to prevent energy in the home from getting onto the return path. Several published and unpublished reports suggest that the home plays a major role in introducing interference onto the reverse path.

Had this role been recognized earlier, could the return have been used more effectively in the days of tree-and-branch architectures? Because there were few economic motivations to make the reverse work, no one worked all that hard to optimize return path performance.

Now, nodal architectures have emerged, primarily to improve reliability and quality. As an added benefit, a nodal architecture yields more capacity in the return direction. This is true because the same return frequencies may be reused from one node to another. Because each node serves only a small number of homes, fewer

homes contribute noise in any one path back to the headend. Some people feel that, as a result, it is not necessary to do anything special at the home to prevent interference from escaping. The reasoning is that fewer homes contribute noise, so there is less need to clean up the noise.

Furthermore, filters on the drop make it more difficult to get signals out of the home. Some are advocating band stop filters that pass 5-15 MHz and block 15-40 MHz (with some reasonable transition band). The band 5-15 MHz includes a number of existing RF IPPV module return bands.

A hidden danger is anecdotal evidence that not all homes on a node contribute equally to return interference. Some investigators report finding individual homes which place the bulk of the noise on the return. Worse, the noise is intermittent, making it difficult to predict or to troubleshoot problems. If this is indeed the case, then it would be prudent to filter all drops even if noise doesn't exist at the moment the return path is examined.

The kinds of services put on the return will largely be digital in nature, using robust modulation methods. This is good. And dangerous. When a problem exists, an operator may not know anything is wrong until the return is completely broken. This will be very visible to customers and will make the cable operator vulner-

able to attacks by the competition, who will say cable is not reliable.

Another column a few months ago attempted to give some tips for working with vendors when buying new systems not previously employed. The column was inspired by the number of systems which claimed they would revolutionize the industry, but which went bust instead of boom. Some months earlier, when I was visiting a client, a possible column of suggestions for working with suppliers was mentioned. My client had his roots in military contracting. He joked that the government, with its unlimited resources, has been buying electronics for more than 50 years and still hasn't learned to do it right. However, we agreed that equipment buyers can improve their chances somewhat with a critical look at what they are being told. Anyone else have any suggestions? By the way, to the several sales-type friends who took exception to the statement, "(Risks) always exist, regardless of what the salesman says," I wasn't talking about you—it was the other guy. (Is there justice in this old joke? Q: How can you tell when a salesman is lying? A: His mouth is moving.)

An operator needs tools to help analyze a vendor's offerings, as that column attempted to address. Had space permitted, the column would also have covered the problems an operator is up against, which makes bringing up new systems so critical. It's not enough to deal with new technology, but there are always subscribers and franchising authorities who are looking for rocks to throw. There are competitors today who make a lot of aggressive claims as to what they would do if they had the franchise (it's easy to promise when you don't have to deliver). Seems as if some franchising agencies are the cable equivalent of speed traps. Finding the cable operator in some infraction is a good way to maybe get some trees planted.

The operator deserves to be told the truth. Of course, as Larry Clayton, my mentor, liked to say, "Hope springs eternal." Vendors are as bad as anyone at thinking the solution lies just beyond the next modification.

## And, powering

Finally, when this column discussed distributing power at other than 60 volts, 60 Hertz, one statement suggested that direct current was frowned upon for power distribution. It is a well known principle of physics that direct current passing through the junction of two different metals will, in the presence of an electrolyte (humidity plus impurities in the air will do nicely), cause migration of metal from one surface to the other. The result is failed connections, sooner or later. A friend, a metallurgy specialist, called my attention to the fact that the old L3 long distance coax telephony system used 2,200 volts direct current for power distribution. When asked how the system was connectorized, he replied, "very carefully and very expensively."

OK, the soup has been stirred for the last time. Hope you have the best holiday season yet. **CED**

## Have a comment?

Contact Jim via e-mail at: [jfarmer@ix.netcom.com](mailto:jfarmer@ix.netcom.com)



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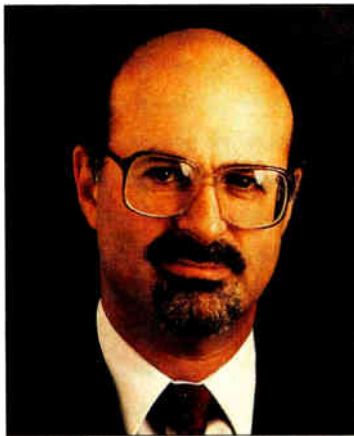
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# Standards and strategic jockeying



By Jeffrey Krauss, obfuscator of technobabble and President of Telecommunications and Technology Policy

The strategic implications of technical standards play a major role in the joint EIA/NCTA standards committees. There is strategic jockeying between the consumer electronics (CE) industry and the cable industry, and even within the CE industry. Never fear, though. Eventually, we will have standards—lots of them, just like the computer industry.

## The Decoder Interface

The EIA and NCTA are working on the final stages of an interface between TVs and cable decoders that won't disable the tuner in the TV set. The cable decoder would use the TV's tuner. This interface is similar, but not exactly identical, to a consumer electronics specification called "AVBus" which could be used for linking the TV and the VCR. AVBus and a closely-related home automation standard known as "CEBus" both use a command language called "CAL."

The Decoder Interface will become a bottleneck that could limit the interactions between cable subscribers and the cable system. The Decoder Interface requires the TV to receive the infrared control signals from a handheld remote control, translate them into CAL commands and send them to the decoder.

Some cable folks think the IR signals are the "crown jewels" of the business and are not too happy about this.

Meanwhile, the CAL language would become established as a standard for communications not only between TV and cable decoders, but also communications among all consumer electronics and home automation products. Echelon, a company that designs home automation networks, uses a competing approach, and feels it would be placed at a marketplace disadvantage.

Echelon has raised antitrust concerns, concerns which are buttressed by the EIA/NCTA voting procedures. On important issues, the cable industry gets one vote, and the consumer electronics industry gets one vote, and both must agree. Outsiders like Echelon, computer companies or telephone companies aren't allowed to vote. None of this "one company-one vote" requirement that applies to other standards committees.

This voting policy has already created confusion. At one recent meeting, a proposal passed by a vote of 17-3 of those companies present. At the next meeting, the EIA said that the 17-3 vote didn't count, because it did not conform to the voting procedures. Evidently, Japanese company representatives, who attend the meetings but never say a word, threw their political weight around within EIA and persuaded EIA to overrule those CE companies that supported the proposal.

Because of minor differences between the Decoder

Interface and the AVBus, it looks like TV sets will need two new interfaces: the Decoder Interface for the cable decoder, and a slightly different one, the AVBus, for the VCR. That's for analog video. For digital video, another EIA committee is deciding on what was going to be one, but now looks like will be two, local area network designs to interconnect TVs, VCRs and cable boxes. A new TV set that meets the FCC's "cable ready" specifications and receives both analog NTSC and digital MPEG video is going to need a whole bunch of new connectors on the back.

## Renewable security

There is general agreement that security is enhanced if the video descrambling or decryption capability is on a replaceable circuit card. For digital MPEG video, the National Renewable Security System (NRSS) Subcommittee is working on the interface between this card and the TV set or cable box. In principle, an NRSS card slot could be built into TV sets, eliminating the need for cable boxes.


The NRSS committee co-chairman was, until recently, a Thomson employee. Consequently, the initial NRSS design was based on the European smart card, because that's the approach that Thomson now uses for its DirecTV boxes. But the European smart card is too thin to contain a battery and other circuitry needed to make the card tamper-proof. The PCMCIA card is thicker, plus, it has more electrical contacts (a smart card has only eight contacts). The additional contacts will permit parallel rather than serial transmission of high speed data, which provides cost, power and temperature advantages.

At the last NRSS meeting, the co-chairman revealed that he had seen the light and now supported a PCMCIA interface. Perhaps his new employer has different strategic interests than Thomson. Don't ever think that these standards committees consist of objective, disinterested engineers. Standards have important strategic consequences, and companies are well aware of this.

In any event, it now looks like there will be two NRSS standards, and TV set makers will have to put both smart card slots and PCMCIA slots into TVs if they hope to stamp out cable boxes.

## Lots of video standards

I don't have space to write in detail about the EIA/NCTA Digital Standards Working Group, but it will probably adopt multiple standards for digital cable TV video compression and transmission, including MPEG-2, DigiCipher, 16 VSB, 64 QAM and a variety of error correction techniques. Anything that is proposed will be included in the standard, whether it will be used by any cable operator or not. Maybe this activity is premature, and they should wait and see what actually gets used.

The cable industry used to be characterized by an absence of technical standards. It's now following the lead of the computer industry. Their motto is "Standards? We love standards! We've got thousands of 'em!!" 

**Have a comment?**  
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# Simple and dangerous interface solutions



By Walter S. Ciciora, Ph.D.

The Decoder Interface work continues to grind onward, making progress, but at a pace slower than most would like. This is partly because the issues are difficult, and no easy solution exists. If we are constrained to use the tuner that is in the TV or VCR, the choices are limited.

Some on the committee have become discouraged over the complexity of the Decoder Interface and have argued that a simpler approach should be taken. There are two proponents of simpleminded solutions. The first argues that we are trying to do more than the 1992 Cable Act requires. They believe all that is required is to just do "the three things" of the Cable Act for basic. The second group says that the Decoder Interface is so complex and expensive that it must be phased into the product line for TVs and VCRs.

### Just do "the three things"

Both of these positions are wrong and dangerous. They will lead to frustrated consumers, more headaches for cable operators and possibly onerous rules or legislation. We would be better off with no solution than a solution which gives "lip service" to the Cable Act but really disadvantages the consumer.

The proponents of the "just do the three things" approach list only the

requirements of the 1992 Cable Act which suit their purposes. They quote the portion of the Cable Act which says that cable operators are required to use conditional access technology so as to: "minimize interference with or nullification of the special functions of subscribers' television receivers or videocassette recorders, including functions that permit the subscriber

- (i) to watch a program on one channel while simultaneously using a videocassette recorder to tape a program on another channel;
- (ii) to use a videocassette recorder to tape two consecutive programs that appear on different channels; and
- (iii) to use advanced television picture generation and display features."

They claim that these "three things" applied to today's basic services are all that is required. They advise against any attempt to anticipate or accommodate future services as beyond what the law requires and more complex than necessary.

The proponents of this approach fail to note the following language from the Cable Act:

"(2) Regulations required

The regulations prescribed by the Commission under this section shall include such regulations as are necessary—...

(B) to require cable operators offering channels whose reception requires a convertor box—

(i) to notify subscribers that they may be unable to benefit from the special functions of their television receivers and videocassette recorders..."

From a practical perspective, this precludes the application of "the three things" to just the current or basic service. A cable operator is required by law to notify subscribers of any situation in which their consumer electronics products—"cable ready" or not—will fail to allow the "three things." Any cable service which is not accommodated by the Decoder Interface would require this warning. This warning will chill the demand for "cable ready" products and cause them to be a marketplace failure. Knowingly taking this route involves a deliberate attempt to frustrate the intentions of the Cable Act and the FCC's rules on compatibility.

The second simpleminded approach argues that rather than implement the full Decoder Interface, a step-by-step approach should be used. The first "cable ready" products would have a very simplified version of the Decoder Interface. Later, more advanced versions of the Decoder Interface would be implemented as the electronics became less expensive.

There are at least two problems with this approach. The first is the requirement that cable operators warn consumers that certain desirable cable services would still need a set-top box. The second problem is in conveying sufficient information to consumers so that they understand the different levels of "cable ready." The marketing of such products will only result in massive consumer confusion, leading to frustration and anger.

### No hurdles allowed!

From a cable operator's perspective, it is critical that no hurdles be placed in the way of subscribers trying and taking new services. The subscriber who buys a "cable ready" TV or VCR—especially one which complies with FCC definitions for "cable ready"—will be reluctant to take any new service which cannot be enjoyed directly with that product and its plug-in modules. He will resist putting a set-top on top of his "cable ready" TV or VCR. This will create a significant barrier to entry for new services for the consumers most likely to be interested in such services; i.e., those who are candidates for advanced "cable ready" TVs and VCRs.

The cable industry cannot agree to any such hobbles. Subscribers must have an easy time of trying new services. This must be done at minimum expense and maximum convenience. A "cable ready" product should not become "non-cable ready" just because an advanced cable service is tried.

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# Integrated cable/telephony solutions

## Planning, and migrating, networks

By Michael J. Bax, Group Manager, New Business Development; and Mary W. Blanchard, Sr. Marketing Manager, Tellabs International Inc.; and Wayne G. Partington, Group Product Manager, Tellabs Operations Inc.

Early cable/telephony networks have been deployed as an overlay to the hybrid fiber/coax network. An overlay network is characterized by separate facilities to connect the telephony subscriber to the digital exchange. Figure 1 illustrates a high-level view of the overlay network. Multiple fibers are deployed from the headend to the fiber node, typically a pair for downstream video signals, one for upstream video signals, and one for the telephony signals. Distribution to the home contains separate feeds—coaxial cable for the video signals and copper twisted pair for the telephony signals. The main disadvantage here is that the narrowband copper drop limits the service provider to only narrowband (64 Kbps) service delivery, typically voice telephony (Plain

(RF) spectrum, both downstream and upstream. Distribution to the home is through a single feed—coaxial cable for both signals. The main advantage of this scheme is that the broadband coax drop enables the service provider to deliver a range of telephony services. Low-speed and high-speed data, video telephony, and LAN interconnection are some of the many services that can be delivered to residential and business customers from this integrated HFC network.

### Integrated cable/telephony network topologies

Residential and business service delivery require different types of integrated solutions. This section examines the different topologies that can be used to meet these service needs.

There is one common element in all integrated topologies—the host digital terminal (HDT), located at the service provider's headend. The HDT provides the telephony interface between the public switching network and the HFC distribution network. But there are a variety of remote terminals, located at the customer's residence or business, depending on the application.

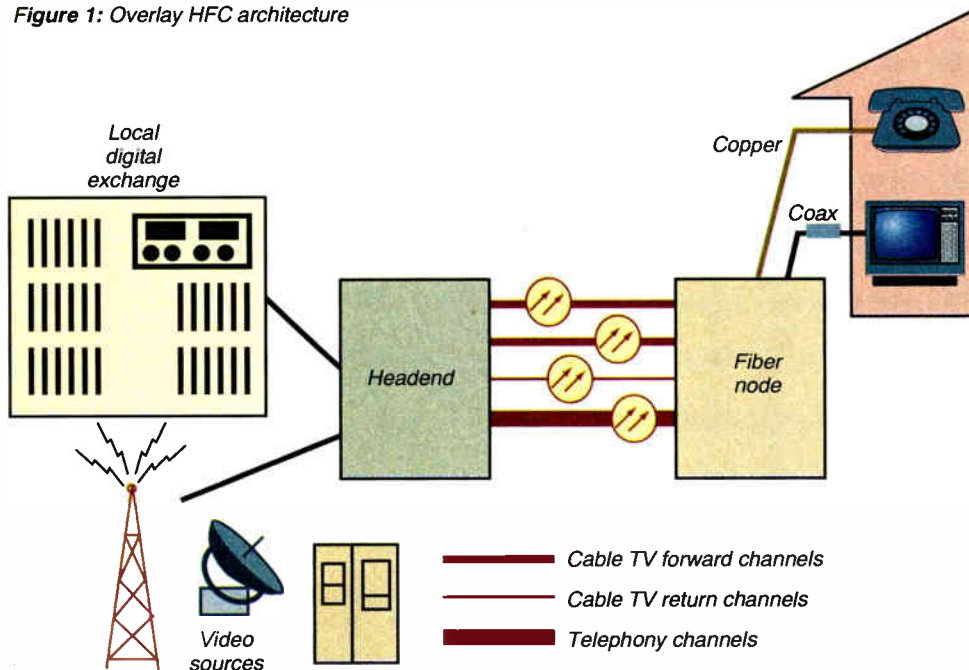
### Residential applications

The first industry implementation for residential applications is the in-house remote terminal for individual homes. This device splits the coaxial drop input into two outputs—typically another coaxial drop to the television or set-top converter for video services, and a standard telephony plug to the telephone for telephony services. Advantages of the in-house terminal center on its straightforward deployment. Environmental conditions and security within the home allow these terminals to be developed simply like consumer electronics devices. One disadvantage of the in-house terminal is the powering scheme. This terminal needs to be powered from the subscriber's home, plus contain multiple-hour battery backup to provide (lifeline) telephony services in the event of power outages. Another disadvantage arises when considering maintenance issues. For some service calls, the service provider may need access inside the home to repair the remote terminal; this creates scheduling problems for the service provider and the subscriber alike. Lastly, there may be "marketing" issues with the in-house unit. Consumers' perceptions that their phone service now requires a new device in addition to the telephone handset,

plus powering that separate device, may be a disadvantage to an alternate service provider who provides competitive service to the national carrier. Nevertheless, an in-house remote terminal may be the only option for service delivery.

Current industry focus for residential applications is directed on external remote terminals'. Mounted outside the house, this device splits the integrated signal

Figure 1: Overlay HFC architecture



Old Telephone Service—POTS).

New cable/telephony networks are being deployed with telephony integrated right into the HFC network. An integrated network is characterized by using the same access facility for both the video services and the telephony services. Figure 2 illustrates a high-level view of these networks. Here, telephony signals are integrated with the video signal in the radio frequency

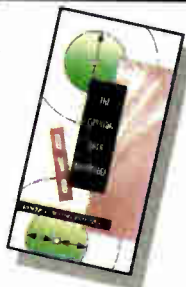


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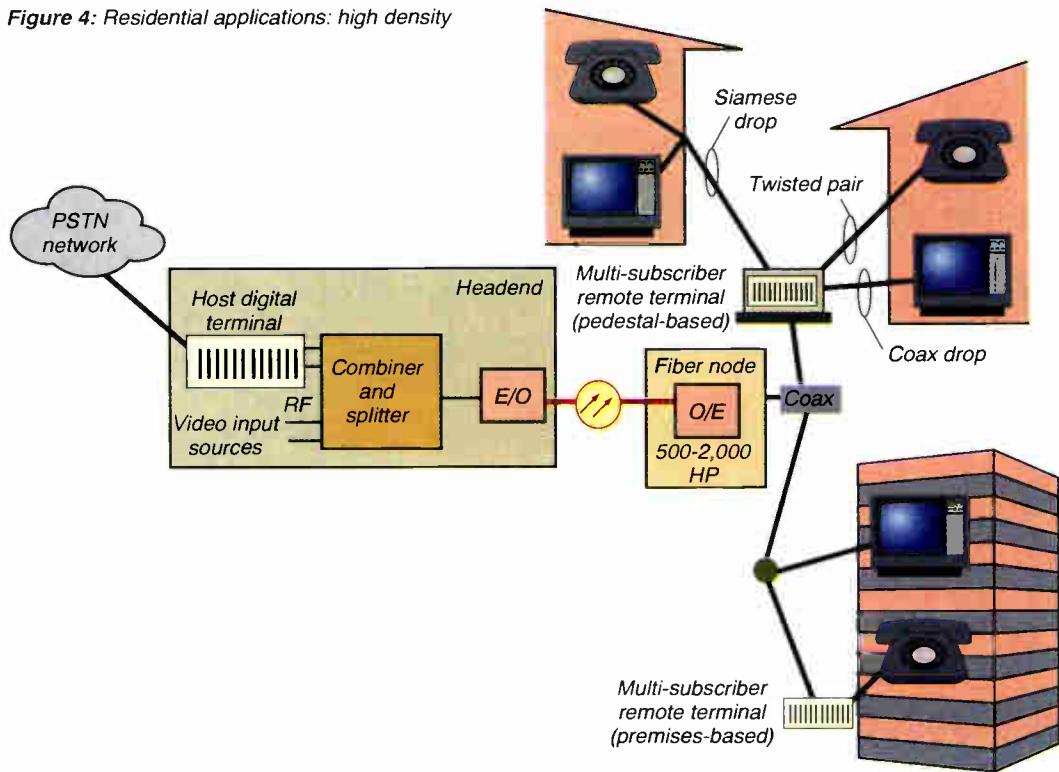
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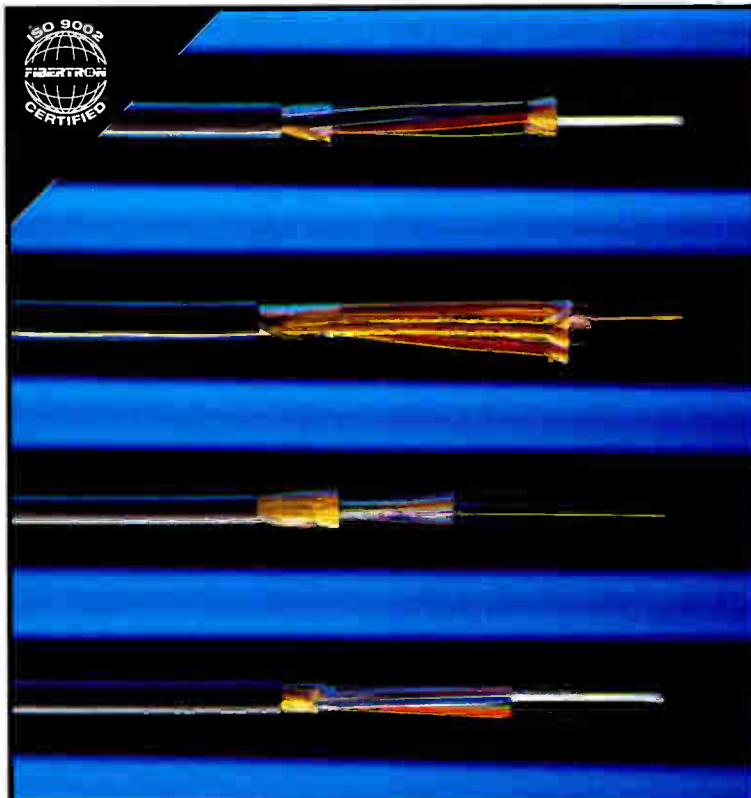
Figure 4: Residential applications: high density



ing in-building copper wiring. The premises-based unit has the same advantages as the pedestal-based unit, and usually requires less stringent environmental features.

The main advantage of both multi-subscriber options is the economics of high-density areas. For pedestal-based units, it is a tradeoff against external remote terminals per home; for premises-based units, it is a tradeoff against in-house remote terminals per apartment. In both cases, the key factor is the anticipated telephony subscription rate. Depending on this rate and the actual HFC topology, these multi-subscriber units are less expensive to deploy.

Residential applications can range widely depending on location (metropolitan, suburban or rural), subscriber demographics and anticipated subscription rates. A portfolio of remote terminal solutions— in-house remote terminals, external



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remote terminals, pedestal-based multi-subscriber terminals and premises-based multi-subscriber terminals—is critical to meet the varying residential service requirements of the service provider.

### Business applications

In much the same way, a portfolio of remote terminal solutions is necessary to meet varying business service requirements. The service provider can utilize the broadband coaxial drop from the integrated HFC network to deliver a wide range of business services. Depending on the size and location of the business, several services and interfaces are required to meet those customers' needs. Figure 5 shows the range

of remote terminal options. In combination with the HDT, these terminals seamlessly add business services onto the cable TV infrastructure.

**With smaller  
channel sizes,  
telephony  
can be spread  
throughout  
the spectrum  
to improve  
fault tolerance**

Enhanced remote terminal: This business terminal is used for telecommuting applications. The target customer would be small businesses within a home, or small offices within or near-by residential communities. Service interfaces are provided for Nx64Kbps data and video conferencing applications, in addition to basic voice telephony.

Remote service terminal: This business terminal can serve many businesses, either in an office tower (with a premises-based terminal) or in an office park (with a pedestal-based terminal).

A full array of service interfaces are provided for the typical business applications, such as voice, dedicated leased line, video conferencing and LAN interconnect.

Mini-remote service terminal: This business terminal can serve several small businesses, co-located in a shopping district or business park. Essentially, this is a hybrid between the enhanced remote terminal and the remote service terminal. Service interfaces would remain the same, but the capacity changes to meet the different density of businesses.

Although not shown in the diagram, these business terminals can co-exist on the same HFC branch as the residential terminals previously discussed. In fact, within metropolitan and suburban areas, this co-existence is the typical requirement. In rural areas, only residential terminals are typically required. These terminals may require additional flexibility to interface with more traditional rural video systems, like microwave video distribution systems (MVDS). The broad portfolio of residential terminals and business terminals discussed here meets all the needs of the service provider.

Several enabling technologies are required to build these integrated cable/telephony networks over HFC architectures. This section examines some of those critical elements.

### RF subsystem

The first dimension of the RF subsystem is the modulation scheme—the algorithm used to encode/decode digital signals to/from the radio frequency spectrum. Figure 8 lists several modulation schemes and their two key characteristics.

Bandwidth efficiency refers to how much digital bandwidth can be encoded into a specified frequency range. This characteristic is very important, since the frequency range available for telephony services is limited, particularly in the return channel (typical networks specify





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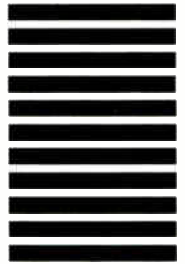
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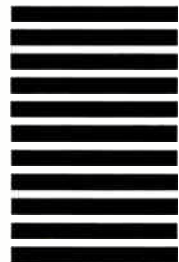
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return channel bandwidth in the 5-30 MHz range). This efficiency is measured as digital bits-per-second per unit frequency (Hz). For example, QPSK provides 1.5 Bps/1 Hz, or equivalently, 1.5 Mbps/1 MHz. QPSK modulation, then, allows an entire T-1 signal to be encoded in 1 MHz of frequency, and an entire E-1 signal in approximately 1.5 MHz of frequency. Required S/N refers to the minimum signal-to-noise ratio required in the forward and return RF channels to allow the modulation scheme to operate at the listed efficiency. As noted in the table, more complex modulation schemes allow more bandwidth efficiency, but there are more stringent noise requirements to achieve that bandwidth. These two characteristics have an impact on network engineering.

Newbuild HFC networks will have advantages due to their topology. Typical HFC networks are currently built with fiber nodes serving 500 to 600 subscribers, which reduces the bandwidth requirements per fiber node. Also, with fiber trunks, new coax, and new forward and return channel amplifiers, noise can be minimized in this HFC system. Under these conditions, higher modulation schemes can be used to meet or exceed the bandwidth requirements per fiber node. Existing HFC or coax-only networks may not have the same advantage. Existing networks typically serve more subscribers per network segment. Existing HFC networks currently serve about 2,000 subscribers per fiber node, and existing coax-only networks can serve up to 10,000 subscribers per coax trunk. Also, larger amounts of noise will exist in all-coax networks. Network engineering may help solve these issues. HFC networks can be split into smaller, 500- to 600-subscriber fiber nodes, and coax networks can be cleaned up for noise problems. However, this may still not be sufficient to enable higher modulation schemes to meet larger bandwidth requirements. Other methods, such as concentration, may be required to address this capacity issue.

The second dimension of the RF subsystem is frequency agility. This refers to the size of the RF carriers (independent of the modulation scheme) and the location of the carriers in the frequency spectrum. Early implementations of RF subsystems required full 6 MHz or 8 MHz channels, as big as a standard NTSC or PAL television channel. Also, these implementations required positions in the low frequency ranges, in place of television channels. These disadvantages in both size and location are addressed with newer implementations. Channel sizes have been reduced down to 1.4 MHz or 2 MHz, and channels can be placed in

the higher frequency spectrum. Both changes provide greater flexibility to the service provider. With higher frequency ranges, telephony services can be added to the system without eliminating a television channel. With smaller channel sizes, telephony services can be spread throughout the spectrum to improve fault tolerance. For example, a 1.5 MHz RF carrier using QPSK modulation carries 30 64-Kbps circuits, and a 6 MHz carrier using


QPSK carries 120 circuits. If there is noise in any part of the 6 MHz carrier, all 120 circuits are impacted and have to be recovered. With the 1.4 MHz carrier, the affected circuits are much fewer.

### Concentration schemes

Concentration can be used to supplement the RF subsystem, to further address high capacity requirements and fault recovery. Of

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
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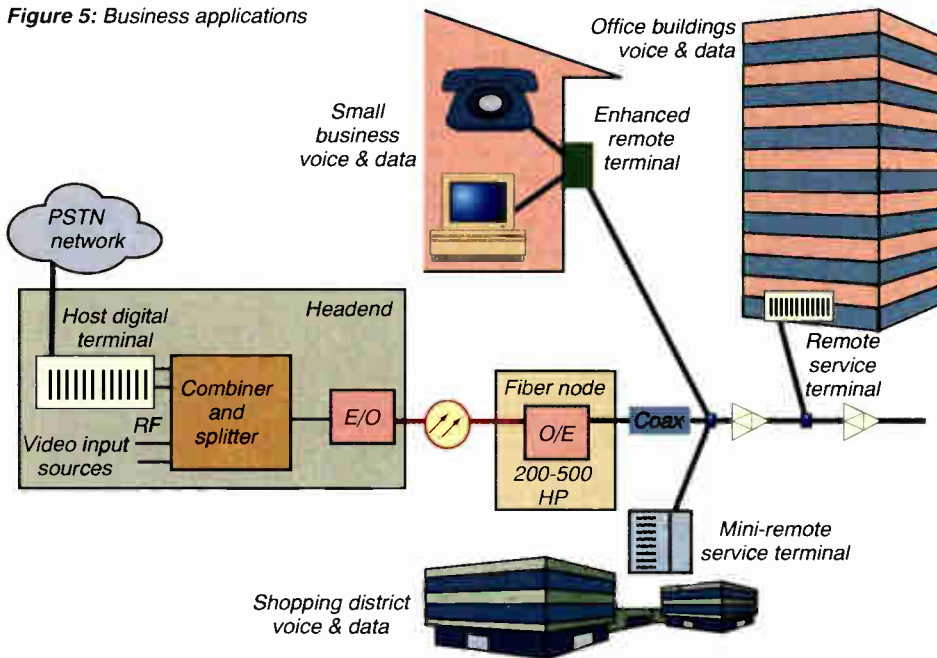
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Figure 5: Business applications



course, concentration applies best when considering residential switched voice service and its typical traffic loading statistics. For integrated cable/telephony, concentration is defined as using less RF bandwidth than the total number of subscriber lines. An example of a 2:1 concentration scheme has 60 subscriber line terminations at the digital exchange and 60 remote terminals, but only a single RF channel that carries 30 6-Kbps channels. With concentration, that single RF channel can be used to serve 60, 90, or even more subscribers, depending on telephone usage. By using concentration, the cable/telephony system allows more subscribers to be served like the higher modulation schemes, but without the stricter SNR requirements of those modulation schemes.

Concentration can also be used in fault recovery schemes for RF channel error conditions. These errors are temporarily created in the presence of noise from direct radio interference or environmental

**"I JUST CONNECTED  
DISNEY TO CHANNEL  
32 WITH THE TOUCH  
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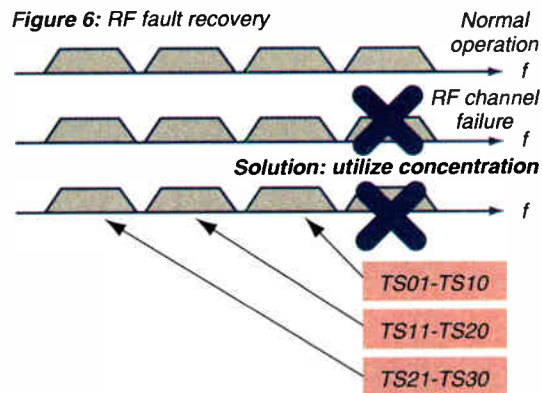
conditions, which can be expected even in new HFC networks or very clean coax networks. A simple error recovery mechanism would switch an RF channel that is experiencing noise problems to a spare RF channel. A more robust error recovery scheme is needed, however, if there are no spare RF channels available. With concentration, all circuits within the failed RF channel can be recovered, assuming statistically normal traffic conditions without all circuits being occupied. Figure 6 illustrates this scenario. Active circuits within the failed RF channel are transparently moved to unused circuits in other RF channels. Idle circuits from that failed RF channel would be dynamically reassigned to other RF channels. When service is required, these additional circuits would contend with the circuits previously assigned to that RF channel.

### Powering methods

Another key element for integrated cable/telephony solutions is the delivery of network power to the remote terminals, particularly the external remote terminals. As discussed earlier, this seems to be the preferred method for the service provider to deliver power. The state of the network affects the powering scheme.

Newbuild HFC networks can have an advantage.

Typical networks are currently built with so-called "Siamese drops" to the home—this term refers to a copper pair and a coaxial cable combined in the same sheath. With this scheme, the coaxial cable is used to deliver integrated cable/telephony services, and the copper pair is used to deliver network power to the remote terminal. The small, incremental cost of a Siamese drop versus coax only at installation provides a large amount of flexibility for the service provider. Existing coax-only networks may not have the same advantage. It would likely be cost-prohibitive to re-install a Siamese drop or even add a simple copper pair. However, network power may be delivered to the home from power-passing taps in the distribution network through the center conductor of the coaxial cable. Current industry development efforts are focused on the operating characteristics of this scheme.



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### Economics

With these enabling technologies, there are several cable/telephony solutions on the market today. This section examines the economics of three types of solutions:

- ✓ Overlay networks
- ✓ Integrated to the pedestal networks

✓ Integrated to the home networks.

Figure 7: Cable/telephony economics

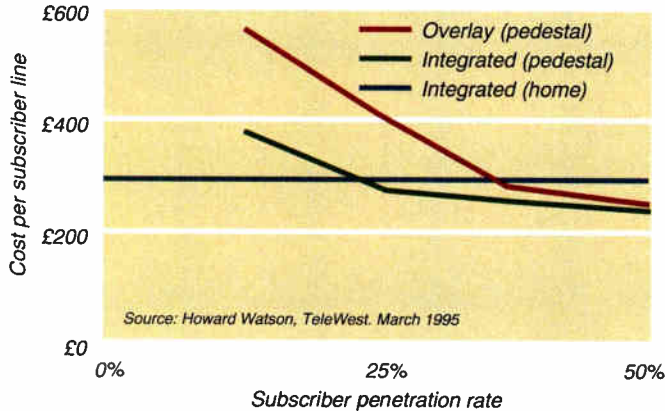


Figure 7 plots the cost per subscriber line for these three solutions, as a function of subscriber penetration rates, as analyzed by TeleWest Communications Group Ltd. in the United Kingdom<sup>2</sup>. The network topology for this study is an HFC network with fiber nodes sized at 500 homes passed; each fiber node serves four pedestals at 125 homes each. The costs represent installed first costs (IFC) for the telephony distribution equipment, facilities and labor. Digital exchange port costs are not included, but are assumed to be equivalent in all three cases.

The first two options, overlay and integrated to the pedestal, are primarily fixed cost models. Each configuration requires some common equipment at the head-end, but more significantly, requires common equipment in every pedestal, even for few subscribers.

Therefore, there are high costs per line when penetration is low; when penetration is high, the cost of this common equipment is spread out over more subscribers. The third option, integrated to the home, is primarily a variable cost model. Some common equipment is required at the head-end, but none at the

Figure 8: Modulation schemes and key characteristics

Modulation scheme	Bandwidth efficiency (bits/sec/Hz)	Required S/N (BER < 10 <sup>-8</sup> )
QPSK	1.5 Bps/Hz	15 dB
16-QAM / 4-VSB	3 Bps/Hz	22 dB
64-QAM / 8-VSB DMT	4.5 Bps/Hz	28 dB
256-QAM / 16-VSB	6 Bps/Hz	34 dB

QPSK - Quadrature phase shift keying  
 n-QAM-Quadrature amplitude modulation, n-level encoding  
 n-VSB-Vestigial side band, n-level encoding  
 DMT-Discrete multi-tone

fiber node or pedestal. Almost all costs are associated with the remote terminal at the home. Costs are incurred incrementally when the units are deployed to new subscribers, so the cost curve is relatively flat over all penetration rates.

Two observations can be made from the graph. First, an integrated solution to the pedestal is always less

expensive than an overlay solution to the pedestal, regardless of the penetration rate. Secondly, an integrated solution to the home is less expensive than an integrated solution to the pedestal, up to penetration rates of 25 percent. Using both integrated solutions, the service provider can employ a least-cost formula for delivering telephony service-home units for low penetration rates or low density areas (like rural communities), and pedestal units for high penetration rates or high density areas (like suburban or urban areas). It is also likely that these integrated solutions will provide additional benefits for life cycle costs, such as power and maintenance.

### Conclusion

Integrated cable/telephony solutions strongly support an evolution path for network operators to deliver broadband cable TV and telephony services. These solutions allow the seamless addition of telephony services onto new or existing cable TV systems. Through RF technologies, these services can be added without disrupting or changing the existing infrastructure. Through cost-effective platforms, telephony services can be added at costs less than those of other traditional telephony distribution technologies. And through flexibility, the broadband connection provided by the coaxial drop offers migration to business services and value-added residential services, thereby protecting the service provider's investment. The portfolio of integrated cable/telephony solutions—in-house and external remote terminals; pedestal-based and premises-based multi-subscriber terminals; and business terminals—delivers flexibility to the service provider to meet a wide range of their customers' needs, now and into the future. CED

### Acknowledgements

The authors thank several members of Tellabs' Worldwide Cable/Telephony Planning team for their support of this paper and for their review of this manuscript. The authors especially thank J. Howard Watson of TeleWest Communication Group Ltd. in the United Kingdom for providing the economic data.

### References

1. There is also industry activity for integrating telephony functions into the cable TV set-top convertor. This poses the same issues as the in-house remote terminal, and introduces some new problems as well. Packaging telephony modules to fit into the convertor must keep pace with the rapid evolution of the convertor for other (multimedia) services. Also, convertors may not be required for basic television service. The integrated convertor does not address telephony services universally, and will not be discussed further in this paper.

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Note: This article was derived from a paper presented at the 1995 NFOEC, Boston.

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# Wireless cos grapple with age-old dilemma

Which comes first?  
The chicken? Or  
the egg?



By Dana Cervenka

**W**hile cable operators and telcos are wrestling with the technical and business issues surrounding the implementation of interactive, multimedia services over a wired network, there are other service providers and manufacturers who are taking the wireless path to interactivity, with varying degrees of progress. Though wireless services are certainly competitive to wired networks, there may be more synergies between the two than many would have thought. Maybe the issues for those with wired networks won't turn out to be fiber-to-the-curb vs. HFC vs. switched digital video, or how to fire up the return path, after all.

For the moment, though, both LMDS and IVDS operators and manufacturers are facing a severe case of chicken-and-the-egg syndrome: which comes first—technology, regulation or markets?

## New entrant

Even though market and regulatory issues are muddying up in the waters in the United States, manufacturing giant Texas Instruments is gearing up to offer end-to-end systems for the LMDS (Local Multipoint Distribution Service) market by mid-1996. TI's version of LMDS, a wireless delivery system which utilizes a one gigahertz pipe to send two-way, digital voice, video and data to subscribers, is being touted as a way for service providers to quickly get into the

multimedia business without the expense of upgrading their existing, hardwired plant. It's also being touted as a quick way for service providers to start from scratch.

Although TI is initially targeting local and interexchange carriers with its LMDS line, company officials were "pleasantly surprised" that cable companies and competitive access providers were interested in the technology as well, as a means to overlay the competition's plant, says Bruce Robidou, LMDS business development manager for Texas Instruments LMDS, a business unit within TI Communications & Electronics Systems. Telcos see it as a quick way to get into video; cable companies see it as a means to deliver telephony, elaborates Robidou, and "everyone wants to deliver data."

In fact, TI, which has had a working LMDS system at its Dallas facility for more than a year, has been conducting trials of the technology with both telcos and MSOs, though it's under non-disclosure agreements with the players involved. "It seems to be a sensitive topic for them (customers), as everyone here, at least in the U.S., starts to look toward the spectrum auctions," explains Robidou. "They don't wish to tip their hands as to who they are aligned with."

The current regulatory picture does complicate things somewhat. Though the FCC plans to auction



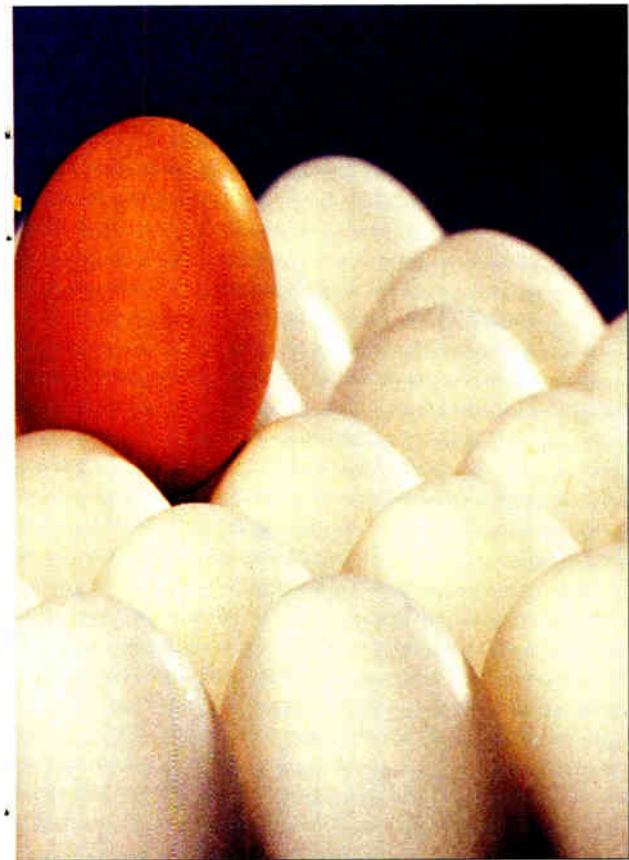


PHOTO BY DAVID DE LOSSY, THE IMAGE BANK

a small, roof-top antenna and the network interface (NIU) which converts the transmission into its separate components: video, voice and data. "We are going to bring a partner on board, which we will be announcing shortly, to help us with the [digital] set-top box, so that we can provide a complete, end-to-end system," says Robidou. TI will also partner with a "major supplier" in the telephony world to secure access to a telephony interface.

### The incumbent

While TI may be the latest to enter the LMDS arena, it is not the first. Incumbent LMDS provider—and manufacturer—CellularVision received a special commercial license from the FCC in 1991 to deliver the service to the New York PMSA (primary metropolitan statistical area), which includes the five boroughs of New York City and the three surrounding counties—Rockland, Putnam and Westchester. CellularVision of New York, the operating entity, currently offers consumers a 49-channel service from a cell site in Brooklyn. It has plenty of wired and wireless competition in its serving area, going up against the likes of Time Warner Cable, Cablevision, Liberty Cable and DBS.

While CellularVision's LMDS technology has the capability to provide a full range of interactive, multimedia services, the company is currently licensed to provide one-way video only, though company officials anticipate that will change this January, when the FCC is expected to grant them permission to offer telephony-based services as well, as part of a Pioneer's Preference.

CellularVision is really two entities, with two different strategies. CellularVision Technologies & Telecommunications (CT&T, L.P.) is the technology company which holds all patent rights and is concentrating on licensing its technology to diverse service providers around the world. Currently, the company has licensed its technology to entities in about 17 different countries, with an expectation that by year's end, that number will have climbed to 40. One of those licensing agreements has been inked with Western International Communications in Canada, the country's largest private broadcaster, which owns radio and TV stations, in addition to specialty cable channels. AG Telecom of Brazil has also licensed the CellularVision technology. "Our licensees are interested in introducing the technology for various applications," says a CellularVision spokesperson. "Some licensees have proposed introducing it as an interactive broadband video distribution system; others want to introduce it as a telephony-based system."

### CellularVision's technology

CellularVision's LMDS system uses the "millimeter" portion of the spectrum, at 27.5 GHz to 29.5 GHz, and provides bandwidth equal to fiber, according to company officials, which has prompted them to refer to the technology as "fiber in the sky." Interestingly, unlike other wireless technologies such as MMDS,

spectrum for LMDS at 28 GHz, probably by mid-1996, the Commission has not resolved whether it will allow cable operators, telcos and MMDS providers to bid for the spectrum (see *Multichannel News*, August 7, 1995, page 7). At the same time, the Commission is concerned that a cable prohibition could hamper the industry's ability to enter the telephony business.

TI is not waiting for the domestic picture to resolve itself, though. The manufacturer has been conducting trials not just in the United States, but around the world. "And it's really our belief that the first deployment contract will be international," says Robidou. "Many countries around the world have not waited—they have granted licenses to many companies at a 28 GHz frequency. And we have been working with those people for some time."

### TI's technology

Called MultiPoint, TI's LMDS line is scalable, and the company says that a network can be set up and serving subscribers in a matter of weeks, if buildings and power are in place, or a matter of months, if towers need to be erected. TI supplies all of the equipment necessary to go from the node to the home, which includes all the electronics at the base of the tower; the transmitter/receivers for the nodes, or RF base stations; the customer premise equipment, which includes

**CellularVision  
execs refer  
to their  
technology as  
"fiber in the  
sky"**

CellularVision's technology does not require line-of-sight transmission: though skeptics initially doubted that the technology would work at all, it works well, in that an omnidirectional transmitter bounces signals off obstacles with no loss in signal quality. Eventually, those signals reach their intended destination, the customer's six-inch by six-inch receiver.

Unlike TI's offering, CellularVision's technology is analog, not digital. "We foresee that

is probably where the market is going," says the company's spokesperson. He adds that "once digital technology becomes a reality, and commercially feasible, we envision that we can implement it as easily as anyone else."

### More eggs

CellularVision has had its own set of obstacles to contend with, one of those being a battle with companies wanting to offer fixed

satellite services (FSS) in the 28 GHz band. A coalition of satellite companies tried to persuade the FCC to move LMDS all the way up to the 41 GHz area, reasoning that the 28 GHz band was too crowded for satellite and LMDS. The Commission, however, based on the arguments of CellularVision, TI and others that LMDS would not be economically viable at 41 GHz, came up with a compromise ruling which divided up the contested spectrum among LMDS and satellite interests (see *MCN*, July 17, 1995, page 1).

Battles aside, CellularVision the operator is looking forward to participating in the upcoming LMDS auctions and rolling out its service on a nationwide basis. And CT&T will continue to talk to those interested in using its technology to enter new service arenas. "The CellularVision technology could accelerate the convergence process," says the company's spokesperson. "Simply put, the technology has the capacity of fiber optics, at a fraction of the cost. It doesn't matter whether you wish to provide voice, video or data services."

### Interactive Video and Data Service

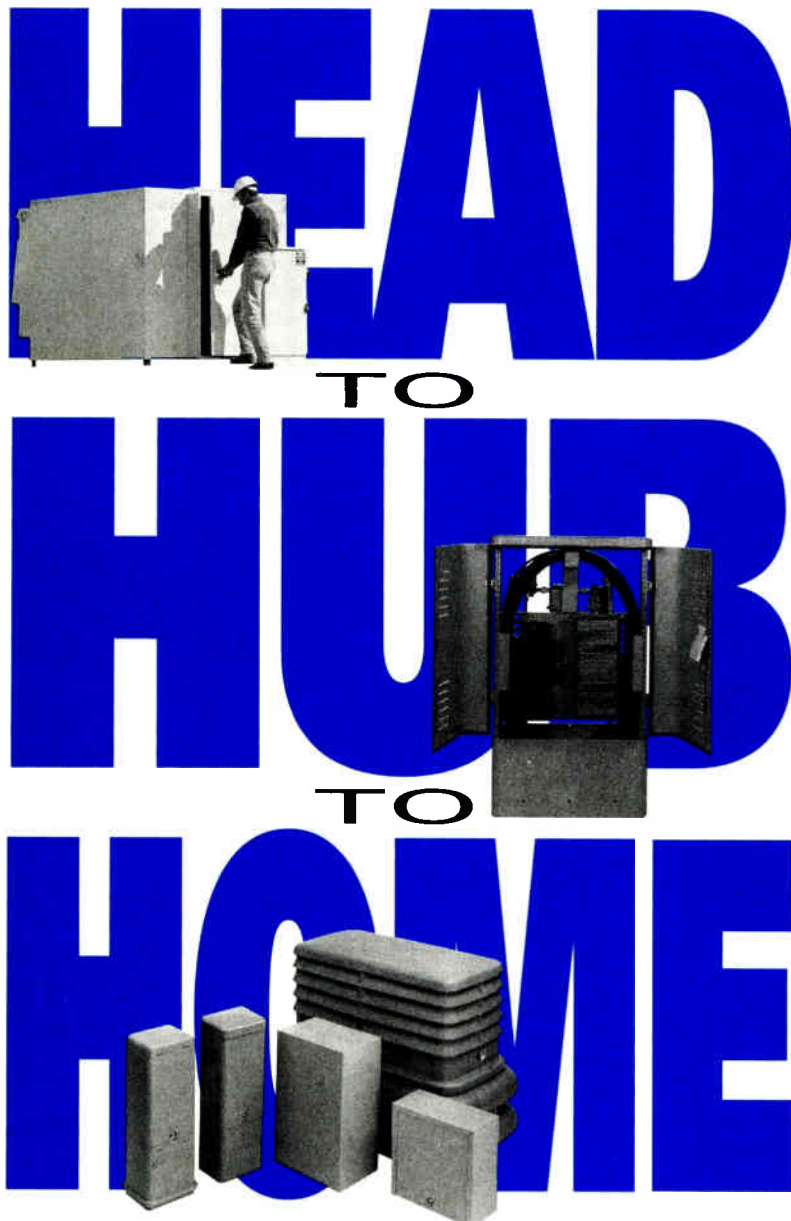
Meanwhile, another service slated to deliver wireless interactivity is making valiant efforts to get off the launch pad. In 1992, the FCC adopted the rules governing Interactive Video and Data Service (IVDS), a service for short distance communications to provide subscribers with interactivity via wireless data transmission. The point-to-multipoint, multipoint-to-point service reserves one megahertz in the 218-219 MHz band to deliver applications which may include viewer polls, home shopping, feedback to advertisers, home banking and remote meter reading.

In General Docket No. 91-2, the Commission defined 734 service areas (306 MSAs and 428 RSAs), with two licenses per serving area. Each license is for a 500 kilohertz channel. The "A" IVDS channel operates from 218.0-218.5 MHz; B operates from 218.5-219 MHz.

The FCC divvied up the first licenses for the service via a lottery, held in 1993, where 18 licenses were awarded for the first nine markets. The next batch of licenses was auctioned off in July of 1994, for a total of 594 licenses that cover the MSAs. The next IVDS auction will be held in the first quarter of 1996.

### Pushing a rope

Though the regulatory framework is in place, the service has yet to take off. One IVDS license holder who characterized the



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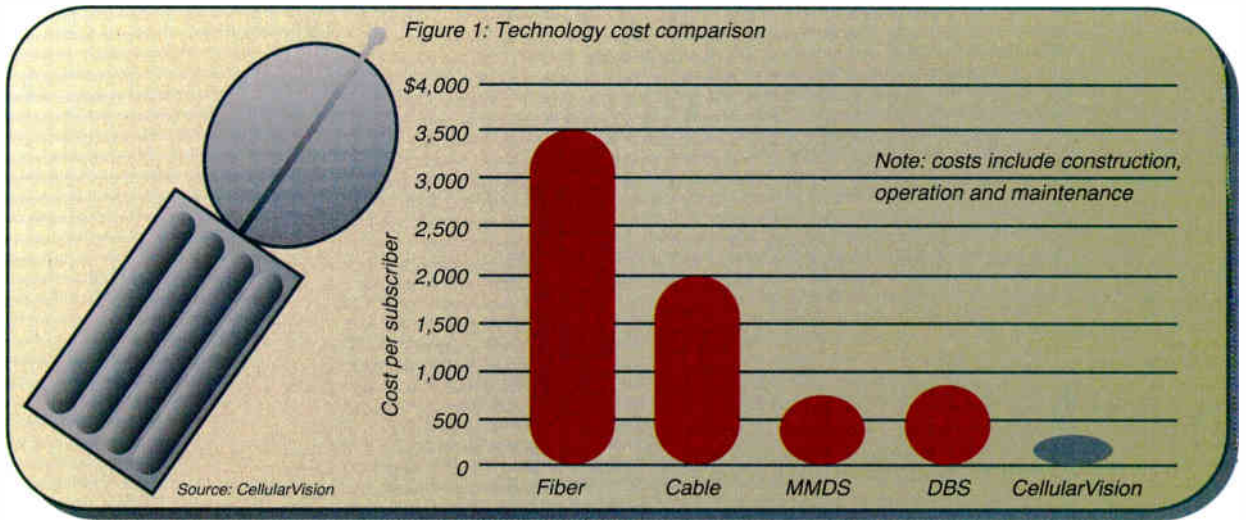
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**IVDS subscribers could answer viewer polls, order the proverbial pizza**

market as “squishy” may have been too conservative. Only a handful of license holders are running test applications, and most of them are looking for solutions that will enable them to offer service.

“Once the equipment is working, and once it is in place, and once you have applications, and once you have subscribers, and once you have sponsors, you have one heck of a nice system,” says Buzz Sawyer, a consultant to ACOMA, an IVDS partnership which holds licenses in Texas. “It’s like pushing a rope.”

In other words, to be successful, IVDS providers will have to affiliate with video programming providers such as cable, advertisers and broadcast networks. An IVDS license, after all, has about one-twelfth the capacity of a standard broadcast television station. Some speculate its best utility is probably as a response path for limited interactivity.

Provided that IVDS providers can meet the technological and market challenges they face, the potential applications are many. Subscribers could answer viewer polls, order the proverbial pizza, request coupons from vendors, and even transmit their vital signs. Sawyer describes an application in which elder-

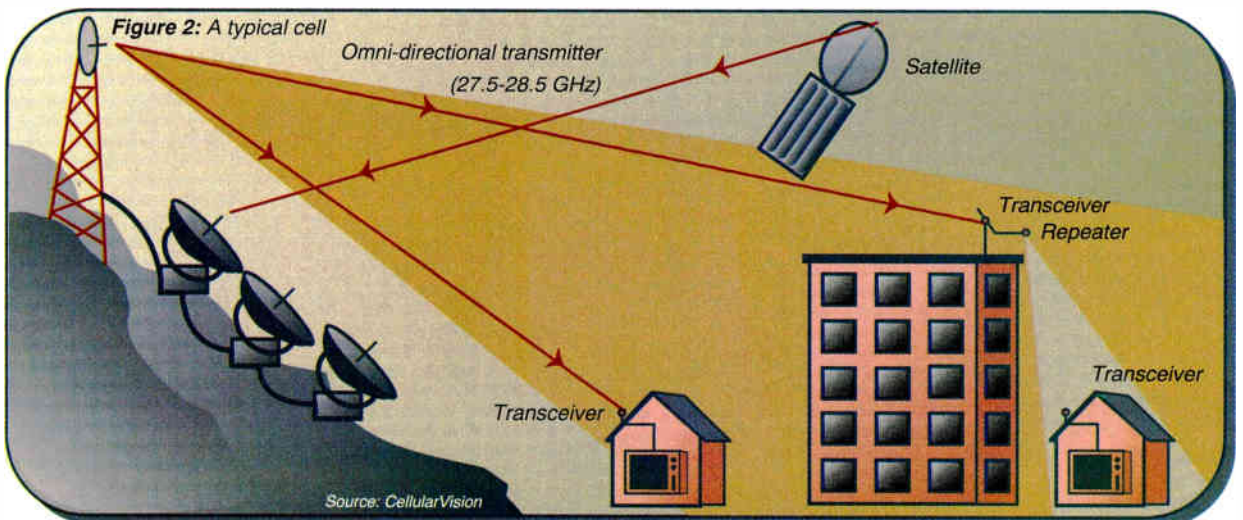
ly, homebound subscribers could be prompted to take their medication via an onscreen interruption of their favorite television programs, ensuring better compliance and care.

And if providers get their wish, the FCC could clear the way by the end of the year to allow IVDS operators to offer ancillary mobile communications services in their service areas. Several companies are already working on mobile applications for the spectrum, including two-way paging, where one pager would communicate directly with another, without utilizing telephone lines.

EON Corporation is testing a real-time data transmission application in Monterey, Mexico which is set up to monitor soft drink vending machines. That test tells the soft drink franchise dealer if a machine is out of inventory or change, is jammed, is out of optimum temperature range, etc., allowing the dealer to better manage the loading and routing of his delivery trucks.

**Strategies**

Strategies for launching IVDS are as numerous as the licensees and manufacturers themselves.





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Dr. Fernando Morales, founder of TV Answer (now EON Corp.) and the original IVDS crusader who persuaded the FCC to allocate spectrum for the service, is still committed to the concept of IVDS, but not the frequencies he originally lobbied for. Now the head of Interactive Return Service Inc., Morales has turned his attention to developing interactive products for the 900 MHz band: specifically, a handheld device with a wireless

connection to the Internet that allows users to respond to video programming they're watching, sending messages to advertisers.

For cable operators, Morales sees IVDS and like services as a chance to add interactive services slowly, before they activate fully interactive plant, with all the expense that entails. "More than half of all cable subscribers don't even have addressable decoders today," notes Morales. "How can [network

operators] dream that [subs] would all have \$700 decoders," when today, less than half have any decoders at all?

Another approach is that of Welcome to the Future Inc., a provider of integrated interactive television technology, which is going the set-top route, providing licensees such as Dispatch Interactive Television Inc. with hardware, software and network services.

The two companies are currently testing a wireless, real-time interactive response system known as HEAT (home entertainment advanced technology) in Columbus, Ohio and Indianapolis, Ind. Viewers use a remote control to interact with news, information and transactional services. The interactive response travels back via the IVDS spectrum.

If IVDS providers manage to define their service and make it viable before cable operators realize their dreams of firing up the return path and offering full, two-way interactivity, they may have a window of opportunity to provide a complementary service for MSOs.

One possibility is that IVDS could provide a small, overlay system for various applications, allowing cable operators to cheaply add unique applications, according to Ron Wilson, a director with manufacturer GLB, which manufactures radio links and modems for 218 MHz, but which, at the moment, has put the technology on the back burner.

"If you look at cable, at the Bell telephone networks, all those services that are out there today," says Wilson, "radio will play a complementary role, but a very small role."

### Speculation and default

Further complicating the IVDS picture is the number of license winners who have defaulted, or will default. Those markets which are declared to be in default will again be put up for sale at the next IVDS auction, according to the Commission.

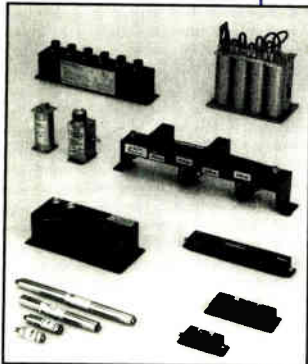
Not only that, but the Federal Trade Commission issued an Alert for Consumers last spring cautioning the public about "unscrupulous promoters" who were sucking in IVDS investors, and noted that "consumers who invest in IVDS licenses typically pay too much."

### Up to the challenge

Regardless of the many uncertainties in regulation, technology and market factors that they face, providers of wireless, interactive services and equipment seem ready to take on these challenges.

For now, at least, they're not going to worry about which comes first. **CED**

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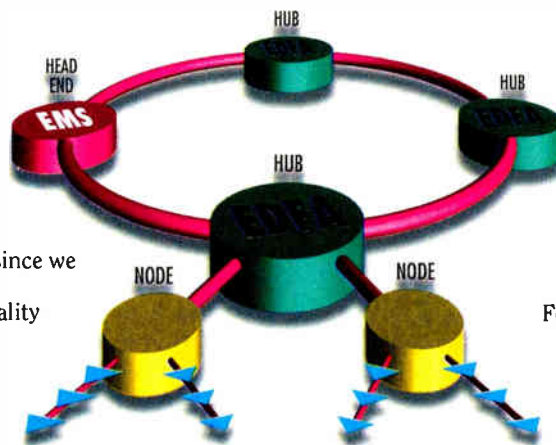
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# Transporting high-speed data over HFC nets

Key elements

By Robert W. Harris, Senior Manager, Marketing, Nortel Broadband Access Networks

A common phrase heard during the 1980s was "I want my MTV" as millions of frenzied consumers demanded the popular music video service. An analogous phrase for the 1990s may become "I want my high-speed data" as millions of PC users venture into the multiple applications available through the Internet and various on-line services.

For the first time since its introduction, sales of PCs for home usage outpaced sales for business usage during 1994. Perhaps more significantly, the growth rate in sales of data modems has actually outpaced that of PCs, a strong indication that PC users have the desire to use their PCs for communication purposes. This is evident in the double digit growth rate of on-line service providers (AOL, CompuServe, Prodigy) and the Internet. Further, the number of people "telecommuting" is well over 6 million, with an expected 30 million part- and full-time telecommuters by the year 2000.

However, there is a genuine level of frustration among current users with respect to the available modem speeds as well as the

requirement to "tie-up" the user's primary phone line when using a data service. The latter could be avoided with the addition of a dedicated second phone line to the home, but at a cost of about \$20 per month, and the user is still stuck with slow modem speeds.

Another alternative for providing moderately high-speed data service is ISDN (integrated services digital network) which is offered by many telcos with symmetrical data rates of 64 or 128 kbps. While ISDN is often used in business applications, it can be cost prohibitive and difficult to activate for home PC applications.

The rapid growth in PC and modem sales, the acceptance of the Internet and on-line services and the expansion of work-at-home, coupled with the frustration of slow modem speeds points to a pent up demand for a high-speed and affordable data service. With few regulatory barriers and little competition in terms of bandwidth capacity, the cable industry is poised to capitalize on these activities and begin delivering a variety of data services over the HFC infrastructure at significantly higher data rates and lower costs than currently available. This will lead to a new and potentially significant revenue stream.

For cable TV operators to capture these revenue streams, the products used for transporting and processing high-speed data must possess a number of key service and functionality elements that address such issues as the types of services supported, the level or grade of service for individual users, fair access to network facilities, standard interfaces, spectrum management, simplified installation of "cable modems" and others. The following provides a discussion of these key service and functionality elements required for successful delivery of high-speed data via HFC networks.

## Services supported

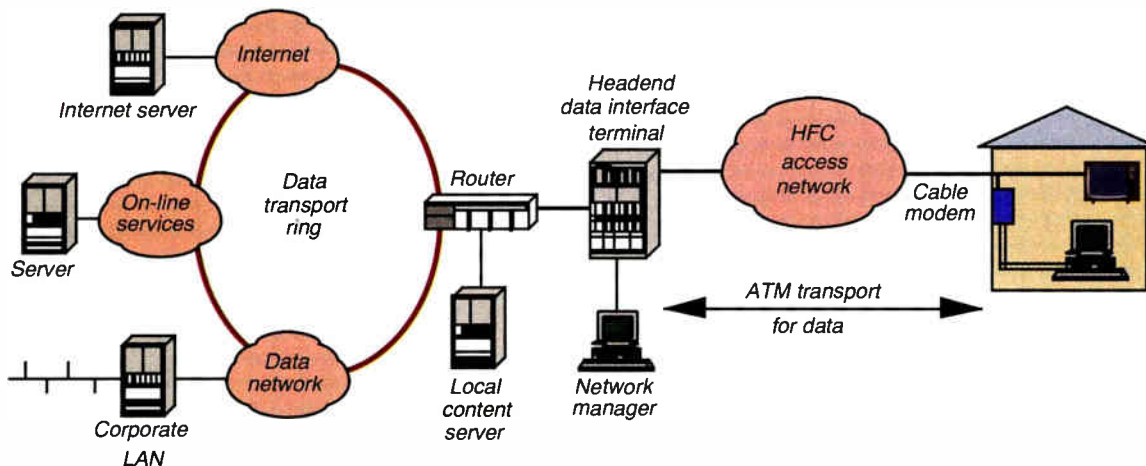
The key services supported by a data over HFC system should include the following: 1) access to commercial, cable operator, government and educational on-line services, 2) access to corporate LANs for work-at-home applications and 3) access to the Internet. See Figure 1.

✓ Access to on-line service providers. The top four on-line service providers (CompuServe, America Online, Microsoft Network and Prodigy) are experiencing double-digit growth rates, and combined, have over 8 million users connected. These companies provide their own specialized services (news, education, chat groups, etc.) as well as providing access to the Internet and the World Wide Web. High-speed data access will enable these service providers to enhance their service offerings with increased graphics and the use of video content. The faster data rates from cable TV delivered high-speed cable modems should greatly enhance users' satisfaction with these services.

✓ Internet access. Incredible growth rates have been reported for the Internet—both in terms of number of users and number of host computers connected. In this application, IP (Internet protocol) packets are transported between the PC and the Internet router via the cable access network. The router would provide Internet connection using standard routing techniques.

✓ Access to corporate LANs. A potentially large target application is "work-at-home." In this application the personal computer accesses an office local area network and computing facilities. The home computer runs network

Figure 1: Key service and network elements for high-speed data over HFC





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software (such as Novell IPX/SPX or Internet TCP/IP) compatible with the office environment and connects to a corporate LAN via the cable access network. The corporate router will have secure connections to the carrier network, while the home office is connected to the carrier network through the HFC plant. In cases where the home and corporate offices are located within the same cable TV network, data can be routed between locations without the need to route traffic through a carrier network.

✓ Access to local content servers. Cable providers have a unique opportunity to provide local and/or regional community information. By owning and maintaining a file server in a local or regional headend, cable operators can provide services of a local nature to on-line subscribers and enable a new distribution channel for local businesses and community organizations. Possible services that could be offered include: local on-line chat services, restaurant or theater selections and reservations, community calendar, local maps, local weather and cable service selections including pay-per-view.

In addition to these applications, other value-added services such as e-mail and remote file backup capability could be offered on the same platform. Users could even create their own World Wide Web home pages to be stored and accessed from the cable provider's local content server. By providing access to local content and offering value-added information services, cable operators gain access to the lucrative revenue streams available to content providers and have the opportunity to differentiate their data service from competitors.

### Functionality

The following section provides a description of the key elements, in terms of functionality, for successful transport of high-speed data over HFC networks:

- ✓ Standard interfaces at the network endpoints
- ✓ Fair and efficient access over the HFC network
- ✓ Multiple grades of service
- ✓ RF spectrum management
- ✓ Network management
- ✓ Simplified installation of cable modem units
- ✓ Data security.

### Key elements

✓ Standard interfaces at network endpoints. A successful high-speed data over cable system must first begin with open and standardized interfaces at the network endpoints (the home and the headend). Standard interfaces at the network endpoints will lead to lower product costs and ensure compatibility between various network and service elements.

To maximize service penetration, the data system must be compatible with a wide range of PCs including DOS-based, Windows-based or Macintosh products. A widely accepted and commonly used worldwide local area network standard is the IEEE 802.3 Ethernet standard which is capable of achieving 10 Mbps and 100 Mbps data rates. By operating a data transport system that is Ethernet compatible, the user needs only to install a low-cost Ethernet card and communications software inside the PC. The subscriber-located cable

modem then serves as a transparent interface between the subscriber's Ethernet compatible PC and the HFC network. It's important to note that the use of a non-standard interface that requires cable operators to install hardware and/or software in the PC would lead directly to increased installation costs, and more importantly, increased customer service and product evolution costs for the data service.

Standard interfaces should also be utilized for managing the individual data network elements. Using a standard SNMP-based (simple network management protocol) management system, the headend data interface terminal, cable modems, routers, etc., can all be monitored and controlled under a common platform that will simplify operational activities and subsequently lower costs.

✓ Fair and efficient access over the HFC network. With many different user types expected, the cable TV data network will require an efficient means to allocate bandwidth to users and to provide statistical multiplexing. An ATM-based transport mechanism in both the downstream and upstream directions provides such a platform. Encapsulating the Ethernet frames into fixed length packets results in superior bandwidth management capabilities. Specific downstream and upstream data rates can then be allocated to each user, allowing cable operators to deliver multiple grades of service (GOS) for multiple tier services (discussed in the next section).

Further, this technique may optionally be used to shape the data traffic to constrain each user to a maximum data rate, ensuring that early users of the data network do not experi-

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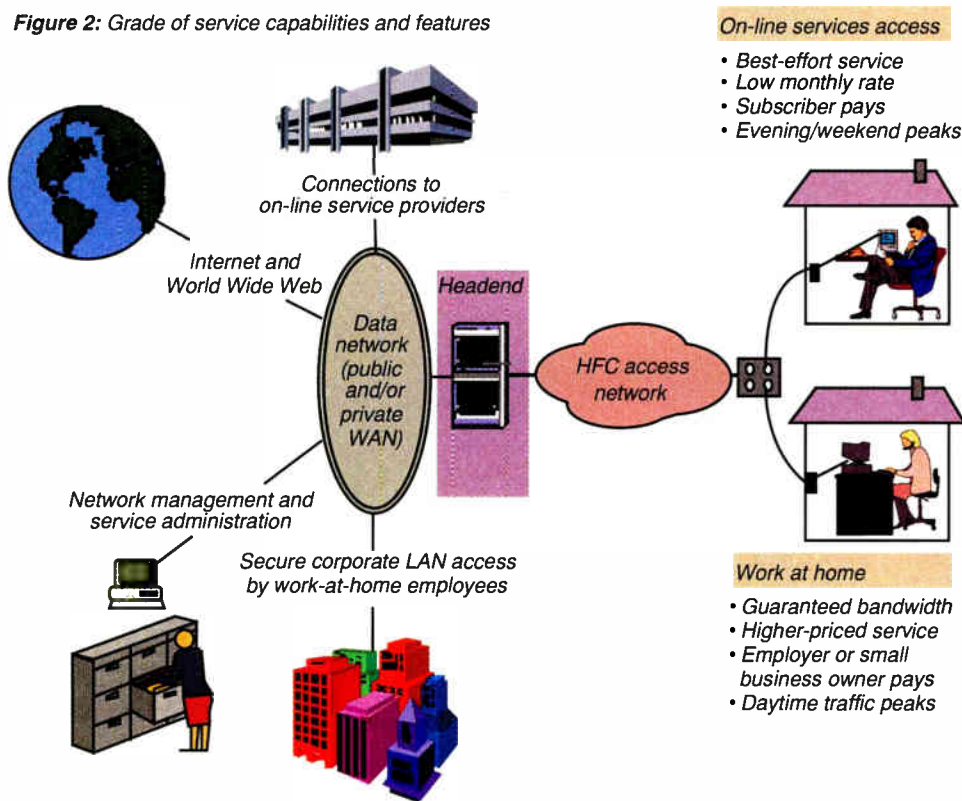
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Figure 2: Grade of service capabilities and features



ence a service degradation as subscribers are added to the system.

Access fairness must be achieved for all subscribers within their service class, regardless of their distance from the headend or the number of users contending for bandwidth. Network users will only experience frustration and dissatisfaction if network throughputs are drastically reduced due to multiple collisions of data traffic as users contend for bandwidth.

To achieve bandwidth access fairness in the available upstream bandwidth, the ATM transport can make use of the TDMA (Time Division Multiple Access) protocol. TDMA can be used to efficiently manage media access by eliminating traffic collisions and avoiding network contention as each cable modem is given a specific time slot for sending its data. The amount of bandwidth given to each user would be determined by the subscriber grade of service. Further, the network could be configured so that only authorized cable modems may transmit their upstream data traffic.

In the downstream direction, a TDM-based traffic protocol within the ATM structure could be used to allow multiple priority levels. The headend data interface terminal would assign the appropriate priority level within the data stream, and ATM cells would flow to every cable modem. At that point, only those cells destined for that cable modem are selected and admitted for Ethernet processing.

For transporting the data signals over the HFC network, a robust modulation format must be chosen—particularly in the noise prone return path. QPSK modulation is proving to be a worthy choice for the return path in that it's an exceptional compromise between bandwidth efficiency and robust performance in the presence of noise. For the downstream, most manufacturers are choosing 64-QAM for modulating data within the 6 MHz bandwidth.

✓ Multiple grades of service. A key element for providing users with a flexible method of choosing a particular service level is the concept of "multiple grades of service." With multiple GOS, the cable operator is capable of setting up market-driven service tiers with different data speeds depending on the subscriber's service requirements and ability or willingness to pay. To maximize the benefit, the data network should be capable of establishing multiple grades of service independently in both the downstream or upstream direction for any user.

When Ethernet data is encapsulated in fixed-length packets, it's a simple matter to equitably distribute bandwidth between a number of subscribers of a given grade of service. The transport mechanism allows for the provisioning of minimum guaranteed data rates as well as maximum burst rates. Multiple tiers, or grades of service, can then be established to allow the operator to segment the data market. For instance, those who are willing to pay a

premium for higher data rates, such as telecommuters or small businesses, can be charged a higher monthly fee relative to those who use the data system for casual usage such as Internet or on-line applications.

For example, telecommuters could be allocated higher throughput levels via a "telecom-muter" GOS, while casual users could be given "best effort" GOS (see Figure 2). For best effort delivery, the transport protocol also allows the system to make use of statistical multiplexing techniques, providing bandwidth to those subscribers who need it. As mentioned earlier, with defined maximum user burst rates, early subscribers on the network won't experience a slowdown in network traffic with new subscribers being added onto the network, since a maximum allowable data rate would already be in place.

Best effort delivery schemes that do not incorporate guaranteed minimum data rates lead to a slowdown in traffic throughput, resulting in a customer perceived service degradation. By providing a GOS as defined above, the highest levels of customer satisfaction with the data service can be maintained.

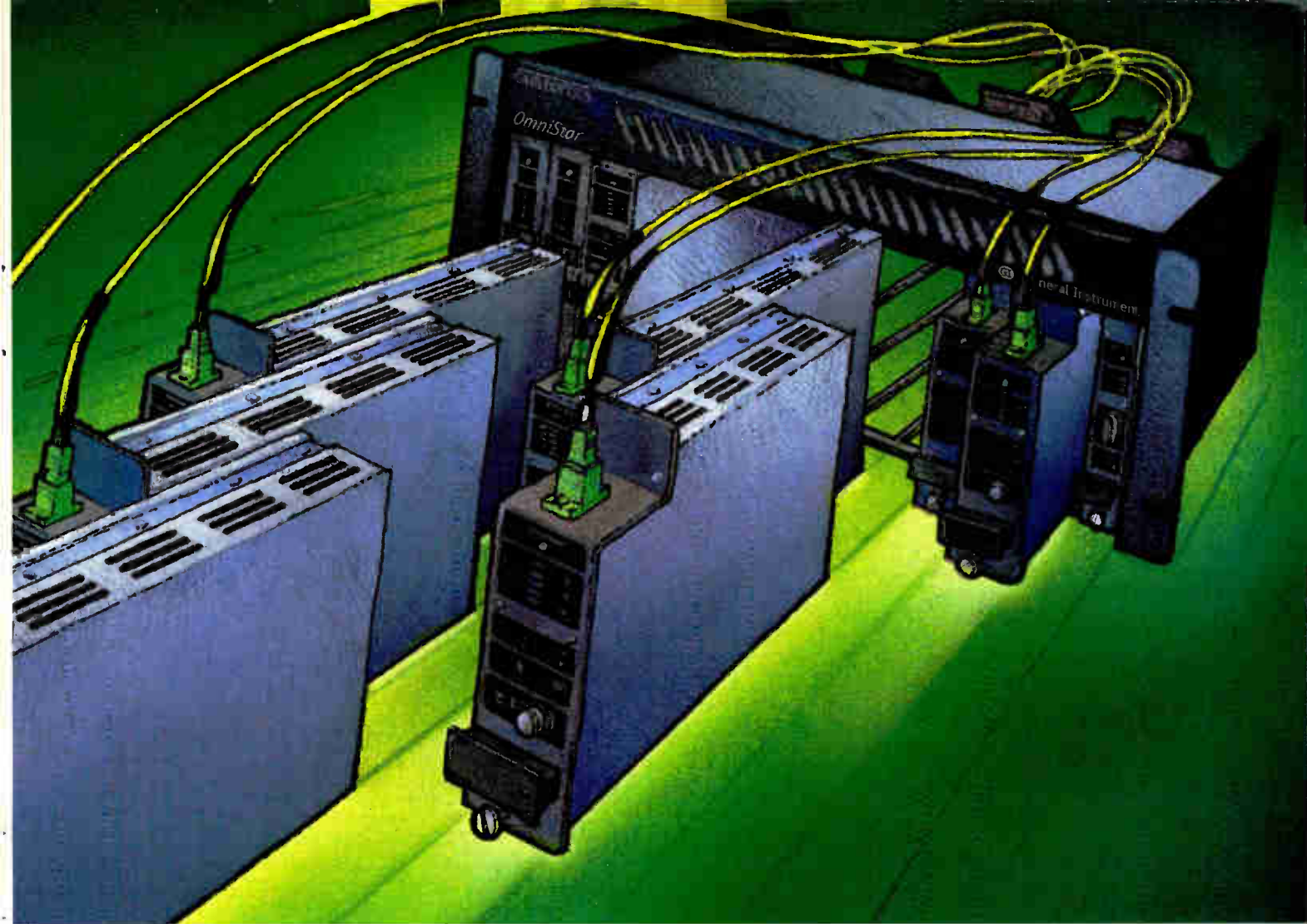
✓ Simplified installation and operation of cable modems. The cable modem in the subscriber's location is a critical element, as it must provide high-speed access to the data network at reasonable costs. Key to its success, the cable modem must be external to the PC, be completely transparent to the user and be easy to install. In other words, it should be "plug-and-play" with no requirement to install the device within the users' PCs. The subscriber would then only need to have installed a simple Ethernet card and associated software within the PC.

While this could be performed by the cable operator, it may make more sense, from a liability standpoint, to require the customer to perform that task. In fact, many new PCs already come fully equipped with a standard Ethernet card and communications software.

As the cable modem is installed and powered up, an automated initialization and registration routine should occur which permits discovery of the modem on the network. A network management system would determine the validity of the cable modem and, in conjunction with an RF spectrum manager, determine frequency and amplitude levels as required for data transmission.

This completely eliminates the need for the installer to perform time-consuming software loads and set-up procedures, minimizing customer activation time and lowering the overall cost of installation.





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The cable modem itself should also come equipped with the capacity to receive new software downloads via the network. In this fashion, future software capabilities, such as new network features, may be delivered to subscribers without hardware upgrades or field truck rolls and would require no intervention on the part of the end user.

✓ **Spectrum management.** In the noise prone 5 MHz to 42 MHz RF return path, it's critical that there be a method for monitoring and dynamically shifting return path signals in the presence of excessive noise. An RF spectrum manager, located within the headend data interface terminal, would be responsible for managing the return path spectrum.

An RF spectrum manager continually monitors a cable system's upstream path by rapidly scanning frequency segments between 5 MHz and 42 MHz for clear upstream channels. Clean frequency slots are identified by comparing the measured power level within a given bandwidth against a pre-determined threshold level.

In the event an active channel becomes corrupted, the spectrum manager would identify a clear channel for spectrum reassignment. The RF spectrum should be monitored continuously in real-time, and frequency changes should occur even while the system is carrying traffic to ensure the highest quality transmission of subscriber traffic.

RF spectrum management implemented in this manner provides significant value to the cable operator in that it directly leads to better service quality for its subscribers. Since it looks for and determines the "cleanest" upstream frequency segments, upstream channels are assigned bandwidth that has less noise. Less noise leads to lower bit error rates, thereby improving network performance and leading to greater customer satisfaction and retention.

The RF spectrum manager also lowers operational costs by automating the frequency agility process, therefore eliminating the need for crafts-person intervention. Further, it provides a more efficient use of the limited upstream bandwidth, especially when deployed in conjunction with other services such as telephony.

Cable TV system tests have shown that much of the impulse noise on the return path is generated from within homes and tends to be confined to small segments of bandwidth. Typically, the noise is likely to affect a segment of bandwidth that's less than 2 MHz wide. Because the return path has limited available bandwidth, and most impulse noise sources occupy less than 2 MHz, it makes little

sense to have upstream channels occupy more than 2 MHz of bandwidth. Dividing the return channel bandwidth into 2 MHz rather than 6 MHz segments provides greater spectrum management flexibility. For example, it's much easier to find noise-free spectrum in 2 MHz increments as opposed to finding noise-free segments for an entire 6 MHz wide return channel.

✓ **Complete network management and control.** A data over HFC system should incorporate

### **DES encryption could optionally provide an additional level of security in the upstream and downstream directions**

comprehensive network management and control using an SNMP-based protocol. Such a system would be responsible for storing, displaying and accessing the data for the functions including: modem marshaling and initialization, alarm logging and fault

reporting and performance monitoring and testing. Additionally, the network management and control would be responsible for determining conditional access of cable modem units and all security and key management. These capabilities allow the data transport system to provide the automated "plug-and-play" installation function and provisioning that minimize costs and customer service activation time. The network management system should also provide both default and custom configurations to permit rapid service initiation and individually tailored service characteristics.

✓ **Security.** With the increase in transaction based businesses over the Internet and work-at-home applications, the need for secure transport of data also increases. As a first level of security, the cable modem should be physically resistant to tampering. As an added level of security, each cable modem should have a unique address to be validated by the network each time the cable modem is powered up.

Further, cable modems would translate from ATM into Ethernet traffic only those cells specifically addressed to it, even though downstream traffic may pass by many subscribers' homes.

DES encryption could optionally provide an additional level of security in both the upstream and downstream directions. The headend data interface terminal would store and manage the distribution of the necessary public and private keys. Finally, application-level security in the form of software encryption could also be applied as an option and would be transparent to the data transport network.

### **Summary**

With the rapid growth in PC usage, the Internet, on-line services and work-at-home applications comes a new and potentially large revenue source for MSOs. This should serve as sufficient motivation to provide high-speed data access and services via their HFC networks.

The key technological elements, in terms of services and product functionality, necessary for successful HFC deployment of high-speed data, have been reviewed and are summarized below:

- ✓ Provide secure high-speed and standards-based access to on-line services, the Internet, corporate LANs and other Internet protocol (IP) destinations.
- ✓ Maximize data service penetration by supporting any Ethernet-capable PC.
- ✓ Minimize customer support costs by not installing hardware or software in users' PCs.
- ✓ Incorporate ATM transport to enable efficient utilization of spectrum, fair access to all users, sophisticated system management and service evolution.
- ✓ Support multiple grades of service and traffic sharing that accommodate flexible, market-driven service tiers.
- ✓ Provide RF return path spectrum management with real-time frequency agility for channel re-assignment in the presence of excessive return path noise.
- ✓ Deploy low-cost cable modems with automated configuration and remote software downloading for simplified installation and low-cost upgrading.

Meeting these service and functionality requirements will allow cable operators to capitalize on the growing data communications market and should go a long way to quiet those frenzied PC users who are shouting, "I want my high-speed data."

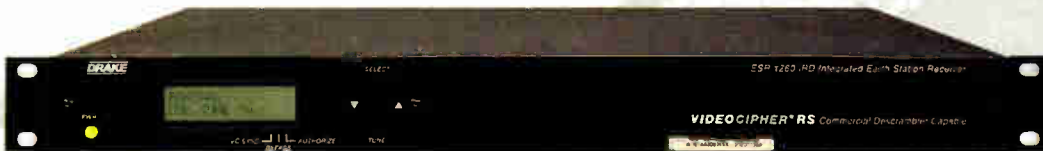
### **Acknowledgments**

The author wishes to thank Beth Carlton, Stu Cassell and Greg Merritt of Nortel's Cornerstone Data group for their valuable insights and suggestions in preparing this paper. **CED**



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# **DRAKE**

# The tug-of-war over Is there a clear winner? set-top operating systems



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By Roger Brown

The battle for the top of the TV is expected to escalate as traditional cable TV networks become digitized, and as competition comes to fruition. Already, consumer electronics giants like Thomson, Sony, Mitsubishi, Samsung and others are saying they'll challenge traditional set-top makers General Instrument, Scientific-Atlanta, Zenith and Pioneer for the valuable real estate as content becomes a digital, interactive product.

But there's yet another, less apparent, tug-of-war brewing—and it's inside the set-top. Just as there are two rival platforms for personal computers, it's looking like there's going to be contention for the set-top operating system, with companies like Microware Systems

Corp., PowerTV, Wind River Systems and others all making major plays for marketshare.

Already, the war of words between these companies has started, with each touting its particular advantage as the one MSOs and telcos should be most attracted to.

For example, Microware has leveraged its OS/9 and DAVID real-time operating systems into the set-top arena by signing some 20 licensees to the product, including General Instrument, the set-top box market leader. With OS/9 resident in hundreds of applications and products, company officials count ubiquity, the plethora of development tools and a wide variety of available feature sets as examples of key advantages Microware holds over the competition.

PowerTV, on the other hand, burst on the

scene about 18 months ago when Scientific-Atlanta hired several members of the former Kaleida Labs team (Kaleida was a joint development team set up by IBM and Apple to develop a common scripting language that both computing platforms could use).

Although PowerTV to date has just a single set-top licensee (Scientific-Atlanta), company officials note it's already in the market, working in networks built by Ameritech, Pacific Bell, Southern New England Telephone and BellSouth. Furthermore, it says more network providers have come calling in search of a fully-featured operating system that costs less and does more.

And there are others. Hyundai Electronics America, for example, just last month announced its selection of Wind River to provide a real-time, multitasking operating system for its planned family of digital set-tops. Hyundai was impressed by Wind River's support of a wide range of processor platforms and chose the VxWorks system as the heart of the unit.

Wind River officials also note that reliability and integrated development tools are key attributes of an operating system that network providers should look for. "In consumer electronics applications, the products are expected to work all the time," notes Stephen Li, vice president of telecom and multimedia at Wind River. "You can't afford to have computer bugs or other OS problems."

## Why should anyone care?

Is all the debate over operating systems really necessary? Or is it akin to having a choice over several automobiles, all of which offer a different look and different color, but each of which features an eight-cylinder, high output engine that virtually no one can discern any difference between?

Cable TV engineers are just now realizing that future set-tops will require them to come calling with a lot more knowledge of software and its functions. Gone are the days when all the functionality of a set-top was derived out of the internal guts of the box. Instead, network operators will be counting on third-party software developers to offer the "killer apps" that keep their customers tuned into game channels, home shopping programs and other interactive programs.

Until today, MSOs never had to look outside the box they were buying. All content was controlled by them, and additional functions relied on the power built into the box at the factory. The operating system was deeply embedded into the set-top, and each was proprietary. General Instrument, for example, would embed



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## ◆ SET-TOPS

Metrotec's VRTXsa system or a PSOS system into a set-top and no one cared as long as everything worked as advertised. And typically, they did, because all the software was written specifically for that platform.

Going forward, that model is being tossed out in favor of a modular, hierarchical one that allows third-party software developers to port their games and applications through the set-top and on to the TV screen. GI, after doing some initial work with Microsoft, last year signed on as a Microware licensee and will utilize the DAVID system in the IDT 1500 second generation digital set-top.

The heart of such a system is the core, or kernel (see Figure, page 62). The kernel consists of only the most vital, low-level functions performed by an OS, and serves as the foundation upon which all other functionality is built.

According to Wind River officials, good kernels provide several key functions, including:

- ✓ Real-time multitasking. It's the kernel's job to allow multiple events to be processed simultaneously by allowing access to the central processing unit in the most efficient manner;
- ✓ fast intertask communication and syn-

chronization so that the application is run effectively;

- ✓ easy communication between OS levels that handle simple, predictable tasks and real-world events that manifest themselves as interrupts. The work is better handled at the work level to provide effective queueing, prioritization and reduced latency; and

- ✓ bounded performance, where a kernel is optimized for worst-case performance. For example, a system that performs a function in 50 microseconds consistently may be better than one that averages 10 microseconds, but occasionally takes 75 microseconds to perform the function.

While a real-time, multitasking kernel is important, much of the focus comes on the layers built around it. As the diagram shows, each concentric ring builds upon the previous one, adding features and functions as it grows. It's in these layers that the battle over the dominant OS will be fought.

There's actually a surprising amount of agreement between companies about what makes a good operating system. Typically, the list includes: availability of third-party applica-

tions; extensive scalability that enables the software to run everything from an inexpensive "broadcast" set-top to the most elaborate unit; access to extensive graphics and networking libraries; and development tools from outside sources so that content developers are encouraged to write applications that run on the operating system software.

Wind River also believes its important to cover an entire range of microprocessors. VxWorks has been designed to cover a wide range of devices, including the PowerPC.

But in an environment where cost is the overriding factor, the size of the operating system, or its footprint, may be the most important short-term issue. With each megabyte of RAM or ROM comes additional cost to the network provider. Pressure is therefore being exerted on these companies to keep RAM or ROM needs to less than a megabyte.

That's where PowerTV believes it holds the advantage over everyone else. "Our solution was drawn on a clean sheet of paper 18 months ago," says Ken Morse, chief technical officer. "We're not trying to leverage an existing product." Morse says the PowerTV

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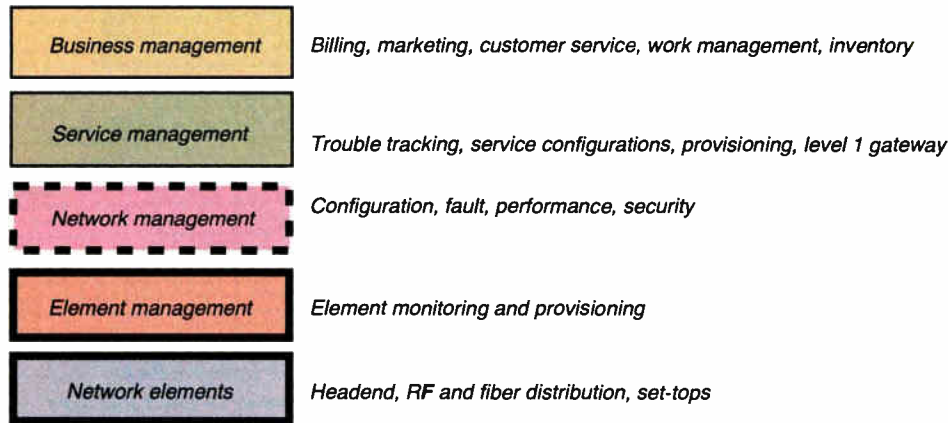
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## ◆ NETWORK MANAGEMENT

Figure 2: TMN management model



various technologies and equipment become unified, so must their management systems. Vendors will provide distributed operations support and network management in a standardized format in order to interoperate with peer and higher-level operational support systems. They will also use standard interfaces and protocols as a means to remain compatible with industry-wide, current and emerging management systems.

The simple network management protocol (SNMP) provides a proven, industry-accepted standardized protocol for delivering network management datagrams in an open network management architecture. A majority of industry vendors have adopted SNMP as a cost-effective means of managing heterogeneous, distributed networks.

In addition to SNMP, the common management information protocol (CMIP) is emerging

to take on the challenge of providing services level management in telecommunications and broadband networks. A proxy agent can coordinate communications between SNMP, CMIP, TLI and vendor-specific network management protocols. Proxy agents are becoming more common in today's network management systems as operators seek enterprise-wide control of networks. Proxy agents provide a smooth migration path into an SNMP management system to allow the SNMP manager to control the device in its native mode. Most of the SNMP management platforms and enabling tools today offer dual model protocol support for both OSI's CMIP and the Internet's SNMP.

### TMN management model

Operational support systems come in many flavors. However, some of the emerging OSS and network management platforms are taking the shape of the ITU's Telecommunications Management Network (TMN) model. This layered model supports network operations by configuring a relational hierarchy throughout the enterprise, starting with the network elements (NEs). Categories of network element equipment are managed by element managers (EMs) that report into network managers (NMs) that are tied to service and business management platforms. Communication between the TMN layers calls for open interfaces and standard communications protocols in an effort to operate in a multivendor environment.

Other issues such as increased competition and FCC testing and quality mandates also drive the need for network management systems. As the variation of service offerings and competition increases, managing service initialization, provisioning and customer churn will become increasingly important in managing business operations. Network management can assist by providing network configuration, statistics, intelligence and usage reports to more advanced services and business management systems.

Network management systems and OSS are essential to improving the quality of services, reducing network operations expenses and providing greater efficiencies associated with service management. This translates into more competitive services that will reduce customer churn and increase subscriber satisfaction.

Another area this level of network management will address is the use of operations data. The evolution is towards a centralized data repository that stores all operations-related data.

This data will be coordinated through relational database models where schemas or

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## ◇ NETWORK MANAGEMENT

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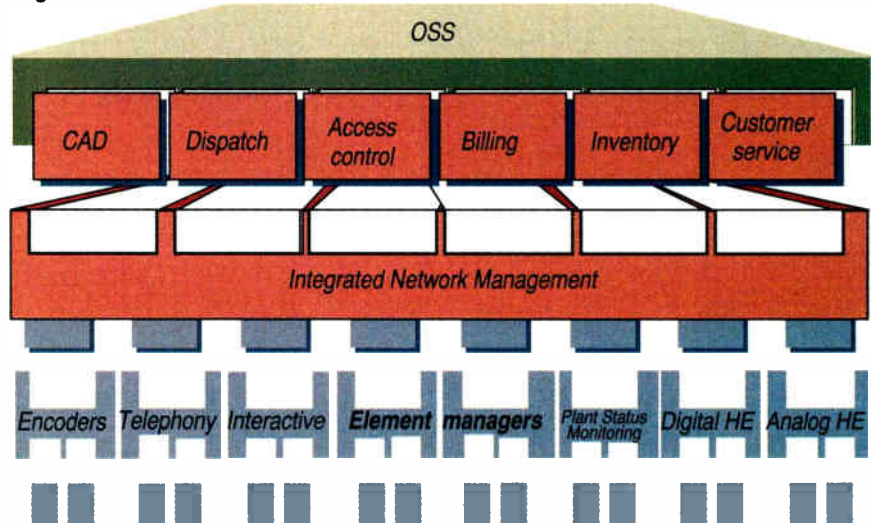
### Costs

Although these systems add value to daily operations, their costs are not trivial. In the early stages of network management deployment, the costs associated with these systems can be justified through a process re-engineering and analysis. Business and network operations functions may be consolidated and automated to improve efficiency. In the latter stages of business and services management, the cost

time and improve mean time between failures (MTBF) as critical information gets into the hands of the people who can act upon it. To take this concept a step further, the next generation of network management will contain commands to autonomously act on network events. These intelligent systems are often labeled "expert systems." Expert system development will rely heavily on the cable system experts to properly assess the causes of network events and recommend the proper remedies that will be integrated into an automated system.

Multimedia networking has emerged to

Figure 3: Network elements



should not be associated with the systems themselves, but with the lack of systems. The lack of these advanced systems could equate to delayed service deployment, duplicated operational functions and operational inefficiencies.

### Benefits

What does this mean to network providers and operators? The following four points could summarize all the benefits of integrated network management:

1. Improved reliability.
2. Information about the network—what is happening and who needs to know.
3. Control over network configuration and pathological conditions.
4. Improved customer care through enhanced customer service and timely provisioning of new services.

As monitoring and management systems become deployed throughout the network, it will be important that these systems interconnect to form an integrated network management platform. This integration is critical to assure network reliability, minimize network down-

engender a host of new applications. These new applications place great demands on the network. Multivendor enterprises and increased network complexity, coupled with attractive revenue potential adds more to the argument for deploying network management systems. These network management systems will use standard protocols and interfaces to communicate with network elements, peer management systems and higher level operational support systems.

As competition heightens, and the variety of services broadens, service management becomes critical to maintaining efficient network operations. Network management can improve network availability and reliability and provide better information about the network and the customers. This intelligence contributes to the ultimate goal of providing premium quality services in accordance with the time frames demanded by subscribers. As the challenge of managing heterogeneous networks and services increases, this strategy is the first step in ensuring the health of the network, and therefore, the business. **CED**



# CEED

COMMUNICATIONS ENGINEERING & DESIGN  
THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

## Editorial Index

November 1994-  
October 1995

Cable television's most complete  
guide to technical articles

## Ad insertion

**Adlink to offer DEC ad system to local operators (MCN)**, Linda Moss, 5/22/95, p. 30. Adlink's cable affiliates will be given a chance to use a new digital ad insertion system for local advertising.

**Antec to start testing ad-insertion system (MCN)**, Linda Moss, 1/9/95, p. 20. Antec looks to begin testing an integrated digital ad insertion system with an eye toward release by mid-1995.

**Bay Cable forges ahead with StarNet digital (MCN)**, Linda Moss, 4/24/95, p. 46. Bay decides to use StarNet in its \$5 million upgrade.

**Chicago interconnect studies going hard-wired (MCN)**, Linda Moss, 11/28/94, p. 132. The Chicago Cable Interconnect ponders spending \$3 million for a fiber optic network.

**Digital ad arena grows crowded, competitive (MCN)**, Linda Moss, 12/12/94, p. 42. Several large newcomers announce plans to jump on digital ad bandwagon.

**Digital set-tops complicate local ad picture (MCN)**, Linda Moss and Leslie Ellis, 5/29/95, p. 1. MSOs will need new headend gear to multiplex local digital ads into their video streams and have them decoded at the set-top.

**How DEC's file-server system won over Adlink (MCN)**, Linda Moss, 1/16/95, p. 20. Adlink's choice of DEC for hardware came as a surprise to some.

**Milwaukee places Channelmatic order (MCN)**, Linda Moss, 2/20/95, p. 58. As it plans to expand digital ad insertion throughout the area, Milwaukee Cable Advertising orders more Channelmatic gear.

**Ops budgeting big time for digital ad gear in '95 (MCN)**, Linda Moss, 11/28/94, p. 130. More and more cable systems and interconnects are budgeting to add digital ad insertion equipment in 1995.

**Op support systems hot at Cable-Tec Expo (CED)**, Roger Brown, Dana Cervenka, Leslie Ellis, July 1995, p. 64. An overview of the technology, software, sundry systems and other developments that debuted during SCTE's 1995 Cable-Tec Expo.

**Several major interconnects ready to go digital (MCN)**, Linda Moss, 5/1/95, p. 68. Several groups, including Chicago and St. Louis, are poised to make their digital hardware selections.

**Sony allows first look at ad insertion system (MCN)**, Leslie Ellis, 12/5/94, p. 14. Sony gives an early look at its digital ad insertion gear, which is scheduled for introduction in mid-1995.

**TCI picks SeaChange for Chicago digital insertion (MCN)**, Linda Moss, 8/14/95, p. 26. SeaChange wins another contract from TCI.

**TCI selects SeaChange, StarNet for digital site (MCN)**, Linda Moss, 2/20/95, p. 58. The big MSO makes hardware selections for two of its cable markets.

## Addressable technologies

**ADC targets MSOs; partners with Electroline (CED)**, Dec. 1994, p. 18. News item on ADC Telecommunications' announcement that it will market new video and telephony products to MSOs through new agreement with Electroline.

**Addressable half-ASCII, a new compromise (CED)**, Walt Ciciora, Oct. 1995, p. 24. Details surrounding the compromise struck on the decoder interface.

**CableData unveils new transactional billing system (CED)**, Jan. 1995, p. 12. News item on the debut of CableData's new transactional management system, the Intelcable software system.

**Cable modems: The MSO's link to the PC boom (CED)**, Jack Mann, Scientific-Atlanta Inc., April 1995, p. 64. A critical mass of new and improved technologies and demonstrated consumer demand indicate a lucrative revenue stream could inundate operators who are prepared to take advantage of it.

**Future set-tops begin to take shape (CED)**, Dec. 1994, p. 18. News item on latest activity — by HP, Zenith, DiviCom and Broadband Technologies — in developing first-generation digital set-tops.

**Looking back on what was to be (CED)**, Roger Brown, Dec. 1994, p. 56. A brief look back on the 1994 promises that were made, kept and broken, as well as those that have been put off.

**The need for support systems (CED)**, Gregory Hardy, Scientific-Atlanta Inc., Jan. 1995, p. 58. The case is made for "one highly reliable, transaction oriented full service network" where each element manager "must be able to talk to the other," i.e., an Operational Support System.

**New products bring hype closer to reality (CED)**, CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Siemens, Sun and S-A combine to offer turnkey HFC system (CED)**, Jan. 1995, p. 12. News item on announcement of "turnkey end-to-end hybrid fiber/coax platforms" for cable operators and telcos alike.

**TCI unveils software platform tied to frame relay network (CED)**, April 1995, p. 14. News item on TCI's sneak preview of its advanced software platform for back office operations, e.g., billing, customer service and workforce management.

**Unleashing the power of the PC (CED)**, LANcity staff, April 1995, p. 26. (Part I of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

## Advanced television

**Broadcast quality technical standards (CED)**, Archer Taylor, Malarkey-Taylor Associates, Nov. 1994, p. 84. Discussion urging the cable industry to continue its work on developing interface standards, in lieu of the FCC doing so, to facilitate the transition between NTSC and ATV.

**Broadcasters must repent before it's too late (CED)**, Jeffrey Krauss, consultant, June 1995, p. 28. Broadcasters who want to use compressed HDTV signals to carry multiple SDTV channels are missing the point...and probably the boat as well.

**Critical time nears for setting HDTV standard (MCN)**, Marty Levine, 6/12/95, p. 12A. The time is now for those who challenge the HDTV modulation method.

**Data revenues waiting for two-way plant (MCN)**, Leslie Ellis, 5/1/95, p. 85. Cable operators are poised to get revenue from interactive services, if there's a two-way path activated.

**Despite live demonstration, HDTV still in distance (MCN)**, Leslie Ellis, 2/20/95, p. 84. In spite of recent demonstrations, commercial HDTV is a long way off because of testing delays and other factors.

**Get out the aspirin: HDTV headaches ahead (CED)**, Jeffrey Krauss, consultant, July 1995, p. 12. A review of the HDTV situation and why it still has a way to go before it's a fait accompli.

**GI goes FTTC, BBT finds partner (CED)**, April 1995, p. 16. News item on General Instrument's equity acquisition in developer of switched digital networks and BroadBand Technologies' announced partnership with Texas Instruments to produce components for the Fiber Loop Access system in Austin.

**HDTV field tests shine: FCC decision on SDTV unclear (MCN)**, Leslie Ellis, 9/11/95, p. 39. While the Charlotte tests went well, will a pending decision on standard TV affect cable operators' digital plans?

**HDTV field tests show VSB shines (CED)**, Nov. 1994, p. 12. News item on successful field tests that support HDTV's "broadcast coverage and cable robustness to the performance of the current NTSC television systems."

**ICTV, Sybase partner to deliver interactivity (CED)**, Nov. 1994, p. 14. News item on partnership announced between ICTV Inc. and Sybase Inc. to integrate Sybase products and services with ICTV's interactive TV system.

**Looking back on what was to be (CED)**, Roger Brown, Dec. 1994, p. 56. A brief look back on the 1994 promises that were made, kept and broken, as well as those that have been put off.

**MPEG encoders make their debut (CED)**, Nov. 1994, p. 14. News item reporting the debut of two MPEG-2 real-time digital video encoders, one from Toshiba, the other from DiviCom.

**Quest for open standards begins for new group (CED)**, Dec. 1994, p. 16. News item on the formation of the North American Digital Group by more than 60 companies and organizations to develop a non-proprietary digital television standard.

**Technical overview of digital music services (CED)**, Ed Krom, Krom Technical Services, Dec. 1994, p. 78. Summary of results from field test of three major suppliers of digital music programming and equipment for cable transmission.

**The return system: A historical perspective (CED)**, Jerry Marketos, Philips Broadband Networks, Sept. 1995, p. 84. A look at what happens to signals in the reverse band.

**Reverse issues stump cable engineers (MCN)**, Leslie Ellis, 6/12/95, p. 9A. Designing reverse path capabilities aren't for the faint of heart.

**Which is the best modulation? QAM vs VSB (CED)**, Henry Samuelli, Broadcom Corp., Leo Montreuil, Scientific-Atlanta Inc.; Woo H. Paik, General Instrument Corp.; Ron Lee, Zenith Electronics Corp.; Dec. 1994, p. 44. Proponents for the two competing digital modulation technologies



go head-to-head to make the case for their respective sides.

#### **Will broadcasters, FCC derail digital TV?**

(CED), Fred Dawson, March 1995, p. 92. The future of digital TV is far from clear with competing standardization pressures from cable and telco industries.

**Zenith sells company to LGE; cash infusion should help network group** (CED), Sept. 1995, p. 12. News item about acquisition of controlling interest in Zenith by Korea's LGE.

### **Back to Basics**

**Five ways to enhance the life of test gear** (CED), Michael McCaffery, CTV Inc., Oct. 1995, p. 74.

Tips on how to keep test gear in tip-top shape and accurate.

**How to measure carrier-to-noise** (CED), Rex Bullinger, Hewlett-Packard Co., Nov. 1994, p. 68. Review of two important concepts (noise correction factors & measuring noise in-service) in measuring the visual carrier-to-noise ratio (CNR) prompted by new FCC technical standards.

**Making it work: Return systems 101** (CED), Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, August 1995, p. 66. The basics on operating a return network.

**Making the color measurements** (CED), Adolfo Rodriguez, Tektronix Inc., Jan. 1995, p. 74. Final part of series examining the entire suite of video tests required by the FCC.

**Measuring visual and aural levels** (CED), Mike Long, Zenith Electronics, Dec. 1994, p. 85. A detailed report on the NCTA recommended practice for signal level measurements that satisfy FCC technical standards.

**The return system: A historical perspective** (CED), Jerry Marketos, Philips Broadband Networks, Sept. 1995, p. 84. A look at what happens to signals in the reverse band.

**Reverse testing and alignment for cable TV** (CED), Steve Windle, Wavetek Corp., April 1995, p. 68. The reverse sweep option, which provides fast, accurate measurements of the reverse bandwidth, is detailed.

**Spectrum analyzer in-service measurement** (CED), Jerry Harris, Tektronix Inc., March 1995, p. 86. Gated and non-gated in-service measurement techniques (applied to CSO, C/N and ICR) are compared, as well as their practical application.

**Two-way activation for telephony** (CED), Fred Rogers, Quality RF Services, June 1995, p. 135. Some basic concerns about return path reliability that should be kept in mind when setting up telephony services.

### **CableLabs**

**CableLabs, CCA plan interoperability show-case** (MCN), CableLabs staff, 11/7/94, p. 55. A preview of the CableNET project that appeared at the 1994 Western Show.

**CableLabs hosts convergence confab** (CED), March 1995, p. 16. News item on CableLabs' successful convergence forum held during the

ComNet '95 trade show.

**CableLabs issues new datacomm RFP** (MCN), Leslie Ellis, 4/24/95, p. 55. An addendum to the \$4 billion telecom RFP goes out to 200 companies.

**CableLabs issues RFP, is awarded 2 patents** (CED), June 1995, p. 16. News item on CableLabs' call to over 200 companies for telecommunications study and its acquisition of two wireless technology patents.

**CableLabs to spend \$13.1 million in '95** (CED), Feb. 1995, p. 16. News item on CableLabs 1995 budget.

**CableNET '94 doubles in size** (MCN), Leslie Ellis, 11/28/94, p. 173. More than 50 companies plan to take part in the massive integration project.

**Data warehouses a tool for telecom** (CED), CableLabs staff, Sept. 1995, p. 30. A seminar examines how enterprise management will converge MIS and plant/engineering functions.

**'Evangelizing' for server solutions** (CED), Robert Wells, CableLabs Inc., Jan. 1995, p. 16. Initial impressions from soon-to-be-issued summary by CableLabs on an RFI analysis of digital media servers.

**The further adventures of Eng** (CED), Dana Cervenka, Feb. 1995, p. 18. A profile of CableLabs' manager of technical services, David Eng.

**Nine co.'s join CableLabs forum** (MCN), Fred Dawson, 1/30/95, p. 57. In order to speak more directly with the computer industry, CableLabs starts the Information Technology Convergence Forum.

**Quest for open standards begins for new group** (CED), Dec. 1994, p. 16. News item on the formation of the North American Digital Group by more than 60 companies and organizations to develop a non-proprietary digital television standard.

**The return band: Open for business?** (CED), Roger Brown, Dec. 1994, p. 40. A discussion of the ramifications of an upcoming report from the CableLabs Network Integrity Group that challenges the industry to actually produce what it's always advertised, i.e., a "two-way ready" capability.

**Return path a fantastic voyage?** (CED), May 1995, p. 28. A brief review of CableLabs' study (and its findings) entitled: "Two-Way Cable Television System Characterization."

### **Capital Currents**

*(Capital Currents is a monthly CED column written by Jeffrey Krauss, consultant.)*

**Broadcasters must repent before it's too late** (CED), Jeffrey Krauss, consultant, June 1995, p. 28. Broadcasters who want to use compressed HDTV signals to carry multiple SDTV channels are missing the point...and probably the boat as well.

**Cable piracy and the schizoid FCC** (CED), Jeffrey Krauss, consultant, August 1995, p. 22. The FCC falls short in its enforcement of cable signal piracy ban.

**Further developments in location technologies** (CED), Jeffrey Krauss, consultant, Feb. 1995, p. 12. A review of technology available that could meet the FCC's proposal that cellular operators provide

caller location information for 911 calls.

**Get out the aspirin: HDTV headaches ahead** (CED), Jeffrey Krauss, consultant, July 1995, p. 12. A review of the HDTV situation and why it still has a way to go before it's a fait accompli.

**Girding for the next big interface debate** (CED), Jeffrey Krauss, consultant, April 1995, p. 12. A review of technical questions to be considered in developing a baseband digital interface (i.e., a high-speed local area data network for the home).

**Hanging ten on the Internet** (CED), Jeffrey Krauss, consultant, March 1995, p. 12. Some important content resources found on the Internet.

**The need for telephone portability** (CED), Jeffrey Krauss, consultant, Dec. 1994, p. 5. A call for interim solutions to the question of service provider portability, i.e., being able to keep your telephone number when switching between telephone providers.

**RBOCs are out of control** (CED), Jeffrey Krauss, consultant, May 1995, p. 12. The cross-subsidization of RBOC's broadband services continues and the FCC is just catching up to that fact.

**Resolving conflict and making progress** (CED), Jeffrey Krauss, consultant, Nov. 1994, p. 5. Results of two months of negotiation between LMDS, FSS and MSS proponents regarding 27.5 GHz to 29.5 GHz spectrum sharing.

**Retail sales of boxes and cable pirates** (CED), Jeffrey Krauss, consultant, Sept. 1995, p. 24. The prospects of cable boxes being sold at retail and associated problems.

**The V Chip ratings controversy** (CED), Jeffrey Krauss, consultant, Oct. 1995, p. 22. A look at some of the controversies surrounding the "violence" chip.

**Video dial tone sputters along** (CED), Jeffrey Krauss, consultant, Jan. 1995, p. 5. Potentially a strong competitor to cable, telco video dial tone (VDT) service is mired in an ongoing debate about who pays for its implementation.

### **Ciciora's Corner**

*(Ciciora's Corner is a bimonthly CED column written by Walter Ciciora, consultant.)*

**Addressable half-ASCII, a new compromise** (CED), Walt Ciciora, consultant, Oct. 1995, p. 24. Details surrounding the compromise struck on the decoder interface.

**EIA suffers from set-top schizophrenia** (CED), Walter Ciciora, consultant, May 1995, p. 118. The Electronic Industries Association's change of position on set-top boxes is explored.

**From the couch to the module** (CED), Walter Ciciora, consultant, March 1995, p. 26. Ciciora puts his spin on the raging decoder interface debate.

**Importance of the decoder interface** (CED), Walter Ciciora, consultant, Nov. 1994, p. 22. Discussion on the importance of the decoder interface and an explanation why cable industry professionals must continue to be active participants in the debate on the issue.

**Reaching a compromise within a box** (CED), Walter Ciciora, consultant, July 1995, p. 24. The

decoder interface debate and negotiations have put the cable industry into a box itself.

**SCTE standards effort needs you (CED)**, Walter Ciciora, consultant, Jan. 1995, p. 20. The case is made for the SCTE to be the cable industry's standard bearer when it comes to negotiating technical standards for the industry in this age of convergence.

## Competing technologies

**ADSL advocates tout major tech advances (MCN)**, Fred Dawson, 3/20/95, p. 1A. There's a lot of progress being made in the ADSL arena.

**AlphaStar picks Samsung to build its DBS set-tops (CED)**, Oct. 1995, p. 14. The new DBS provider picks Samsung to build its receivers.

**AT&T Paradyne develops new ADSL system (CED)**, Sept. 1995, p. 14. News item about advances made with video over copper technology.

**Ahead of the pack (CV)**, Chris Nolan, 9/18/95, p. 17. Most voice-over-coax service is offered by cable operators—but not in Deerfield, Mich., a rural telco.

**Ameritech Corp. lays out deliberate VDT strategy (MCN)**, Fred Dawson, 11/14/94, p. 1. Ameritech begins to lay out a strategy that includes Disney, BellSouth and SBC Communications.

**Ameritech sorts out video plans (MCN)**, Fred Dawson, 1/23/95, p. 39. The regional Bell company lays groundwork for next-generation TV service.

**Ameritech talking of Jones overbuild (MCN)**, Ted Hearn, 5/8/95, p. 3. Ameritech plans to seek a cable franchise in Naperville, Ill.

**Ameritech vendor choices spell big play in analog (MCN)**, Fred Dawson, 2/27/95, p. 45. The RBOC selects Scientific-Atlanta to supply most of its broadband gear.

**AT&T touts transmission system (MCN)**, Fred Dawson, 7/31/95, p. 33. New equipment from AT&T Paradyne may be good news to RBOCs interested in pursuing ADSL technology.

**Bandwidth management in an HFC network (CED)**, G. Keith Cambron, Pacific Bell and Fred Kemmerer, AT&T Bell Labs, Sept. 1995, p. 78. A look at how Pac Bell has engineered its broadband network.

**Bell Atlantic adds fiber to VDT diet (MCN)**, Kent Gibbons, 5/15/95, p. 2. It appears the RBOC will re-file its VDT application, but will include much more fiber and much less coaxial cable.

**Bell Atlantic slams brakes on VDT nets (MCN)**, Ted Hearn and Leslie Ellis, 5/1/95, p. 1. Faced with long delays from the FCC and changing technology options, the RBOC decides to wait to upgrade its networks to broadband capability.

**Bellcore delves into HFC amid support for FITL (CED)**, Fred Dawson, Oct. 1995, p. 80. Bellcore reaches out to MSOs, but seems to have a bias toward FITL architectures.

**BellSouth to test Intel cable modems in Ga. (MCN)**, Leslie Ellis, 6/26/95, p. 4. The first RBOC jumps on the high-speed data bandwagon and will test gear in Chamblee, Ga.

**Cable networks in the next millennium (CED)**, Dana Cervenka, Dec. 1994, p. 30. A crystal ball

discussion of engineering professionals — five MSO representatives and three manufacturer representatives — on the network of the future and cable's future in telephony among other things.

**Cablephone not ringing yet (CED)**, Dana Cervenka, March 1995, p. 32. The rush to provide telephony services has created a hardware crunch. Manufacturer's product lines, trials and deployment schedules are reviewed.

**Cable + wireless = Cablemaxx (CV)**, Tom Kerver, 4/5/95, p. 41. A profile of how one MMDS operator is performing against cable.

**Cambron's HFC network lies in wait (CED)**, Dana Cervenka, Sept. 1995, p. 16. Profile of Keith Cambron, director of systems engineering for broadband services at Pacific Bell.

**Changing the cost picture (MCN)**, Leslie Ellis, 6/26/95, p. 49. Thomson thinks it can build a digital set-top for switched digital networks at a cost much cheaper than cable boxes.

**DBS companies ready interactive technology (MCN)**, Marty Levine, 3/20/95, p. 12A. The second generation Thomson decoder will include some level of interactivity.

**DBS: We're walking the walk (MCN)**, Kent Gibbons, 1/16/95, p. 3. The DBS backers plow a lot of resources back into the industry.

**Defensive driving on the infoban (Conv)**, Craig Kuhl, Nov. 1994, p. 12. Cable operators and telcos are eyeing each other warily as they gear up for head-to-head competition.

**Delivering the promise (CED)**, Andrew Paff, Antec Corp., May 1995, p. 32. The evolutionary path of HFC infrastructure development, both its unexpected problems and its unforeseen potential, is detailed and brought up-to-date.

**Delivering video without set-tops (CED)**, Roger Pience, Watson Technologies Corp., June 1995, p. 73. A new signal delivery and control architecture that is completely compatible with existing coax and HFC systems is detailed.

**Dialing for dollars (Conv)**, Judith Lockwood, May 1995, p. 18. A close look at four major telcos involved in video service trials.

**Digital tests hearten wireless cable execs (MCN)**, Leslie Ellis, 3/13/95, p. 6. Digital video compression tests undertaken recently have MMDS operators ecstatic over their prospects for success.

**'Evangeling' for server solutions (CED)**, Robert Wells, CableLabs Inc., Jan. 1995, p. 16. Initial impressions from soon-to-be-issued summary by CableLabs on an RFI analysis of digital media servers.

**FCC gives boost to LMDS wireless technology (MCN)**, David Kaut, 7/17/95, p. 4. CellularVision is pleased with the FCC's decision to carve up the spectrum between LMDS and satellite users.

**FCC okays spate of VDT networks (MCN)**, Kent Gibbons, 1/2/95, p. 1. The FCC clears a few VDT requests off the docket.

**FCC will not enforce ISDN rule: major boost to high-speed service (MCN)**, Kent Gibbons, 6/5/95, p. 37. The FCC won't enforce a rule that would have forced telcos to raise ISDN rates.

**The great convergence poker game (Conv)**, Larry Yokell, Feb. 1995, p. 18. The stakes are high as

telecommunication high rollers roll the dice in the big convergence game.

**Hardware is real; MSOs begin to commit (CED)**, Fred Dawson, Jan. 1995, p. 62. Behind all the razzledazzle of the 1994 Western Show, a number of developments show the industry is finally on the move towards its multimedia, interactive future.

**Hartford: Where the action is (MCN)**, Fred Dawson, 10/9/95, p. 3. Forget about Orlando and Castro Valley, the brutal action between MSOs and telcos is in and around Hartford, Conn.

**Hazardous driving in the local loop (Conv)**, David Smith, April 1995, p. 32. Long distance carriers, cable operators and competitive access providers are racing to get a piece of the local telephone pie.

**The I of the hurricane (Conv)**, Price Colman, October 1995, p. 16. Cyberspace is competing with television for attention.

**IVDS coming to the Midwest; testing to begin (CED)**, Oct. 1995, p. 14. The new interactive service is coming to Columbus, Ohio.

**Keep your eye on the bear (CED)**, Ted Harston, Post-Newsweek Cable, March 1995, p. 24. Harston believes cable's future depends on customer service, quality control, increased education and the ability not to get too overconfident.

**Long distance repairs (CV)**, Chris Nolan, 10/9/95, p. 24. The new Sony DirecTv receivers suffers a few glitches.

**MSOs ally with Sprint; telcos turn up the heat (CED)**, Dec. 1994, p. 16. News item about two alliances in the competitive cable and telco camps: Sprint, TCI, Comcast and Cox in one corner, Nynex, Bell Atlantic, Pacific Telesis and Creative Artists Agency in the other.

**Network powering: Looking beyond 60 volts (CED)**, Leslie Ellis, Nov. 1994, p. 58. A discussion of the technical and economic challenges the cable industry faces in powering telephony services.

**New life for ADSL (MCN)**, Fred Dawson, 12/5/94, p. 101. As the Bell companies push to offer multimedia to the business sector, it's breathing new life into ADSL technology.

**New wireless cable system hits snags (MCN)**, Fred Dawson, 1/23/95, p. 3. The once-promising LMDS, or "cellular TV" service is running into problems.

**Nynex, BellSouth get FCC nod on VDT networks (MCN)**, Kent Gibbons, 2/13/95, p. 4. The two RBOCs plan for video dialtone are approved.

**Nynex Corp. outlines broadband future (MCN)**, Fred Dawson, 7/31/95, p. 33. After completing its HFC tests, Nynex wants to test ADSL and other options related to its embedded plant.

**Nynex pushes for VDT delay (MCN)**, Ted Hearn, 7/17/95, p. 3. The company pushes for the FCC to delay ruling on VDT ground rules.

**Oracle, Hewlett-Packard to supply interactive system to Pacific Bell (MCN)**, Leslie Ellis, 6/12/95, p. 1A. Oracle software will be meshed with HP's MediaStream video server to provide interactive TV capability for the RBOC.

**PacBell defends hybrid fiber/coax: 'Right technology at right price' (MCN)**, Leslie Ellis, 7/3/95, p. 33. The RBOC details its



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California construction plans.

**PacTel finds video plans too ambitious** (MCN), John Higgins, 10/2/95, p. 1. The RBOC refocuses its efforts toward the Bay Area, agrees that the revolution will take time.

**Probita, GI will team on gateways** (MCN), Leslie Ellis, 1/9/95, p. 41. The two companies plan to co-develop Level 1 gateways for telco video dialtone applications.

**RBOC group issues set-top RFP** (CED), April 1995, p. 14. News item on request for proposals for up to 4 million analog and digital set-tops by consortium of Nynex, Bell Atlantic and Pacific Telesis.

**RBOCs invest in MMDS provider** (CED), May 1995, p. 14. News item on the boost the "wireless cable" industry has received with the \$100 million investment of two telcos looking for an alternative to wireline systems.

**RBOCs on track with digital TV rollout by '96** (MCN), Fred Dawson, 2/6/95, p. 1. Several RBOCs predict that, with swift FCC action, they could be offering digital TV to the market in about a year.

**Resolving conflict and making progress** (CED), Jeffrey Krauss, consultant, Nov. 1994, p. 5. Results of two months of negotiation between LMDS, FSS and MSS proponents regarding 27.5 GHz to 29.5 GHz spectrum sharing.

**Satellites have operators looking skyward** (CED), Fred Dawson, Nov. 1994, p. 62. A detailed overview of the challenges and opportunities presented by advanced satellite systems to providers of all landline services.

**SBC's VOD effort drawing eyes to Texas** (MCN), Kent Gibbons, 5/1/95, p. 3. The telco's trial in Richardson is worth watching.

**Smith pushes ADSL strategy** (MCN), Fred Dawson, 9/25/95, p. 49. Bell Atlantic chief Ray Smith touts the VOD trial that was performed with ADSL technology.

**SNET drops digital from VDT trial plan** (MCN), Kent Gibbons, 9/1/95, p. 3. Because digital technology won't be ready in time, SNET decides to add more analog capacity to its one-year VDT trial.

**Standards** (CED), Return Path poll, March 1995, p. 114. Operators express growing approval of setting standards, but disagree on what standards should be set and who should set them.

**Telco networks have come full-circle** (CED), Fred Dawson, Dec. 1994, p. 90. Fast moving technology developments and the slow moving Section 214 approval process have telcos considering a hybrid HFC / FTTC topology to deliver their video dialtone.

**Tele-TV issues RFP for wireless set-tops** (MCN), Leslie Ellis, 7/17/95, p. 4. The telco consortium has received eight responses for a digital wireless set-top.

**TI jumps into LMDS fray** (MCN), Fred Dawson, 10/9/95, p. 65. Texas Instruments announces a plan to offer a complete "cellular TV" system.

**Unleashing the power of the PC** (CED), LANcity staff, April 1995, p. 26. (Part 1 of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

**US West details working ADSL model as a laboratory concept** (MCN), Leslie Ellis, 7/10/95, p. 45.

A working prototype of ADSL is shown.

**US West pulls VDT; eyes wireless, DBS** (MCN), Fred Dawson, 6/5/95, p. 1. Following in the footsteps of Bell Atlantic, US West pulls its VDT applications and re-evaluates its video approach.

**US West sets ambitious Atlanta plans** (MCN), Fred Dawson, 7/3/95, p. 33. The company plans to spend \$200 million to upgrade Atlanta—and it's in a hurry.

**Where in the world are we headed?** (CED), Archer Taylor, Malarkey-Taylor Associates, Dec. 1994, p. 124. Cable's dive into residential voice and data telephony services is just a matter of time, technology and a clearly defined strategy.

**Which is the best modulation? QAM vs VSB** (CED), Henry Samuelli, Broadcom Corp.; Leo Montreuil, Scientific-Atlanta Inc.; Woo H. Paik, General Instrument Corp.; Ron Lee, Zenith Electronics Corp.; Dec. 1994, p. 44. Proponents for the two competing digital modulation technologies go head-to-head to make the case for their respective sides.

**Why the PC will rule the interactive house** (CED), Roger Brown, August 1995, p. 60. A PC professional (Avram Miller/Intel Corp.) explains why he believes the PC will be the interactive gateway in consumer homes.

**Wireless op receives \$100M from Baby Bells** (MCN), Kent Gibbons, 4/3/95, p. 1. Bell Atlantic and Nynex invest in CAI Wireless so they can get into the video arena in a hurry.

**Wireless operators prepare for battle after conference** (MCN), Fred Dawson, 7/24/95, p. 53. MMDS operators now know that digital transmission works, so they're drawing up battle plans against cable operators.

## Construction issues

**1995 construction plans** (CED), Return Path poll, April 1995, p. 90. Operators provide details of upcoming capital expenditures spurred by increased competition.

**Construction from a contractor's point of view** (CED), Jeff Michaud, Cable Constructors Inc., Oct. 1995, p. 42. Some things to think about to help your rebuild go more smoothly.

**Construction outlook strong for summer** (MCN), Leslie Ellis, 6/12/95, p. 1A. Despite a small slump in hardware purchases, indicators point to a strong construction season.

**The drop cable dilemma continues** (CED), Chris Bowick, Jones Intercable, April 1995, p. 22. Some recommendations to curb drop cable waste.

**A field-installable fusion connector** (CED), Rodney Throckmorton and Rudolf Brugger, Siccior Corp. and Siemens AG, August 1995, p. 24. Details of a new field-installable connector are revealed.

**The great disappearing drop cable issue** (CED), Chris Bowick, Jones Intercable, March 1995, p. 22. Results and implications of study on the apparent increased deployment drop cable throughout the industry

**Hardware is real; MSOs begin to commit** (CED), Fred Dawson, Jan. 1995, p. 62. Behind all the razzledazzle of the 1994 Western Show, a number of

developments show the industry is finally on the move towards its multimedia, interactive future.

**In-home wiring: an arm wrestling match** (CED), Dana Cervenka, June 1995, p. 62. Cable operators are in a real tug-of-war with their competitors over in-home wiring.

**PacBell defends hybrid fiber/coax: 'Right technology at right price'** (MCN), Leslie Ellis, 7/3/95, p. 33. The RBOC details its California construction plans.

**Preparing the drop for digital services** (CED), John Grothendick, Antec, Oct. 1995, p. 36. The weak link in digital will be the in-home wiring and the drop. But there are some steps that can be taken.

**SCTE group drafts construction guidelines** (CED), Dana Cervenka, Oct. 1995, p. 48. An update on the work being done by the SCTE Basic Construction Working Group.

**Skepticism abounds** (MCN), Leslie Ellis, 9/4/95, p. 35. US West plans an aggressive build in Atlanta, but few believe it can be done on schedule.

**Suppliers squeezed to meet demand** (CED), Leslie Ellis, Nov. 1994, p. 34. Worldwide demand for high bandwidth, high-quality equipment is putting a big pinch on U.S. operators who want to rebuild or upgrade their networks.

**US West sets ambitious Atlanta plans** (MCN), Fred Dawson, 7/3/95, p. 33. The company plans to spend \$200 million to upgrade Atlanta—and it's in a hurry.

## Consumer interface

**Addressable half-ASCII, a new compromise** (CED), Walt Ciciora, consultant, Oct. 1995, p. 24. Details surrounding the compromise struck on the decoder interface.

**Amendment threatens decoder interface work** (CED), July 1995, p. 14. News item about a proposed amendment to the telecommunications bill that could jeopardize NCTA/EIA negotiations on decoder interface standard

**Application of standards a delicate balance** (CED), Wendell Bailey, NCTA, April 1995, p. 20. Before jumping on any standards bandwagon, the industry has to determine whether they will degrade the delivered product or hinder competitiveness because they're too expensive.


**Bell Atlantic backs off HFC builds, cites reduction in costs for digital nets** (CED), June 1995, p. 14. News item about FCC delays that have prompted Bell Atlantic to forgo HFC based systems and change to switched digital video network build outs.

**Broadcast quality technical standards** (CED), Archer Taylor, Malarkey-Taylor Associates, Nov. 1994, p. 84. Discussion urging the cable industry to continue its work on developing interface standards, in lieu of the FCC doing so, to facilitate the transition between NTSC and ATV.

**Cable networks in the next millennium** (CED), Dana Cervenka, Dec. 1994, p. 30. A crystal ball discussion of engineering professionals — five MSO representatives and three manufacturer representatives — on the network of the future and cable's future in telephony among other things.

**Cablephone not ringing yet** (CED), Dana





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Cervenka, March 1995, p. 32. The rush to provide telephony services has created a hardware crunch. Manufacturer's product lines, trials and deployment schedules are reviewed.

**Combating cable signal theft (CED)**, Rhea Kaston, Henry Schwab, Stephen Pagano, Staten Island Cable, July 1995, p. 58. Edited text of the winning entry in NCTA's 1995 signal security ideas competition.

**Compatibility fighters find some common ground (CED)**, Roger Brown, June 1995, p. 66. An agreement on a decoder interface standard between the NCTA and EIA may finally be in sight.

**Delivering the promise (CED)**, Andrew Paff, Antec Corp., May 1995, p. 32. The evolutionary path of HFC infrastructure development, both its unexpected problems and its unforeseen potential, is detailed and brought up-to-date.

**Delivering video without set-tops (CED)**, Roger Pience, Watson Technologies Corp., June 1995, p. 73. A new signal delivery and control architecture that is completely compatible with existing coax and HFC systems is detailed.

**Digital set-top approaches become clearer (CED)**, Fred Dawson, May 1995, p. 91. A report on how designs for digital set-tops have finally begun to crystalize.

**Disabled must have easy NII access (CED)**, Wendell Bailey, NCTA, May 1995, p. 22. A plea to cable operators to think about access problems of the disabled before interactive hardware and software solutions are finalized.

**Don't lose sight of the pivot point (CED)**, Chris Bowick, Jones Intercable, Dec. 1994, p. 24. A reasoned warning not to forget the pivotal figures in all the fast-breaking developments in the industry, i.e., consumers, and a plea to avoid developing proprietary interfaces to reach them.

**EIA drops bombshell on NCTA, decides to scrap decoder standard (CED)**, March 1995, p. 14. News item on the abrupt halt of talks on a new decoder interface standard.

**EIA stirs up set-top box compatibility effort (MCN)**, Leslie Ellis, 2/13/95, p. 12. The EIA files with the FCC, asking that cable operators be prohibited from scrambling.

**EIA suffers from set-top schizophrenia (CED)**, Walter Ciciora, consultant, May 1995, p. 118. The Electronic Industries Association's change of position on set-top boxes is explored.

**Eshoo's new stance aids decoder interface, cable (MCN)**, Leslie Ellis, 7/24/95, p. 54. After an initial bill that caused problems, Rep. Eshoo stands in favor of the decoder interface work performed by the NCTA and EIA.

**From the couch to the module (CED)**, Walter Ciciora, consultant, March 1995, p. 26. Ciciora puts his spin on the raging decoder interface debate.

**Girding for the next big interface debate (CED)**, Jeffrey Krauss, consultant, April 1995, p. 12. A review of technical questions to be considered in developing a baseband digital interface (i.e., a high-speed local area data network for the home).

**The good old days (CED)**, Archer Taylor, Malarkey-Taylor Associates, May 1995, p. 124.

"Interoperability" seems to be the key to the future

and cable should consider getting behind it before it's too late.

**HDTV field tests show VSB shines (CED)**, Nov. 1994, p. 12. News item on successful field tests that support HDTV's "broadcast coverage and cable robustness to the performance of the current NTSC television systems."

**Importance of the decoder interface (CED)**, Walter Ciciora, consultant, Nov. 1994, p. 22. Discussion on the importance of the decoder interface and an explanation why cable industry professionals must continue to be active participants in the debate on the issue.

**In-home wiring: an arm wrestling match (CED)**, Dana Cervenka, June 1995, p. 62. Cable operators are in a real tug-of-war with their competitors over in-home wiring.

**The irksome interface impediment (CED)**, Archer Taylor, Sept. 1995, p. 116. Archer buys a new TV set and has problems getting everything hooked up to cable.

**Looking through a dim crystal ball (CED)**, Jim Farmer, Antec Technology Center, August 1995, p. 12. Farmer speculates on future trends and technology developments in the industry.

**NCTA, EIA reach accord on compatibility issues (MCN)**, Roger Brown, 5/8/95, p. 165. The two sides reach an agreement in principle on the decoder interface standards.

**New products bring hype closer to reality (CED)**, CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**No agreement as ruling nears on compatibility (MCN)**, Leslie Ellis, 1/23/95, p. 39. Agreement on the decoder interface is still elusive as the EIA and NCTA squabble over details.

**Northern Telecom debuts HFC architecture, products (CED)**, Dec. 1994, p. 14. News item on NT's development of a new architecture and related products to assist in the provision of digital telephony, video and data over HFC networks.

**OSS: The backbone of interactive television (CED)**, Ed Means, CableData, August 1995, p. 54. Factors to consider when searching for an Operations Support System for interactive services.

**PacBell poised and ready to proceed with HFC network; awaits FCC OK (CED)**, August 1995, p. 14. News item on PacBell opening its broadband laboratory to the press and reaffirming its commitment to a HFC deployment.

**Prepare to enter the fray (CED)**, Wendell Bailey, NCTA, March 1995, p. 20. Bailey warns cable operators to be prepared to enter the decoder interface battle when the FCC targets the issue for resolution.

**Reaching a compromise within a box (CED)**, Walter Ciciora, consultant, July 1995, p. 24. The decoder interface debate and negotiations have put the cable industry into a box itself.

**Rep's move eschews compatibility (MCN)**, Leslie Ellis, 6/5/95, p. 1. A new bill offered by Rep. Eshoo could undo a lot of agreements between cable interests and the EIA.

**A robust digital link for in-residence distribution**

(CED) Alastair Warwick and Robert Thomas, Broadband Access Technology Applications, Nov. 1994, p. 40. A new look at an old technology — BPSK, Bipolar Phase Shift Keying — proves to be a viable solution for improving digital cable reception in the home.

**Sega Channel poised for take-off (CED)**, June 1995, p. 16. News item about developments that have moved Sega Channel closer to becoming a reality.

**Synergistic swap meet, or no deal? (CED)**, Dana Cervenka, May 1995, p. 52. As more cable operator/utility partnerships are announced, the pros and cons for each partner are detailed, as well as a look at what a successful partnership might entail.

**TCI ventures into on-line data services (CED)**, June 1995, p. 14. News item on TCI's announced partnership to provide on-line data services.

**Time Warner shows off telecommunications nerve center (CED)**, Dec. 1994, p. 14. News item on the unveiling of TW's new National Operations Center (NOC) that will serve as a network monitoring facility and a one-stop shop for cable/telephony transactions between customers and NOC staffers.

**Two-way activation for telephony (CED)**, Fred Rogers, Quality RF Services, June 1995, p. 135. Some basic concerns about return path reliability that should be kept in mind when setting up telephony services.

**The ubiquitous cable box (CED)**, Archer Taylor, Oct. 1995, p. 108. Cable has experimented with lots of technologies, but always comes back to the set-top box.

**User-perceived availability of HFC networks (CED)**, David Large, Connections Group, June 1995, p. 118. A reliability analysis of several architectures with performance comparisons.

## Data communications

**Antec, Nortel pen 3 alliances (CED)**, Sept. 1995, p. 14. The two companies agree to form alliance companies to develop telecom and datacom products.

**Apple petitions FCC to create NII Band (CED)**, July 1995, p. 14. News items on Apple's petition to the FCC to create a National Information Infrastructure band of the radio spectrum for high-speed data communications.

**BellSouth to test Intel cable modems in Ga. (MCN)**, Leslie Ellis, 6/26/95, p. 4. The first RBOC jumps on the high-speed data bandwagon and will test gear in Chamblee, Ga.

**Cable data in tandem with online services (CED)**, Fred Dawson, July 1995, p. 78. The dynamic, rapidly-developing synergies between cable data communication capabilities and on-line services are explored.

**Cable hooks up to data at NCTA (CED)**, CED staff, June 1995, p. 104. Attendees to the NCTA National Show are encouraged by the progress manufacturers have made with the introduction of new equipment at the show.

**CableLabs hosts convergence confab (CED)**, March 1995, p. 16. News item on CableLabs' successful convergence forum



held during the ComNet '95 trade show.

**CableLabs issues new datacomm RFP (MCN)**, Leslie Ellis, 4/24/95, p. 55. An addendum to the \$4 billion telecom RFP goes out to 200 companies.

**CableLabs issues RFP, is awarded 2 patents (CED)**, June 1995, p. 16. News item on CableLabs' call to over 200 companies for telecommunications study and its acquisition of two wireless technology patents.

**Cable modems: The MSO's link to the PC boom (CED)**, Jack Mann, Scientific-Atlanta Inc., April 1995, p. 64. A critical mass of new and improved technologies and demonstrated consumer demand indicate a lucrative revenue stream could inundate operators who are prepared to take advantage of it. **Cablephone not ringing yet (CED)**, Dana Cervenka, March 1995, p. 32. The rush to provide telephony services has created a hardware crunch. Manufacturer's product lines, trials and deployment schedules are reviewed.

**Cable TV data network system security (CED)**, Stephen Holmes, Zenith Electronics Corp., Dec. 1994, p. 60. A report on the security issues cable TV-based data communication systems face and some of the methods that can thwart system abuse.

**Cable/utility groups see many synergies (CED)**, March 1995, p. 14. News item about the increased talk and activity in developing interactive broadband communication links with utility companies.

**Cablevision Systems offers on-line services in N.Y. (MCN)**, Fred Dawson, 11/28/94, p. 186. Customers in Yonkers and Long Island are slated to have high-speed access to several online providers.

**Canada MSOs commit to datacomm services (MCN)**, James Careless, 6/5/95, p. 37. Canada's three largest MSOs are working together to launch a national access service for PCs.

**CATV bandwidth assessment (CED)**, Gino Caira, GLA International, June 1995, p. 32. Current development of spectrum-saving technology provides a practical approach to system design.

**Is CDMA a viable choice for the upstream path? (CED)**, Gihad Ghaibeh, Ericsson-Raynet Corp., August 1995, p. 40. The allure of Code Division Multiple Access is explored.

**Comcast Corp. plots bold online strategy for '95 (MCN)**, Leslie Ellis, 12/12/94, p. 3. The MSO plans to roll out Comcast PC Connect by the end of 1995.

**Counting on high-speed applications (MCN)**, James Careless, 10/9/95, p. 65. Rogers Cablesystems hooks up to the World Wide Web.

**Datacomm emerges as next wave (MCN)**, Leslie Ellis and Fred Dawson, 5/15/95, p. 1. The National Show is dominated by news surrounding cable data modems.

**Data communications (CED)**, Return Path poll, July 1995, p. 94. While interest is high, actual deployment of data communication technology is still limited in the industry.

**Data crusader rails against vaporware (CED)**, Dana Cervenka, August 1995, p. 18. Profile of LANcity founder and data communications proponent, Rouzbeh Yassini.

**Data revenues waiting for two-way plant (MCN)**, Leslie Ellis, 5/1/95, p. 85. Cable operators are poised to get revenue from interactive services, if

there's a two-way path activated.

**Data transmission interference in CATV systems (CED)**, William Sward, XEL Communications Inc., April 1995, p. 36. The potential for interference between data and video on CATV systems is explored.

**Data warehouses a tool for telecom (CED)**, CableLabs staff, Sept. 1995, p. 30. A seminar examines how enterprise management will converge MIS and plant/engineering functions.

**The door is open, but ITV stumbles (CED)**, Roger Brown, August 1995, p. 30. Reasons why the bloom is definitely off the interactive TV rose.

**Early adopters take to it (MCN)**, Fred Dawson, 10/23/95, p. 47. Continental nearing commercial roll-out of datacom services.

**For a few pennies more (CED)**, Dana Cervenka, April 1995, p. 18. A profile of Media General Cable's vice president of technical projects, Michael Nelson.

**GI, Novell team on broadband LAN (MCN)**, Leslie Ellis, 11/21/94, p. 2. Novell plans to work with GI to develop residential local area networks.

**Girding for the next big interface debate (CED)**, Jeffrey Krauss, consultant, April 1995, p. 12. A review of technical questions to be considered in developing a baseband digital interface (i.e., a high-speed local area data network for the home).

**GI to debut ATM gear (MCN)**, Leslie Ellis, 5/1/95, p. 85. GI plans to debut an ATM front end for its PCLinX datacom platform.

**Hanging ten on the Internet (CED)**, Jeffrey Krauss, consultant, March 1995, p. 12. Some important content resources found on the Internet.

**Harnessing the power of the PC (CED)**, LANcity staff, May 1995, p. 74. (Part 2 of two-part series.) How to turn cable plant into a high-speed Local Area Network is discussed.

**Hearst @Home with Internet (MCN)**, Leslie Ellis, 7/3/95, p. 1. Q&A with Will Hearst III, who has been charged to run the @Home service.

**Hewlett Packard details cable modem (MCN)**, Leslie Ellis, 9/25/95, p. 49. HP gives MSOs and analysts look at new cable modem it will develop.

**The high-speed CATV data revolution (CED)**, Ken Pyle, E/O Networks, April 1995, p. 52. An overview of the issues, business motivations and implementation concerns behind one of the industry's newest (and potentially most lucrative) revenue streams — data communications.

**High-speed data for the consumer market (CED)**, Ed Moura, Hybrid Networks Inc., April 1995, p. 44. An overview of a new system network architecture (i.e., Hybrid Access System) being tested in Castro Valley, Calif. by Viacom, Intel Corp. and General Instrument.

**How one MSO got started in datacomm (CED)**, Roger Brown, May 1995, p. 46. An inside look at "ET Net," a metropolitan area network that ties 12 manufacturing companies together in Arizona.

**The I of the hurricane (Conv)**, Price Colman, October 1995, p. 16. Cyberspace is competing with television for attention.

**IEEE hopes to lock in data standard next year (MCN)**, Leslie Ellis, 5/22/95, p. 38. An update on what the IEEE 802.14 cable TV

protocol working group is doing.

**Implementing telecom on broadband nets (CED)**, Richard Lyford, Antec Corp., March 1995, p. 56. A discussion of some incremental service opportunities available that can keep revenue flowing while operators strive for full service telecommunication systems.

**Intel, cable eye TV/Web bridge (MCN)**, Kent Gibbons, 10/23/95, p. 47. An Intel idea that brings the Internet and TV together is getting a lot of support.

**Intel signs six software companies for CablePort (MCN)**, Leslie Ellis, 11/28/94, p. 182. Intel adds six software companies to the list of companies that will adapt software for delivery over cable systems.

**Interactive group accelerates practices (CED)**, August 1995, p. 14. News item on steps taken by participants in the Interactive Multimedia Association to develop common protocols.

**Interconnect (CED)**, Return Path poll, Feb. 1995, p. 94. Operators sound off on the pros and cons of interconnecting with their cable neighbors and beyond.

**Internet pioneer eyes cable (MCN)**, Leslie Ellis, 2/6/95, p. 35. A look at what Paul Baran and Com-21 propose to do with data over cable TV.

**LANCity and Motorola debut new cable modems (MCN)**, Leslie Ellis, 4/24/95, p. 55. New hardware is poised to make its debut.

**Microsoft's broadband course (MCN)**, Leslie Ellis, 5/8/95, p. 3. A Q&A interview with Nathan Myhrvold of Microsoft.

**Microsoft takes wraps off on-line network (MCN)**, Kent Gibbons, 11/21/94, p. 81. The company unveils plans to start the Microsoft Network to compete with other online services.

**MSOs ally with Sprint; telcos turn up the heat (CED)**, Dec. 1994, p. 16. News item about two alliances in the competitive cable and telco camps: Sprint, TCI, Comcast and Cox in one corner, Nynex, Bell Atlantic, Pacific Telesis and Creative Artists Agency in the other.

**MSOs encouraged so far (MCN)**, Leslie Ellis, 10/2/95, p. 37. Cable operators are encouraged that high-speed data will generate cash.

**'My kingdom for a modem' (CED)**, Fred Dawson, June 1995, p. 127. The progress made and the challenges that lie ahead in the development of high-speed, low-cost cable modems.

**New products bring hype closer to reality (CED)**, CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Nine co.'s join CableLabs forum (MCN)**, Fred Dawson, 1/30/95, p. 57. In order to speak more directly with the computer industry, CableLabs starts the Information Technology Convergence Forum.

**Northern Telecom debuts HFC architecture, products (CED)**, Dec. 1994, p. 14. News item on NT's development of a new architecture and related products to assist in the provision of digital telephony, video and data over HFC networks.

**Online at 64 kbps (MCN)**, Fred Dawson, 4/24/95, p. 55. Prodigy and IBM will support ISDN access.

**Ops eye high-speed data as big business (MCN)**, Gene Koprowski, 12/5/94, p. 101. High-speed data and Internet access becomes a new priority among major cable operators.

**Ops may gain from games via PC (MCN)**, Fred Dawson, 7/3/95, p. 33. As PCs become the platform of choice for games, cable operators seem poised for revenue from high-speed access.

**OSS: The backbone of interactive television (CED)**, Ed Means, CableData, August 1995, p. 54. Factors to consider when searching for an Operations Support System for interactive services.

**Phone vendors consider data modems (MCN)**, Leslie Ellis, 3/27/95, p. 39. Several of the cable-phone vendors are working to adapt products for use in the high-speed data arena.

**Picking up speed online (MCN)**, Fred Dawson, 2/20/95, p.77. Next generation on-line services move forward with initiatives from Oracle, AT&T and CompuServe.

**Quest for open standards begins for new group (CED)**, Dec. 1994, p. 16. News item on the formation of the North American Digital Group by more than 60 companies and organizations to develop a non-proprietary digital television standard.

**Rogers will link IBM workers at home (MCN)**, Leslie Ellis, 12/5/94, p. 101. Rogers will test work-at-home service to 20 IBM workers in Ontario.

**Six more ops team with Microsoft (MCN)**, Leslie Ellis, 11/28/94, p. 1. Microsoft adds several more operators to its "Insight" development program.

**Standards threaten high-speed data (MCN)**, Fred Dawson, 10/30/95, p.57. Actually, it's the lack of standard protocols that could slow cable's roll out of high-speed data services.

**Synergistic swap meet, or no deal? (CED)**, Dana Cervenka, May 1995, p. 52. As more cable operator/utility partnerships are announced, the pros and cons for each partner are detailed, as well as a look at what a successful partnership might entail.

**Talking networks (CV)**, Chris Nolan, 10/23/95, p. 26. Computer companies stand ready and willing to help cable companies go two-way.

**TCI's @Home (CV)**, Chris Nolan, 10/9/95, p. 26. The Microsoft Network is only part of what the cable company hopes to offer.

**TCI, Microsoft form on-line partnership (CED)**, Feb. 1995, p. 16. News item on 20 percent investment of TCI into partnership with Microsoft to develop high-speed, interactive computing service.

**TCI plots nationwide Internet path (MCN)**, Leslie Ellis, 5/8/95, p. 2. The MSO starts up @Home, an on-line service intended to be pushed over cable plant.

**TCI ventures into on-line data services (CED)**, June 1995, p. 14. News item on TCI's announced partnership to provide on-line data services.

**Telcos look to ADSL for high-speed data services (MCN)**, Fred Dawson, 10/23/95, p. 51. The telcos are searching for way to send high-speed data over existing copper plant, and ADSL might fit the bill.

**Three cos. reveal modem plans (MCN)**, Fred Dawson, 9/11/95, p. 39. ADC, Nortel and Zenith detail their cable modem plans—and they're all different.

**Time Warner does online homework in Elmira**

(MCN), Fred Dawson and Richard Katz, 7/24/95, p. 4. The MSO chooses its Elmira, N.Y. system to do a test of on-line services.

**Time Warner goes online in Elmira, N.Y. (CED)**, Sept. 1995, p. 12. News item about the MSO's plans to offer high-speed datacom.

**Time Warner provides a glimpse of online strategy (MCN)**, Leslie Ellis, 5/29/95, p.35. The MSO jumps on the on-line service bandwagon, but begs for more time to detail its full plan.

**Time Warner wins technical Emmy for HFC (CED)**, Nov. 1994, p. 12. News item on Time Warner's Emmy win for developing hybrid fiber coax, "the architectural bridge spanning existing and future network applications."

**A trip down memory lane (CED)**, Chris Bowick, Jones Intercable, Jan. 1995, p. 22. Bowick argues that many of the "hot" issues the industry is debating today are far from new.

**Unleashing the power of the PC (CED)**, LANcity staff, April 1995, p. 26. (Part 1 of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

**Utilities energized for telecom business (Conv)**, Judith Lockwood, Nov. 1994, p. 20. Utilities are looking to generate new revenues by building advanced telecommunication networks.

**Utilities and outages (CED)**, Return Path poll, August 1995, p. 88. Operators express high interest in joining forces with local utilities, but outages continue to raise concerns about providing full-fledged telephony services.

**Vows aggressive test (MCN)**, Leslie Ellis, 7/17/95, p. 89. TCI plans to issue a cable modem RFP with an eye toward early 1996 deployment.

**Why the PC will rule the interactive house (CED)**, Roger Brown, August 1995, p. 60. A PC professional (Avram Miller/Intel Corp.) explains why he believes the PC will be the interactive gateway in consumer homes.

**Zenith deal could boost cable modems (MCN)**, Fred Dawson, 7/24/95, p. 3. South Korea's LG Group acquires Zenith and the new capital could be a boost for cable modem products.

**Zenith sells company to LGE; cash infusion should help network group (CED)**, Sept. 1995, p. 12. News item about acquisition of controlling interest in Zenith by Korea's LGE.

## Digital technologies

**1550 nm gear back on radar screen (CED)**, Leslie Ellis, Feb. 1995, p. 44. For those cable operators strapped for capacity or wanting turbo-charged throughput, dense-WDM may be the answer.

**Adlink to offer DEC ad system to local operators (MCN)**, Linda Moss, 5/22/95, p. 30. Adlink's cable affiliates will be given a chance to use a new digital ad insertion system for local advertising.

**AlphaStar picks Samsung to build its DBS set-tops (CED)**, Oct. 1995, p. 14. The new DBS provider picks Samsung to build its receivers.

**Antec to start testing ad-insertion system (MCN)**, Linda Moss, 1/9/95, p. 20. Antec looks to begin testing an integrated digital ad insertion system with an eye toward release by mid-1995.

**Apple details interactive TV strategy (MCN)**, Leslie Ellis, 4/17/95, p. 41. The company unveils the set-top it plans to use with British Telecom.

**ATM: Sure thing, or leap of faith? (CED)**, Alan Stewart, March 1995, p. 68. Many consider Asynchronous Transfer Mode switches a crucial linchpin in the Information Superhighway, but is the hardware where it needs to be for MSOs to make such an expensive change?

**Bay Cable forges ahead with StarNet digital (MCN)**, Linda Moss, 4/24/95, p. 46. Bay decides to use StarNet in its \$5 million upgrade.

**Bell Atlantic backs off HFC builds, cites reduction in costs for digital nets (CED)**, June 1995, p. 14. News item about FCC delays that have prompted Bell Atlantic to forgo HFC based systems and change to switched digital video network build outs.

**Broadcasters must repent before it's too late (CED)**, Jeffrey Krauss, consultant, June 1995, p. 28. Broadcasters who want to use compressed HDTV signals to carry multiple SDTV channels are missing the point...and probably the boat as well.

**Broadcasters score big in digital (MCN)**, Fred Dawson, 5/29/95, p. 1. The House telecom bill gives broadcasters additional spectrum, with few restrictions on how to use it.

**Cable, b'casters progress on set-top standards (MCN)**, Fred Dawson, 5/22/95, p. 38. Progress is being made on components of the digital set-top by the VESA standards group.

**Cable hooks up to data at NCTA (CED)**, CED staff, June 1995, p. 104. Attendees to the NCTA National Show are encouraged by the progress manufacturers have made with the introduction of new equipment at the show.

**CableLabs issues RFP, is awarded 2 patents (CED)**, June 1995, p. 16. News item on CableLabs' call to over 200 companies for telecommunications study and its acquisition of two wireless technology patents.

**Cable launches new initiative to find digital common ground (MCN)**, Fred Dawson, 9/4/95, p. 4. MSOs want to determine which digital video compression approach is the best one for cable TV.

**Cable looks at true VOD by '96 (MCN)**, Fred Dawson, 12/5/94, p. 1. Cablevision Systems commits to deploy 20,000 digital set-tops by the end of 1995 with AT&T providing hardware.

**Cable modems: The MSO's link to the PC boom (CED)**, Jack Mann, Scientific-Atlanta Inc., April 1995, p. 64. A critical mass of new and improved technologies and demonstrated consumer demand indicate a lucrative revenue stream could inundate operators who are prepared to take advantage of it.

**Cable networks in the next millennium (CED)**, Dana Cervenka, Dec. 1994, p. 30. A crystal ball discussion of engineering professionals — five MSO representatives and three manufacturer representatives — on the network of the future and cable's future in telephony among other things.

**Cable, telecom convergence on display (CED)**, CED staff, May 1995, p. 88. Important developments and product debuts at Supercomm '95 are detailed.

**Cablephone not ringing yet (CED)**, Dana Cervenka, March 1995, p. 32. The rush to provide



telephony services has created a hardware crunch. Manufacturer's product lines, trials and deployment schedules are reviewed.

**Cablevision box will use AT&T encryption system (MCN)**, Leslie Ellis, 1/16/95, p. 47. A new encryption system, developed by AT&T and VLSI Technology, will be resident in the digital set-top Cablevision will use.

**Can coax support digital?** (CED), Bruce Carlson, General Instrument Corp., Nov. 1994, p. 52. Revisiting vital coaxial cable characteristics with a "digital perspective."

**The care and feeding of your existing plant (CED)**, Joseph Waltrich, General Instrument Corp., Nov. 1994, p. 50. A brief discussion of factors that should be considered when introducing digital video into current analog systems.

**C-Cube introduces real-time MPEG encoder (CED)**, Dec. 1994, p. 14. News item on the introduction of a new family of MPEG-2 real-time encoder products for digital TV by C-Cube and some of the customers already in line to receive the products.

**Changing the cost picture (MCN)**, Leslie Ellis, 6/26/95, p. 49. Thomson thinks it can build a digital set-top for switched digital networks at a cost much cheaper than cable boxes.

**Cheaper and cheaper? Time will tell (CV)**, Chris Nolan, 2/6/95, p. 18. Is it realistic to expect an inexpensive digital set-top soon?

**Compression comprehension: The quest for standards (Conv)**, David Smith, June 1995, p. 27. Digital video compression is the key to vastly expanding content delivery options.

**DAVIC approaches completion of end-to-end specs (MCN)**, 9/25/95, p. 52. Agreement has been reached on a wide number of specifications for a digital networking standard.

**DAVIC completes draft for standards proposal (MCN)**, Fred Dawson, 3/20/95, p. 2A. The group completes its first draft proposal for an end-to-end system standard.

**DAVIC makes some progress, falls short (MCN)**, Fred Dawson, 6/26/95, p. 49. More progress made toward a standard, but thorny set-top issues remain.

**DAVIC standards group progresses (MCN)**, Fred Dawson, 1/30/95, p. 47. Update on DAVIC standards progress after the Orlando, Fla. meeting.

**DAVID wants to be the operating standard for digital set-tops (MCN)**, Fred Dawson, 2/20/95, p. 77. A look at how Microware is approaching the set-top operating system environment.

**DBS companies ready interactive technology (MCN)**, Marty Levine, 3/20/95, p. 12A. The second generation Thomson decoder will include some level of interactivity.

**DBS competition (CED)**, Return Path poll, June 1995, p. 146. While operators deny DBS has had little impact on their customer base, it has sped up the pace of upgrading systems and bandwidth.

**DEC pursues fast-track digital strategy (MCN)**, Fred Dawson, 12/12/94, p. 49. Digital Equipment moves forward in its plan to be a digital hardware systems integrator and video server supplier.

**Different things to different people (CV)**, Chris Nolan, 5/8/95, p. 42. There are a lot of different

kinds of MPEG available, depending on what features you want.

**Delivering video without set-tops (CED)**, Roger Pience, Watson Technologies Corp., June 1995, p. 73. A new signal delivery and control architecture that is completely compatible with existing coax and HFC systems is detailed.

**Digital set-top approaches become clearer (CED)**, Fred Dawson, May 1995, p. 91. A report on how designs for digital set-tops have finally begun to crystallize.

**Digital set-tops complicate local ad picture (MCN)**, Linda Moss and Leslie Ellis, 5/29/95, p. 1. MSOs will need new headend gear to multiplex local digital ads into their video streams and have them decoded at the set-top.

**Digital standards tied to broadcast (MCN)**, 2/6/95, p. 3. The FCC's push to develop digital standards is tied to allowing broadcasters to use new spectrum for standard TV.

**Digital tests hearten wireless cable execs (MCN)**, Leslie Ellis, 3/13/95, p. 6. Digital video compression tests undertaken recently have MMDS operators ecstatic over their prospects for success.

**The door is open, but ITV stumbles (CED)**, Roger Brown, August 1995, p. 30. Reasons why the bloom is definitely off the interactive TV rose.

**Emerging technologies/services (CED)**, Return Path poll, Nov. 1994, p. 78. While the potentially huge impact of new technologies is readily recognized, operators are split on when those technologies will be commonplace.

**Establishing a reliable network (CED)**, Brian Bentley, Broadband Transmission Systems; Michael Pritz, Antec Corp.; Feb. 1995, p. 38. The Sonet solution to broadband network survivability is described and discussed.

**'Evangelizing' for server solutions (CED)**, Robert Wells, CableLabs Inc., Jan. 1995, p. 16. Initial impressions from soon-to-be-issued summary by CableLabs on an RFI analysis of digital media servers.

**FCC digital standards warning shocks ops (MCN)**, Leslie Ellis, 1/16/95, p. 1. The FCC warning about treading in the digital realm sends tremors through the industry.

**FCC official warns cable over '95 digital advances (MCN)**, Leslie Ellis, 1/9/95, p. 2. Senior FCC engineer warns cable operators not to wander too far into the digital realm before standards set.

**FCC's chief engineer promised action on digital standards soon (CED)**, Feb. 1995, p. 14. News item on announcement that FCC plans to begin a new proceeding on digital transmission standards for the cable industry soon (and reaction to it).

**Future set-tops begin to take shape (CED)**, Dec. 1994, p. 18. News item on latest activity — by HP, Zenith, DiviCom and Broadband Technologies — in developing first-generation digital set-tops.

**Get out the aspirin: HDTV headaches ahead (CED)**, Jeffrey Krauss, consultant, July 1995, p. 12. A review of the HDTV situation and why it still has a way to go before it's a fait accompli.

**Getting close to the edge (CED)**, Dana Cervenka, July 1995, p. 34. The coming switch from analog to digital will be a big leap of faith and a big jump

into a whole new world of digital tests and training. **GI focuses on telecom, expands training program (CED)**, June 1995, p. 18. News item on General Instrument's establishment of business unit targeted to serve telco customers and its stepped-up broadband training program.

**GI goes FTTC, BBT finds partner (CED)**, April 1995, p. 16. News item on General Instrument's equity acquisition in developer of switched digital networks and BroadBand Technologies' announced partnership with Texas Instruments to produce components for the Fiber Loop Access system in Austin.

**Girding for the next big interface debate (CED)**, Jeffrey Krauss, consultant, April 1995, p. 12. A review of technical questions to be considered in developing a baseband digital interface (i.e., a high-speed local area data network for the home).

**Hardware is real; MSOs begin to commit (CED)**, Fred Dawson, Jan. 1995, p. 62. Behind all the razzledazzle of the 1994 Western Show, a number of developments show the industry is finally on the move towards its multimedia, interactive future. **Harnessing the power of the PC (CED)**, LANcity staff, May 1995, p. 74. (Part 2 of two-part series.) How to turn cable plant into a high-speed Local Area Network is discussed.

**HDTV field tests shine; FCC decision on SDTV unclear (MCN)**, Leslie Ellis, 9/11/95, p. 39. The Charlotte tests go well, but will a pending decision on standard TV affect cable operators' digital plans?

**HDTV field tests show VSB shines (CED)**, Nov. 1994, p. 12. News item on successful field tests that support HDTV's "broadcast coverage and cable robustness to the performance of the current NTSC television systems."

**Headend interconnects: Sonet or non-Sonet? (CED)**, Robert Harris and Thomas Hall, Nortel Ltd., May 1995, p. 58. A network cost comparison between Sonet and non-Sonet systems.

**HFC gathers steam as telco solution (CED)**, Fred Dawson, August 1995, p. 74. Pacific Bell and Southern New England Telephone take the lead in promoting HFC as the solution to video dialtone delivery.

**HFC, SDV cost differential still muddy (CED)**, Leslie Ellis, Sept. 1995, p. 48. Comparing the cost of installing HFC and SDV is a tough exercise.

**High-end analog set-top boxes bridge digital gap (MCN)**, Leslie Ellis, 12/5/94, p. 3. Cable operators are asking for more advanced analog set-tops as they wait for digital boxes to be introduced.

**High-end boxes to stay costly (MCN)**, Leslie Ellis, 9/25/95, p. 49. It'll be at least two more years before digital set-tops drop below \$500, unless you want a stripped model.

**The high-speed CATV data revolution (CED)**, Ken Pyle, E/O Networks, April 1995, p. 52. An overview of the issues, business motivations and implementation concerns behind one of the industry's newest (and potentially most lucrative) revenue streams — data communications.

**High-tech trials: Wait 'til '95 (MCN)**, Leslie Ellis, 11/7/94, p. 3. Looking back, it's clear that 1994 was the year of limited field trials of new

technology like interactive and digital.

**HITS: Cable's best shot?** (CV), Tom Kerver, 2/6/95, p. 40. Inside the Headend in the Sky.

**Home wiring worries** (CV), Chris Nolan, 1/23/95, p. 18. Digital TV poses a challenge for installers and do-it-yourselfers who tackle home repairs.

**How one MSO got started in datacom** (CED), Roger Brown, May 1995, p. 46. An inside look at "ET Net," a metropolitan area network that ties 12 manufacturing companies together in Arizona.

**Hundt throws wrench into digital TV future** (MCN), Fred Dawson, 5/15/95, p. 1. The FCC will develop its own standards for digital broadcast TV, throwing cable's digital future into uncertainty.

**Importance of the decoder interface** (CED), Walter Ciciora, consultant, Nov. 1994, p. 22.

Discussion on the importance of the decoder interface and an explanation why cable industry professionals must continue to be active participants in the debate on the issue.

**The info highway: Who's going to be first?**

(CED), Robert Stanzone, AT&T Network Systems, Sept. 1995, p. 44. Switched digital video and HFC networks are compared and contrasted.

**Interactivity comes on line** (CED), Fred Dawson, Feb. 1995, p. 86. Assessing the impact of Time Warner's debut of its Full Service Network trial in Orlando, Fla.

**Interactivity on-ramp** (CV), George Mannes, 5/8/95, p. 46. Sony and Mitsubishi form separate pacts to provide set-top boxes.

**It's no game** (CV), Chris Nolan, 2/20/95, p. 22. Sega offers a peek at the challenges of the digital world.

**Long distance repairs** (CV), Chris Nolan, 10/9/95, p. 24. The new Sony DirecTV receivers suffer a few glitches.

**Looking back on what was to be** (CED), Roger Brown, Dec. 1994, p. 56. A brief look back on the 1994 promises that were made, kept and broken, as well as those that have been put off.

**Microsoft puts focus on broadband networks** (CED), Dec. 1994, p. 16. News item on Microsoft's announcement that it is working with an array of companies to develop "an end-to-end software solution for interactive broadband networks."

**Microsoft, TCI consider set-tops for Seattle trial** (MCN), Leslie Ellis, 1/23/95, p. 44. The two companies appear ready to select a set-top vendor for the video trial in Seattle.

**Microunity aims new ICs at cable modems, boxes** (MCN), Leslie Ellis, 10/16/95, p. 55. A new chip promises to obsolete custom ASICs, pack more punch than today's best processors, and handle every multimedia communication function conceived.

**Microware moves in on GI licensing deal** (MCN), Fred Dawson, 4/17/95, p. 41. Microware will be providing operating system for GI's digital set-tops.

**Milwaukee places Channelmatic order** (MCN), Linda Moss, 2/20/95, p. 58. As it plans to expand digital ad insertion throughout the area, Milwaukee Cable Advertising orders more Channelmatic gear.

**MPEG encoders make their debut** (CED), Nov. 1994, p. 14. News item reporting the debut of two MPEG-2 real-time digital video encoders, one from

Toshiba, the other from DiviCom.

**MPEG patent holders report progress** (MCN), Fred Dawson, 4/3/95, p. 44. Progress is made on determining intellectual property rights issues.

**MSOs prepare employees for digital literacy** (MCN), Gene Koprowski, 5/8/95, p. 184. As the industry prepares for the digital revolution, a number of companies are struggling to train their employees.

**New ICs shrink in size, cost** (MCN), Leslie Ellis, 4/10/95, p. 57. The guts of digital set-tops are undergoing change toward smaller and cheaper.

**New products bring hype closer to reality** (CED), CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Northern Telecom debuts HFC architecture, products** (CED), Dec. 1994, p. 14. News item on NT's development of a new architecture and related products to assist in the provision of digital telephony, video and data over HFC networks.

**Novell nudges Netware into set-tops** (MCN), Leslie Ellis, 5/22/95, p. 37. Novell allies with Microware to nudge its Netware connectivity software into set-tops.

**Oracle, HP team on PacTel ITV system** (CED), July 1995, p. 16. News item on Oracle/HP team effort to provide scalable interactive TV system to Pacific Telesis.

**Orlando to boast 2nd interactive network** (CED), Sept. 1995, p. 14. Disney and AT&T will build an interactive network in a new planned community.

**OS players Microware, S-A form alliances** (MCN), Fred Dawson, 5/15/95, p. 101. Microware and S-A sign up partners, but have radically different agendas.

**Preparing the drop for digital services** (CED), John Grothendick, Antec, Oct. 1995, p. 36. The weak link in digital will be the in-home wiring and the drop. But there are some steps that can be taken.

**Prevue, SeaChange team on server** (MCN), Linda Moss, 10/16/95, p. 55. Prevue chooses SeaChange to be its partner to create a digital video server network reaching 3,500 sites.

**Quest for open standards begins for new group** (CED), Dec. 1994, p. 16. News item on the formation of the North American Digital Group by more than 60 companies and organizations to develop a non-proprietary digital television standard.

**RBOC group issues set-top RFP** (CED), April 1995, p. 14. News item on request for proposals for up to 4 million analog and digital set-tops by consortium of Nynex, Bell Atlantic and Pacific Telesis.

**RBOCs on track with digital TV rollout by '96** (MCN), Fred Dawson, 2/6/95, p. 1. Several RBOCs predict that, with swift FCC action, they could be offering digital TV to the market in about a year.

**The return band: Open for business?** (CED), Roger Brown, Dec. 1994, p. 40. A discussion of the ramifications of an upcoming report from the CableLabs Network Integrity Group that challenges the industry to actually produce what it's always advertised, i.e., a "two-way ready" capability.

**Rings, clamshells and spurs** (CED), Staff, Cox Communications Inc., Feb. 1995, p. 24. A detailed

explanation of Cox's ground-breaking "Ring-in-Ring" fiber optic architecture.

**A robust digital link for in-residence distribution** (CED) Alastair Warwick and Robert Thomas, Broadband Access Technology Applications, Nov. 1994, p. 40. A new look at an old technology — BPSK, Bipolar Phase Shift Keying — proves to be a viable solution for improving digital cable reception in the home.

**Rogers buys 190K GI DigiCable set-tops** (MCN), Leslie Ellis, 10/16/95, p. 2. The Canadian MSO hopes to roll out digital boxes in 1996.

**S-A forms PowerTV to seek software for digital** (MCN), Fred Dawson, 12/5/94, p. 20. Scientific-Atlanta forms a new subsidiary to develop digital TV software.

**SDV: delivering multimedia to the home** (CED), Don McCullough, BroadBand Technologies, Sept. 1995, p. 36. The virtues of building networks in the switched digital video model.

**Set-tops** (CED), Return Path poll, Oct. 1995, p. 96. Survey reveals it will be years before digital set-tops are widely deployed.

**Set-tops cranking out, but have nowhere to go?** (CED), Oct. 1995, p. 12. News item about Philips/CLI production of digital set-top boxes.

**Set-top vendors weigh new switched digital chip set** (MCN), Leslie Ellis, 10/9/95, p. 65. A new chip set from AT&T and BroadBand Technologies promises to reduce the cost of digital boxes.

**Several major interconnects ready to go digital** (MCN), Linda Moss, 5/1/95, p. 68. Several groups, including Chicago and St. Louis, are poised to make their digital hardware selections.

**Slow and steady?** (CV), Chris Nolan, 3/20/95, p. 22. Microsoft says it could dominate the two-way video future.

**SNET drops digital from VDT trial plan** (MCN), Kent Gibbons, 9/11/95, p. 3. Because digital technology won't be ready in time, SNET decides to add more analog capacity to its one-year VDT trial.

**Standards in a digital world** (CED), Roger Brown, June 1995, p. 44. As the interactive future comes closer to reality, standards-making groups are popping up all over.

**Tandem, Compaq form alliance on video servers** (MCN), Leslie Ellis, 10/23/95, p. 49. A strategic alliance calls for Tandem's ServerNet technology to be integrated in Compaq's application servers.

**TCI selects SeaChange, StarNet for digital site** (MCN), Linda Moss, 2/20/95, p. 58. The big MSO makes hardware selections for two of its cable markets.

**Technical overview of digital music services** (CED), Ed Krom, Krom Technical Services, Dec. 1994, p. 78. Summary of results from field test of three major suppliers of digital music programming and equipment for cable transmission.

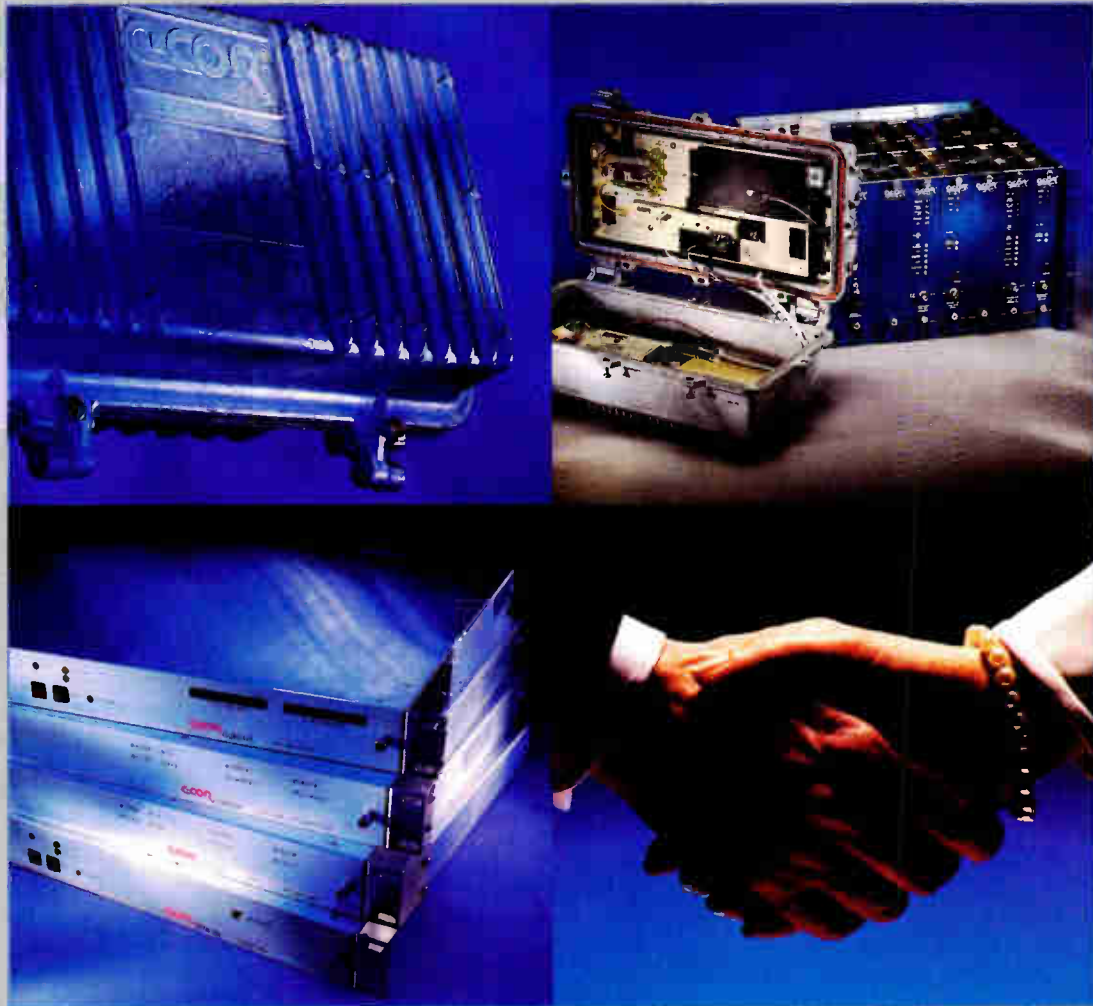
**Telco cash jumpstarts set-tops** (MCN), Leslie Ellis, 4/10/95, p. 57. The \$100 million infusion into MMDS by the telcos will spawn new digital technology, including set-tops.

**Telco networks have come full-circle** (CED), Fred Dawson, Dec. 1994, p. 90. Fast moving technology developments and the slow moving Section 214 approval process have telcos considering a hybrid



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HFC / FTTC topology for their video dialtone.

**Three Baby Bells issue set-top RFP** (MCN), Leslie Ellis, 3/6/95, p. 1. The consortium of Bell Atlantic, Nynex and Pacific Bell issue an RFP for 3 million digital set-tops.

**Three more MSOs plan cablephone tests** (CED), April 1995, p. 16. Time Warner Cable, Cablevision Systems and Comcast join NewChannels Corp. to test telephony-over-cable hardware.

**Time Warner eyes fast start into digital TV** (MCN), Fred Dawson, 12/19/94, p. 41. TWC is poised to get into digital TV in other locations by leveraging what it has learned in the construction of the Full Service Network.

**Time Warner unwraps Full Service Network** (CED), Feb. 1995, p. 14. News item on the debut of TW's new interactive network in a much touted (and long delayed) field test in Orlando.

**Trouble in the house** (MCN), Leslie Ellis, 1/9/95, p. 41. Engineers say existing in-home wiring may not be good enough to support digital signals.

**Unleashing the power of the PC** (CED), LANcity staff, April 1995, p. 26. (Part 1 of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

**WDM technology poised to enter fiber market** (CED), Fred Dawson, April 1995, p. 74.

Compelling options the industry should keep in mind when thinking about implementing wavelength division multiplexing.

**Which is the best modulation? QAM vs VSB** (CED), Henry Samuelli, Broadcom Corp.; Leo Montreuil, Scientific-Atlanta Inc.; Woo H. Paik, General Instrument Corp.; Ron Lee, Zenith Electronics Corp.; Dec. 1994, p. 44. Proponents for the two competing digital modulation technologies go head-to-head to make the case for their respective sides.

**Will broadcasters, FCC derail digital TV?** (CED), Fred Dawson, March 1995, p. 92. The future of digital TV is far from clear with competing standardization pressures from cable and telco industries.

**Wireless technologies and PSC applications** (CED), Raymond Schulz, GLA International, March 1995, p. 60. Personal Communication Service offers an array of opportunities and pitfalls for MSOs.

**Zenith, Teledyne ally on digital encryption** (CED), Jan. 1995, p. 14. News item on announcement that Zenith will use Teledyne's military-grade encryption technology in its new "Media Access" set-tops.

## Distortions and interference

**Can coax support digital?** (CED), Bruce Carlson, General Instrument Corp., Nov. 1994, p. 52. Revisiting vital coaxial cable characteristics with a "digital perspective."

**The care and feeding of your existing plant** (CED), Joseph Waltrich, General Instrument Corp., Nov. 1994, p. 50. A brief discussion of factors that should be considered when introducing digital video into current analog systems.

**Is CDMA a viable choice for the upstream path?**

(CED), Gihad Ghaibeh, Ericsson-Raynet Corp., August 1995, p. 40. The allure of Code Division Multiple Access is explored.

**The complexity of simple coax** (CED), Chris Bowick, Jones Intercable, May 1995, p. 24. The critical importance of having source and load impedances matched to the characteristic impedance of a coaxial cable being used.

**Data transmission interference in CATV systems** (CED), William Sward, XEL Communications Inc., April 1995, p. 36. The potential for interference between data and video on CATV systems is explored.

**Get out the aspirin: HDTV headaches ahead** (CED), Jeffrey Krauss, consultant, July 1995, p. 12. A review of the HDTV situation and why it still has a way to go before it's a fait accompli.

**Getting wired over in-home wiring** (CED), Wendell Bailey, NCTA, Jan. 1995, p. 18. A (shake-your-head-in-wonder) summary of the arguments being bandied about in the FCC regarding its ruling of who owns and can use the privately-installed cable wires.

**Laser chirp in linear fiber optic links** (CED), Hank Blauvelt, Ortel Corp., Sept. 1995, p. 72. Managing the trade-off between chirp and performance levels.

**Looking through a dim crystal ball** (CED), Jim Farmer, Antec Technology Center, August 1995, p. 12. Farmer speculates on future trends and technology developments in the industry.

**Making it work: Return systems 101** (CED), Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, August 1995, p. 66. The basics on operating a return network.

**The mystique of reflection** (CED), Markus Giebel, Siecor Corp., Nov. 1994, p. 30. A discussion on whether or not APC connectors are needed to deal with reflectivity when upgrading systems or deploying new architecture.

**Optimizing the return path** (CED), Jim Harris, Trilithic, July 1995, p. 50. How easier, more effective return maintenance can be achieved.

**PacBell poised and ready to proceed with HFC network; awaits FCC OK** (CED), August 1995, p. 14. News item on PacBell opening its broadband laboratory to the press and reaffirming its commitment to a HFC deployment.

**Resolving conflict and making progress** (CED), Jeffrey Krauss, consultant, Nov. 1994, p. 5. Results of two months of negotiation between LMDS, FSS and MSS proponents regarding 27.5 GHz to 29.5 GHz spectrum sharing.

**The return band: Open for business?** (CED), Roger Brown, Dec. 1994, p. 40. A discussion of the ramifications of an upcoming report from the CableLabs Network Integrity Group that challenges the industry to actually produce what it's always advertised, i.e., a "two-way ready" capability.

**Return path a fantastic voyage?** (CED), May 1995, p. 28. A brief review of CableLabs' study (and its findings) entitled: "Two-Way Cable Television System Characterization."

**The return system: A historical perspective** (CED), Jerry Marketos, Philips Broadband Networks, Sept. 1995, p. 84. A look at what hap-

pens to signals in the reverse band.

**Reverse testing and alignment for cable TV** (CED), Steve Windle, Wavetek Corp., April 1995, p. 68. The reverse sweep option, which provides fast, accurate measurements of the reverse bandwidth, is detailed.

**A robust digital link for in-residence distribution** (CED) Alastair Warwick and Robert Thomas, Broadband Access Technology Applications, Nov. 1994, p. 40. A new look at an old technology — BPSK, Bipolar Phase Shift Keying — proves to be a viable solution for improving digital cable reception in the home.

**The scalpel versus the machete** (CED), Archer Taylor, Malarkey-Taylor Associates, March 1995, p. 124. The development of the Cumulative Leakage Index established an important precedent on how private and public sector groups can solve problems.

**Selecting DFB transmitters for broadband services** (CED), Dr. Yaron Simler, Transmission Systems; Dr. Chien-Yu Kuo, Harmonic Lightwaves Inc.; Feb. 1995, p. 58. Important parameters that affect DFB laser transmitter operation that can be used when evaluating laser performance.

**Spectrum analyzer in-service measurement** (CED), Jerry Harris, Tektronix Inc., March 1995, p. 86. Gated and non-gated in-service measurement techniques (applied to CSO, C/N and ICR) are compared, as well as their practical application.

**Time to re-examine 1550?** (CED), Don Vassel, Corning Inc., March 1995, p. 28. As cable evolves from television to full service telecommunications, 1550 nm transmission represents an important operating window of opportunity.

**Two-way activation for telephony** (CED), Fred Rogers, Quality RF Services, June 1995, p. 135. Some basic concerns about return path reliability that should be kept in mind when setting up telephony services.

**Unleashing the power of the PC** (CED), LANcity staff, April 1995, p. 26. (Part 1 of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

## Emerging technology

**The 1994 Western Show Anaheim Convention Center** (CED), Dec. 1994, p. 106. Floor plan and exhibitor list and exhibitor contact information for 1994 Western Show.

**Advances, lower cost giving ATM a new life** (MCN), Fred Dawson, 11/21/94, p.83. There are divergent opinions about the short-term need for ATM technology.

**Amendment threatens Decoder Interface work** (CED), July 1995, p. 14. News item about a proposed amendment to the telecommunications bill that could jeopardize NCTA/EIA negotiations on decoder interface standard

**ATM accord may spur VOD** (MCN), Fred Dawson, 2/6/95, p.35. The ATM Forum makes progress on routing compressed video.

**ATM goes to the head of the class** (CV), Ken Freed, 1/23/95, p.20. What's ATM switching, who's using them, and what's next?



**BellSouth first to file wide ATM services tariff** (MCN), Fred Dawson, 2/20/95, p. 77. Southern Bell of North Carolina is first to file a territory-wide ATM tariff, signaling ATM's rapid advance.

**Broadband networks demand operations support** (CED), Richard Schwarz/AT&T Network Systems and Steven Kreutzer/AT&T Bell Laboratories, June 1995, p. 92. A well-designed operations system can help MSOs negotiate all the changes that lie ahead.

**CableData unveils new transactional billing system** (CED), Jan. 1995, p. 12. News item on the debut of CableData's new transactional management system, the Intelcable software system.

**Cable hooks up to data at NCTA** (CED), CED staff, June 1995, p. 104. Attendees to the NCTA National Show are encouraged by the progress manufacturers have made with the introduction of new equipment at the show.

**CableLabs, CCTA plan interoperability showcase** (MCN), CableLabs staff, 11/7/94, p. 55. A preview of the CableNET project that appeared at the 1994 Western Show.

**Cable modems: The MSO's link to the PC boom** (CED), Jack Mann, Scientific-Atlanta Inc., April 1995, p. 64. A critical mass of new and improved technologies and demonstrated consumer demand indicate a lucrative revenue stream could inundate operators who are prepared to take advantage of it.

**Cable's link to the future** (Conv), Sue Marek, October 1995, p. 46. TCI's headend in the sky hopes to usher in a new era in cable service.

**Cable/utility groups see many synergies** (CED), March 1995, p. 14. News item about the increased talk and activity in developing interactive broadband communication links with utility companies.

**Compatibility fighters find some common ground** (CED), Roger Brown, June 1995, p. 66. An agreement on a decoder interface standard between the NCTA and EIA may finally be in sight.

**Counting on cablephone** (MCN), Fred Dawson, 12/12/94, p. 49. The pace is fast, but it will be mid-1996 before MSOs can roll out cablephone service.

**Data revenues waiting for two-way plant** (MCN), Leslie Ellis, 5/1/95, p. 85. Cable operators are poised to get revenue from interactive services, if there's a two-way path activated.

**Delivering the promise** (CED), Andrew Paff, Antec Corp., May 1995, p. 32. The evolutionary path of HFC infrastructure development, both its unexpected problems and its unforeseen potential, is detailed and brought up-to-date.

**Delivering video without set-tops** (CED), Roger Pience, Watson Technologies Corp., June 1995, p. 73. A new signal delivery and control architecture that is completely compatible with existing coax and HFC systems is detailed.

**The door is open, but ITV stumbles** (CED), Roger Brown, August 1995, p. 30. Reasons why the bloom is definitely off the interactive TV rose.

**EIA drops bombshell on NCTA, decides to scrap decoder standard** (CED), March 1995, p. 14. News item on the abrupt halt of talks on a new decoder interface standard.

**EIA suffers from set-top schizophrenia** (CED), Walter Ciciora, consultant, May 1995, p. 118. The

Electronic Industries Association's change of position on set-top boxes is explored.

**Emerging technologies/services** (CED), Return Path poll, Nov. 1994, p. 78. While the potentially huge impact of new technologies is readily recognized, operators are split on when those technologies will be commonplace.

**Engineers head to Orlando for SCTE conference** (MCN), Leslie Ellis, 1/2/95, p. 20. A preview of the SCTE Conference on Emerging Technologies.

**FCC's chief engineer promised action on digital standards soon** (CED), Feb. 1995, p. 14. News item on announcement that FCC plans to begin a new proceeding on digital transmission standards for the cable industry soon (and reaction to it).

**From the couch to the module** (CED), Walter Ciciora, consultant, March 1995, p. 26. Ciciora puts his spin on the raging decoder interface debate.

**Further developments in location technologies** (CED), Jeffrey Krauss, consultant, Feb. 1995, p. 12. A review of technology available that could meet the FCC's proposal that cellular operators provide caller location information for 911 calls.

**Get out the aspirin: HDTV headaches ahead** (CED), Jeffrey Krauss, consultant, July 1995, p. 12. A review of the HDTV situation and why it still has a way to go before it's a fait accompli.

**Girding for the next big interface debate** (CED), Jeffrey Krauss, consultant, April 1995, p. 12. A review of technical questions to be considered in developing a baseband digital interface (i.e., a high-speed local area data network for the home).

**GI to debut ATM gear** (MCN), Leslie Ellis, 5/1/95, p. 85. GI plans to debut an ATM front end for its PCLInX datacom platform.

**The good old days** (CED), Archer Taylor, Malarkey-Taylor Associates, May 1995, p. 124. "Interoperability" seems to be the key to the future and cable should consider getting behind it before it's too late.

**HDTV field tests show VSB shines** (CED), Nov. 1994, p. 12. News item on successful field tests that support HDTV's "broadcast coverage and cable robustness to the performance of the current NTSC television systems."

**High-tech trials: Wait 'til '95** (MCN), by Leslie Ellis, 11/7/94, p. 3. Looking back, it's clear that 1994 was the year of limited field trials of new technology like interactive and digital.

**Hitachi expanding ATM technology development** (MCN), Fred Dawson, 1/9/95, p. 32. Fresh of success in Orlando with Time Warner, Hitachi looks to expand its ATM efforts in broadband.

**Hitachi Ltd. will make products with ADC, Oracle** (MCN), Fred Dawson, 10/9/95, p. 78. Deals are made to build new lines of products around ATM switches, file servers and set-tops boxes.

**Hooked up in Rochester** (MCN), Leslie Ellis, 2/27/95, p. 45. Time Warner announces plans to test telephone over cable gear from Tellabs.

**ICTV, Sybase partner to deliver interactivity** (CED), Nov. 1994, p. 14. News item on partnership announced between ICTV Inc. and Sybase Inc. to integrate Sybase products and services with ICTV's interactive TV system.

**Implementing telecom on broadband nets** (CED),

Richard Lyford, Antec Corp., March 1995, p. 56. A discussion of some incremental service opportunities available that can keep revenue flowing while operators strive for full-service telecommunication systems.

**Interactivity comes on line** (CED), Fred Dawson, Feb. 1995, p. 86. Assessing the impact of Time Warner's debut of its Full Service Network trial in Orlando, Fla.

**Internet pioneer eyes cable** (MCN), Leslie Ellis, 2/6/95, p. 35. A look at what Paul Baran and Com-21 propose to do with data over cable TV.

**IVDS coming to the Midwest; testing to begin** (CED), Oct. 1995, p. 14. The new interactive service is coming to Columbus, Ohio.

**Just the fax** (CV), Ken Freed, 2/20/95, p. 24. Some think we'll be faxing via the TV; others say e-mail will kill the fax in a few years.

**Microsoft outlines ATM migration path** (MCN), Leslie Ellis, 9/4/95, p. 35. Work being done to help network operators get to an ATM environment.

**Microsoft puts focus on broadband networks** (CED), Dec. 1994, p. 16. News item on Microsoft's announcement that it is working with an array of companies to develop "an end-to-end software solution for interactive broadband networks."

**Microsoft, Sony reach deal** (MCN), Fred Dawson, 1/30/95, p. 47. The two companies agree to develop set-tops and highly specialized servers.

**MPEG-2 market heats up at NAB** (CED), May 1995, p. 16. News item on the debut of new MPEG-2 encoders and servers and the announcement of an initial royalty model for digital decoders, videodisk players and pre-recorded storage media.

**MSOs ally with Sprint; telcos turn up the heat** (CED), Dec. 1994, p. 16. News item about two alliances in the competitive cable and telco camps: Sprint, TCI, Comcast and Cox in one corner, Nynex, Bell Atlantic, Pacific Telesis and Creative Artists Agency in the other.

**'My kingdom for a modem'** (CED), Fred Dawson, June 1995, p. 127. The progress made and the challenges that lie ahead in the development of high-speed, low-cost cable modems.

**Networking, in every sense of the word** (CED), Dana Cervenka, Dec. 1994, p. 96. CableNET '94: The Convergence Laboratory exhibit at the 1994 Western Show offers great opportunity to network literally and figuratively.

**NewChannels, Tellabs to test cable phone** (MCN), Leslie Ellis, 12/5/94, p. 2. NewChannels says it will test Tellabs cable telephone gear in Syracuse.

**New life for ADSL** (MCN), Fred Dawson, 12/5/94, p. 101. As the Bell companies push to offer multimedia to the business sector, it's breathing new life into ADSL technology.

**New products bring hype closer to reality** (CED), CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**New services on your old network: cable** (Conv), Larry Yokell, April 1995, p. 24. How cable operators are coping with all the new services on the horizon.

**PacBell poised and ready to proceed with HFC network; awaits FCC OK (CED)**, August 1995, p. 14. News item on PacBell opening its broadband laboratory to the press and reaffirming its commitment to a HFC deployment.

**NT details strategy for telco platform (MCN)**, Fred Dawson, 11/21/94, p. 81. Nortel outlines its approach to several new products that will provide telephony over cable networks.

**Ops eye high-speed data as big business (MCN)**, Gene Koprowski, 12/5/94, p. 101. High-speed data and Internet access becomes a new priority among major cable operators.

**Prepare to enter the fray (CED)**, Wendell Bailey, NCTA, March 1995, p. 20. Bailey warns cable operators to be prepared to enter the decoder interface battle when the FCC targets the issue for resolution.

**Powering options for cable telephony (CED)**, Chris Bowick, Jones Intercable, Nov. 1994, p. 20. Examination of the current options for powering cable telephony services.

**RBOCs invest in MMDS provider (CED)**, May 1995, p. 14. News item on the boost the "wireless cable" industry has received with the \$100 million investment of two telcos looking for an alternative to wireline systems.

**Reaching a compromise within a box (CED)**, Walter Ciciora, consultant, July 1995, p. 24. The decoder interface debate and negotiations have put the cable industry into a box itself.

**Residential shared tenant services (CED)**, C. Derrick Huang and Dick Swan, Northern Telecom, March 1995, p. 52. Residential shared tenant service may just be the stepping stone into telephony that cable has been looking for.

**The return system: A historical perspective (CED)**, Jerry Marketos, Philips Broadband Networks, Sept. 1995, p. 84. A look at what happens to signals in the reverse band.

**Reverse issues stump cable engineers (MCN)**, Leslie Ellis, 6/12/95, p. 9A. Designing reverse path capabilities aren't for the faint of heart.

**Rings, clamshells and spurs (CED)**, Staff, Cox Communications Inc., Feb. 1995, p. 24. A detailed explanation of Cox's ground-breaking "Ring-in-Ring" fiber optic architecture.

**Rogers will link IBM workers at home (MCN)**, Leslie Ellis, 12/5/94, p. 101. Rogers will test work-at-home service to 20 IBM workers in Ontario.

**Rollout of Canadian ATM service on track for December (MCN)**, Fred Dawson, 3/27/95, p. 40. New Brunswick Telephone is on track to launch ATM services to customers by the end of the year.

**Sega Channel poised for take-off (CED)**, June 1995, p. 16. News item about developments that have moved Sega Channel closer to becoming a reality.

**Siemens, Sun and S-A combine to offer turnkey HFC system (CED)**, Jan. 1995, p. 12. News item on announcement of "turnkey end-to-end hybrid fiber/coax platforms" for cable operators and telcos alike.

**Sony wants into set-top box biz (CED)**, March 1995, p. 16. News item on Sony's announced intention to enter the cable set-top box market.

**Talking back to the tube (CV)**, Ken Freed, 2/6/95, p. 20. Everyone loves the idea of voice-operated TVs, but it's just talk.

**Tandem unveils switching server (MCN)**, Leslie Ellis, 7/17/95, p. 89. Tandem unveils a new server architecture for multimedia applications.

**TCI, Microsoft form on-line partnership (CED)**, Feb. 1995, p. 16. News item on 20 percent investment of TCI into partnership with Microsoft to develop high-speed, interactive computing service.

**TCI ventures into on-line data services (CED)**, June 1995, p. 14. News item on TCI's announced partnership to provide on-line data services.

**TCI networks have come full-circle (CED)**, Fred Dawson, Dec. 1994, p. 90. Fast moving technology developments and the slow moving Section 214 approval process have telcos considering a hybrid HFC / FTTC topology for their video dialtone.

**Three more MSOs plan cablephone tests (CED)**, April 1995, p. 16. Time Warner Cable, Cablevision Systems and Comcast join NewChannels Corp. to test telephony-over-cable hardware.

**Time Warner pursues voice as new remote (MCN)**, Fred Dawson, 1/9/95, p. 41. Look at the progress in voice recognition technology as it applies to TV remote controls.

**Time Warner takes stake in ITV venture (CED)**, June 1995, p. 16. News item on TW's plans to become an equity partner in a venture to provide integrated multimedia software platforms for interactive TV.

**Time Warner unwraps Full Service Network (CED)**, Feb. 1995, p. 14. News item on the debut of TW's new interactive network in a much touted (and long delayed) field test in Orlando.

**Time Warner wins technical Emmy for HFC (CED)**, Nov. 1994, p. 12. News item on Time Warner's Emmy win for developing hybrid fiber coax, "the architectural bridge spanning existing and future network applications."

**Two-way services will finally work (CED)**, Jim Farmer, Antec Technology Center, July 1995, p. 22. Farmer believes two-way service is (finally) just around the corner.

**Unleashing the power of the PC (CED)**, LANcity staff, April 1995, p. 26. (Part 1 of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

**Video dial tone sputters along (CED)**, Jeffrey Krauss, consultant, Jan. 1995, p. 5. Potentially a strong competitor to cable, telco video dial tone (VDT) service is mired in an ongoing debate about who pays for its implementation.

**WDM technology poised to enter fiber market (CED)**, Fred Dawson, April 1995, p. 74. Compelling options the industry should keep in mind when thinking about implementing wavelength division multiplexing.

**Wireless technologies and PCS applications (CED)**, Raymond Schulz, GLA International, March 1995, p. 60. Personal Communication Service offers an array of opportunities and pitfalls for MSOs.

**Zenith, AT&T partner on interactive device (CED)**, Feb. 1995, p. 14. News item on new partnership that will bring voice and text (phone mes-

sages, headline news, etc.) to TVs via phone line and in-home box.

**Zenith, Teledyne ally on digital encryption (CED)**, Jan. 1995, p. 14. News item on announcement that Zenith will use Teledyne's military-grade encryption technology in its new "Media Access" set-tops.

**Zing, 3 MSOs agree to distribution deal (CED)**, August 1995, p. 16. News item on agreement by three MSOs who have agreed to distribute Zing's interactive encoded TV signals over their networks.

## Engineering management

**Antec, TCI draw near on materials venture (MCN)**, Leslie Ellis, 2/13/95, p. 6. Two companies move closer to signing a material management deal.

**Bellcore delves into HFC amid support for FITL (CED)**, Fred Dawson, Oct. 1995, p. 80. Bellcore reaches out to MSOs, but seems to have a bias toward FITL architectures.

**Cable engineers cope with new economics (MCN)**, Leslie Ellis, 5/8/95, p. 165. A Q&A session on a variety of topics with the industry's leading engineers.

**Charting a course for success (CED)**, Roger Brown, Jan. 1995, p. 24. A detailed profile of CED's 1994 Man of the Year, Nick Worth, vice president of engineering at TeleCable Inc.

**Data warehouses a tool for telecom (CED)**, CableLabs staff, Sept. 1995, p. 30. A seminar examines how enterprise management will converge MIS and plant/engineering functions.

**Ending the paper chase (CED)**, Bill Snyder, AT&T Network Systems, March 1995, p. 97. Taking Subscriber Management Systems to a higher (automated) level, i.e., a Field Operations Management System.

**Engineers juggle today's and tomorrow's challenges (MCN)**, Leslie Ellis, 11/28/94, p.173. Roundtable discussion with leading engineers on a variety of current topics.

**MSOs seek vendor participation on UPC bar codes (MCN)**, Leslie Ellis, 10/23/95, p. 47. Purchasing execs want vendor participation in a move toward paperless materials management.

**Process re-engineering hones new systems (CED)**, John Greening and Jan Lubin, Arrowsmith Technologies, Inc., June 1995, p. 80. Future success means cable operators should take a close look at re-engineering some of their business processes.

**TCI, Antec team up for supply management plan (MCN)**, Leslie Ellis, 1/30/95, p. 47. TCI contracts with Antec to provide material management services.

**TCI previews software (MCN)**, Leslie Ellis and Roger Brown, 2/27/95, p. 1. TCI gives the first public sneak peak of its proprietary network management system, dubbed Summit by TCI.

**TCI unveils software platform tied to frame relay network (CED)**, April 1995, p. 14. News item on TCI's preview of its advanced software platform for back office operations, e.g., billing, customer service and workforce management.

**Tech personnel fear being swallowed up (CED)**, Dana Cervenka, August 1995, p. 79. Increased com-



petition from within and out of the industry is fueling job-security concerns on industry personnel in this annual salary survey.

**Warehouses on wheels (CV)**, Simon Applebaum, 8/7/95, p. 22. Sprint joins Comcast to deploy a customized inventory management process.

### Farmer's Market

*(Farmer's Market is a monthly CED column written by Jim Farmer of Antec Technology Center.)*

**Delivering more power to the plant (CED)**, Jim Farmer, Antec Technology Center, Sept. 1995, p. 22. Looking at powering fundamentals, and how they may change in the short-term.

**Looking through a dim crystal ball (CED)**, Jim Farmer, Antec Technology Center, August 1995, p. 12. Farmer speculates on future trends and technology developments in the industry.

**Revolution is in our midst (CED)**, Jim Farmer, Antec Technology Center, Oct. 1995, p. 20. How to determine what's real, and what's not.

**Two-way services will finally work (CED)**, Jim Farmer, Antec Technology Center, July 1995, p. 22. Farmer believes two-way service is (finally) just around the corner.

### Fiber optics

**1995 construction plans (CED)**, Return Path poll, April 1995, p. 90. Operators provide details of upcoming capital expenditures spurred by increased competition.

**ADC pens agreements with OSI and Optivision (CED)**, Oct. 1995, p. 12. News item about new business relationships resulting in new products.

**ALS doubles size of facility; may begin building RF gear soon (CED)**, Nov. 1994, p. 12. News item on major expansion of manufacturing and R&D facilities at American Lighthouse Systems announced by ADC Telecommunications.

**AT&T, BBT unveil new FTTC system (MCN)**, Fred Dawson, 3/27/95, p. 39. The two companies work together to develop a next generation FTTC system.

**AT&T will combine FTTC, HFC designs (MCN)**, by Fred Dawson, 11/7/94, p. 51. AT&T and BroadBand Technologies have developed a way to use existing copper and tie it to a HFC network to support ATM video delivery.

**Bandwidth management in an HFC network (CED)**, G. Keith Cambron, Pacific Bell and Fred Kemmerer, AT&T Bell Labs, Sept. 1995, p. 78. A look at how Pac Bell has engineered its broadband network.

**Bell Atlantic adds fiber to VDT diet (MCN)**, Kent Gibbons, 5/15/95, p. 2. It appears the RBOC will re-file its VDT application, but will include much more fiber and much less coaxial cable.

**Bell Atlantic backs off HFC builds, cites reduction in costs for digital nets (CED)**, June 1995, p. 14. News item about FCC delays that have prompted Bell Atlantic to forgo HFC based systems and change to switched digital video network build outs.

**Bellcore delves into HFC amid support for FITL**

(CED), Fred Dawson, Oct. 1995, p. 80. Bellcore reaches out to MSOs, but seems to have a bias toward FITL architectures.

**Bell Labs boasts cheaper all-optical network (MCN)**, Fred Dawson, 3/6/95, p. 52. Researchers believe they've developed a way to dramatically lower the cost of fiber to the curb networks.

**Best details Cox's "Ring in ring" plan (MCN)**, Leslie Ellis, 12/5/94, p. 101. A detailed explanation of a new network architecture being developed and deployed by Cox Communications.

**Brooks Fiber preps launches (MCN)**, Fred Dawson, 9/11/95, p. 39. Brooks unveils plan to construct switched telecom networks.

**Brooks to build 3 more CAP nets (CED)**, Sept. 1995, p. 12. News item about Brooks Fiber's plans to build CAP networks in Albuquerque, Tucson and Bakersfield, Calif.

**Cable hooks up to data at NCTA (CED)**, CED staff, June 1995, p. 104. Attendees to the NCTA National Show are encouraged by the progress manufacturers have made with the introduction of new equipment at the show.

**Cable networks in the next millennium (CED)**, Dana Cervenka, Dec. 1994, p. 30. A crystal ball discussion of engineering professionals — five MSO representatives and three manufacturer representatives — on the network of the future and cable's future in telephony among other things.

**Cablephone not ringing yet (CED)**, Dana Cervenka, March 1995, p. 32. The rush to provide telephony services has created a hardware crunch. Manufacturer's product lines, trials and deployment schedules are reviewed.

**Cable, telecom convergence on display (CED)**, CED staff, May 1995, p. 88. Important developments and product debuts at Supercomm '95 are detailed.

**Cable will surpass telcos on fiber (MCN)**, Leslie Ellis, 3/6/95, p. 51. A market study by Corning predicts that cable TV could overtake the telcos as the largest purchaser of fiber cable.

**Cambron's HFC network lies in wait (CED)**, Dana Cervenka, Sept. 1995, p. 16. Profile of Keith Cambron, director of systems engineering for broadband services at Pacific Bell.

**Is CDMA a viable choice for the upstream path? (CED)**, Gihad Ghaibeh, Ericsson-Raynet Corp., August 1995, p. 40. The allure of Code Division Multiple Access is explored.

**Comprehensive testing of fiber infrastructures (CED)**, Steve Grady, ADC Telecommunications Inc., July 1995, p. 40. Details of how successful management of fiber systems can be accomplished through thorough testing and on-line documentation techniques.

**Denenberg and the new math (CED)**, March 1995, p. 18. Leader of Southern New England Telephone's leap into the fiber optic future, Dr. Charlotte Denenberg, is profiled.

**The door is open, but ITV stumbles (CED)**, Roger Brown, August 1995, p. 30. Reasons why the bloom is definitely off the interactive TV rose.

**Emerging technologies/services (CED)**, Return Path poll, Nov. 1994, p. 78. While the potentially huge impact of new technologies is readily recog-

nized, operators are split on when those technologies will be commonplace.

**A field-installable fusion connector (CED)**, Rodney Throckmorton and Rudolf Brugger, Siecor Corp. and Siemens AG, August 1995, p. 24. Details of a new field-installable connector are revealed.

**Future proofing with hybrid fiber/coax (CED)**, John Frederick, ADC Telecommunications, Sept. 1995, p. 52. Today's HFC networks can be designed to fit the future, too.

**GI goes FTTC, BBT finds partner (CED)**, April 1995, p. 16. News item on General Instrument's equity acquisition in developer of switched digital networks and BroadBand Technologies' announced partnership with Texas Instruments to produce components for the Fiber Loop Access system in Austin.

**Harmonic, Augat take aggressive steps toward 1550 (MCN)**, Fred Dawson, 6/5/95, p. 41. The number of hardware manufacturers supporting 1550 nm technology is about to grow.

**Harnessing the power of the PC (CED)**, LANcity staff, May 1995, p. 74. (Part 2 of two-part series.) How to turn cable plant into a high-speed Local Area Network is discussed.

**Headend interconnects: Sonet or non-Sonet? (CED)**, Robert Harris and Thomas Hall, Nortel Ltd., May 1995, p. 58. A network cost comparison between Sonet and non-Sonet systems.

**HFC gathers steam as telco solution (CED)**, Fred Dawson, August 1995, p. 74. Pacific Bell and Southern New England Telephone take the lead in promoting HFC as the solution to video dialtone delivery.

**HFC, SDV cost differential still muddy (CED)**, Leslie Ellis, Sept. 1995, p. 48. Comparing the cost of installing HFC and SDV is a tough exercise.

**The high-speed CATV data revolution (CED)**, Ken Pyle, E/O Networks, April 1995, p. 52. An overview of the issues, business motivations and implementation concerns behind one of the industry's newest (and potentially most lucrative) revenue streams — data communications.

**IBM develops 20-wavelength multiplexers (MCN)**, Fred Dawson, 1/16/95, p. 43. Wavelength division multiplexing takes a step forward with this announcement.

**The info highway: Who's going to be first? (CED)**, Robert Stanzione, AT&T Network Systems, Sept. 1995, p. 44. Switched digital video and HFC networks are compared and contrasted.

**An integrated telecom network trial (CED)**, Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, May 1995, p. 38. The varied aspects that should be taken into account to provide a wide area and regional telecommunications network are discussed.

**Jones fires up nations' first passive HFC network in Alexandria, Va. (CED)**, Oct. 1995, p. 12. News item talking about Jones' unique network design.

**Jones goes passive actively in Alexandria, Va. (MCN)**, Kent Gibbons, 9/4/95, p. 10. Jones builds an innovative fiber system to serve the Alexandria market.

**Laser chirp in linear fiber optic links (CED)**,

Hank Blauvelt, Ortel Corp., Sept. 1995, p. 72. Managing the trade-off between chirp and performance levels.

**Lightwave leaps lead OFC show** (MCN), Fred Dawson, 3/6/95, p. 51. Multi-wavelength lightwave technology is making significant progress.

**Looking back on what was to be** (CED), Roger Brown, Dec. 1994, p. 56. A brief look back on the 1994 promises that were made, kept and broken, as well as those that have been put off.

**Looking through a dim crystal ball** (CED), Jim Farmer, Antec Technology Center, August 1995, p. 12. Farmer speculates on future trends and technology developments in the industry.

**The mystique of reflection** (CED), Markus Giebel, Siecior Corp., Nov. 1994, p. 30. A discussion on whether or not APC connectors are needed to deal with reflectivity when upgrading systems or deploying new architecture.

**Narrowcast and broadcast fiber optic technology** (CED), Gregory Hardy, Scientific-Atlanta, July 1995, p. 26. A properly prepared business plan can be a key factor in deciding which fiber optic transmission architecture and technology is best.

**New products bring hype closer to reality** (CED), CED staff, Jan. 1995, p. 40. New products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Northern Telecom debuts HFC architecture, products** (CED), Dec. 1994, p. 14. News item on NT's development of a new architecture and related products to assist in the provision of digital telephony, video and data over HFC networks.

**Ops eye new optical gear** (MCN), Leslie Ellis, 12/19/94, p. 41. Cable operators are keeping a close eye on a new concept called dense wave division multiplexing.

**Op support systems hot at Cable-Tec Expo** (CED), Roger Brown, Dana Cervenka, Leslie Ellis, July 1995, p. 64. An overview of the technology, software, sundry systems and other developments that debuted during SCTE's 1995 Cable-Tec Expo.

**Optus Vision awards key technology contracts** (CED), June 1995, p. 16. Australian joint-venture taps American suppliers for its integrated network.

**Orlando to boast 2nd interactive network** (CED), Sept. 1995, p. 14. Disney and AT&T will build an interactive network in a new planned community.

**PacBell defends hybrid fiber/coax: 'Right technology at right price'** (MCN), Leslie Ellis, 7/3/95, p. 33. The RBOC details its California construction plans.

**PacBell poised and ready to proceed with HFC network; awaits FCC OK** (CED), August 1995, p. 14. News item on PacBell opening its broadband laboratory to the press and reaffirming its commitment to a HFC deployment.

**Pirelli's WDM systems get cable MSOs' attention** (MCN), Leslie Ellis, 2/27/95, p. 48. Pirelli does deal with BellSouth for WDM gear; plans include cable MSOs as well.

**Putting fiber to the test** (CED), Todd Jennings, Siecior Corp., Oct. 1995, p. 26. Some real-world tips on how to test fiber in the field.

**RBOC group issues set-top RFP** (CED), April 1995, p. 14. News item on request for proposals for

up to 4 million analog and digital set-tops by consortium of Nynex, Bell Atlantic and Pacific Telesis.

**Rings, clamshells and spurs** (CED), Staff, Cox Communications Inc., Feb. 1995, p. 24. A detailed explanation of Cox's ground-breaking "Ring-in-Ring" fiber optic architecture.

**S-A allies with two new partners** (CED), April 1995, p. 16. News item on Scientific-Atlanta's long-term agreement with Optical Transmission Labs to produce fiber gear that operates in the 1550 nm window and its announced joint venture with Siemens Public Communications Network Group to develop telephony-over-cable products.

**S-A in fiber amp deal with Synchronous** (MCN), Fred Dawson, 3/6/95, p. 2. Scientific-Atlanta looks to Synchronous to supply 1550 nm fiber gear.

**SDV: delivering multimedia to the home** (CED), Don McCullough, BroadBand Technologies, Sept. 1995, p. 36. The virtues of building networks in the switched digital video model.

**Siemens, Sun and S-A combine to offer turnkey HFC system** (CED), Jan. 1995, p. 12. News item on announcement of "turnkey end-to-end hybrid fiber/coax platforms" for cable operators and telcos alike.

**Sizzle and spark: HFC power safety** (CED), Tom Osterman, Comm/net Systems Inc., May 1995, p. 26. New network services by both MSOs and telcos are generating new powering approaches and new concerns over safety as well.

**Streamlining headend fiber organization** (CED), William Seim, 3M Telecom Systems, Dec. 1994, p. 28. A brief description of the "hub in a box" concept, a high-density fiber organization for the head-end or hub office.

**Suppliers squeezed to meet demand** (CED), Leslie Ellis, Nov. 1994, p. 34. Worldwide demand for high bandwidth, high-quality equipment is putting a big pinch on U.S. operators who want to rebuild or upgrade their networks.

**The survivable network's next question** (CED), Jonathan Morgan, Fujitsu, Sept. 1995, p. 64. Which fiber design is best for survivable networks?

**TCI details new architecture** (MCN), Leslie Ellis, 4/3/95, p. 43. After all those RFIs, TCI publicly details its network architecture for the future.

**TCI issues RFI on node platforms** (MCN), Leslie Ellis, 1/30/95, p. 47. TCI issues the first of several planned RFIs on network platforms that provide flexibility to deliver targeted services.

**TCI issues second network RFI** (MCN), Leslie Ellis, 2/20/95, p. 77. The second RFI on network platforms goes out.

**Technology race tightens for MSOs, telcos** (CED), Fred Dawson, Sept. 1995, p. 88. Technology advances on all fronts make choosing a network architecture even tougher.

**Telco networks have come full-circle** (CED), Fred Dawson, Dec. 1994, p. 90. Fast moving technology developments and the slow moving Section 214 approval process have telcos considering a hybrid HFC / FTTC topology to deliver their video dial-tone.

**Telcos considering use of solar power for networks** (MCN), Fred Dawson, 10/9/95, p. 66. Solar power is gaining ground as an option for powering

end-of-line components in fiber networks.

**Telephone system engineering** (CED), Steve Day, Comm DOC Services, March 1995, p. 46. Given the increased demands on CATV networks that are just around the corner, a new approach to designing CATV/HFC systems is discussed.

**Time to re-examine 1550?** (CED), Don Vassel, Corning Inc., March 1995, p. 28. As cable evolves from television to full service telecommunications, 1550 nm transmission represents an important operating window of opportunity.

**Time Warner wins technical Emmy for HFC** (CED), Nov. 1994, p. 12. News item on Time Warner's Emmy win for developing hybrid fiber coax, "the architectural bridge spanning existing and future network applications."

**Two-way services will finally work** (CED), Jim Farmer, Antec Technology Center, July 1995, p. 22. Farmer believes two-way service is (finally) just around the corner.

**Unleashing the power of the PC** (CED), LANcity staff, April 1995, p. 26. (Part 1 of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

**User-perceived availability of HFC networks** (CED), David Large, Connections Group, June 1995, p. 118. A reliability analysis of several architectures with performance comparisons.

**Vyxx eyes video delivery service by 1997** (MCN), Fred Dawson, 10/30/95, p. 22. WilTech has begun putting in place a digital media distribution infrastructure to allow access of remote video sources.

**WDM technology poised to enter fiber market** (CED), Fred Dawson, April 1995, p. 74. Compelling options the industry should keep in mind when thinking about implementing wave-length division multiplexing.

## From the Headend

*(From the Headend is a monthly CED column written by Chris Bowick of Jones Intercable.)*

**The complexity of simple coax** (CED), Chris Bowick, Jones Intercable, May 1995, p. 24. The critical importance of having source and load impedances matched to the characteristic impedance of a coaxial cable being used.

**Don't lose sight of the pivot point** (CED), Chris Bowick, Jones Intercable, Dec. 1994, p. 24. A reasoned warning not to forget the pivotal figures in all the fast-breaking developments in the industry, i.e., consumers, and a plea to avoid developing proprietary interfaces to reach them.

**The drop cable dilemma continues** (CED), Chris Bowick, Jones Intercable, April 1995, p. 22. Some recommendations to curb drop cable waste.

**The great cable drop conspiracy** (CED), Chris Bowick, Jones Intercable, Feb. 1995, p. 22. An ingenious, if "biting," theory on the voracious consumption of drop cable in the industry every year.

**The great disappearing drop cable issue** (CED), Chris Bowick, Jones Intercable, March 1995, p. 22. Results and implications of study on the apparent increased deployment drop cable throughout the industry.



**Powering options for cable telephony (CED)**, Chris Bowick, Jones Intercable, Nov. 1994, p. 20. Examination of the current options for powering cable telephony services.

**Reflections on my final column (CED)**, Chris Bowick, Jones Intercable, June 1995, p. 26. Bowick bows out of his weekly column with reflections on some of the topics he has covered.

**A trip down memory lane (CED)**, Chris Bowick, Jones Intercable, Jan. 1995, p. 22. Bowick argues that many of the "hot" issues the industry is debating today are far from new.

## Frontline

*(Frontline is a monthly opinion column that appears in CED written by Wendell Bailey of NCTA.)*

**Application of standards a delicate balance (CED)**, Wendell Bailey, NCTA, April 1995, p. 20. Before jumping on any standards bandwagon, the industry has to determine whether they will degrade the delivered product or hinder competitiveness because they're too expensive.

**The computer ate my homework (CED)**, Wendell Bailey, NCTA, Oct. 1995, p. 18. Why is it that no one complains about computer reliability when it seems to crash all the time?

**Disabled must have easy NII access (CED)**, Wendell Bailey, NCTA, May 1995, p. 22. A plea to cable operators to think about access problems of the disabled before interactive hardware and software solutions are finalized.

**Electronic community mirrors the real one (CED)**, Wendell Bailey, NCTA, June 1995, p. 24. Cyberspace community reflects the good, bad and ugly of our physical community.

**A feast for the eyes and service, too (CED)**, Wendell Bailey, NCTA, August 1995, p. 20. Cable professionals can learn about customer service by visiting their favorite restaurant.

**Getting wired over in-home wiring (CED)**, Wendell Bailey, NCTA, Jan. 1995, p. 18. A (shake-your-head-in-wonder) summary of the arguments being bandied about in the FCC regarding its ruling of who owns and can use the privately-installed cable wires.

**Imitation is sincerest form of flattery (CED)**, Wendell Bailey, NCTA, Nov. 1994, p. 18.

Speculation on how cable operators, programmers and hardware suppliers will fare "in the new, competitive world."

**In the spirit of the giving season (CED)**, Wendell Bailey, NCTA, Dec. 1994, p. 22. A holiday wish list for resolution of major industry problems and some goodwill for deserving industry personnel.

**The new Congress and the cable industry (CED)**, Wendell Bailey, NCTA, Feb. 1995, p. 20. The newly elected GOP majority in Congress and what possible impact it may have on revising or repealing the 1992 Cable Act.

**Prepare to enter the fray (CED)**, Wendell Bailey, NCTA, March 1995, p. 20. Bailey warns cable operators to be prepared to enter the decoder interface battle when the FCC targets the issue for resolution.

**Telecom reform coming up fast (CED)**, Wendell Bailey, NCTA, July 1995, p. 20. Progress on the telecommunication bill is reviewed.

**Winning at the numbers game (CED)**, Wendell Bailey, NCTA, Sept. 1995, p. 18. Some thoughts about the North American Numbering Plan.

## Headend issues

**1550 nm gear back on radar screen (CED)**, Leslie Ellis, Feb. 1995, p. 44. For those cable operators strapped for capacity or wanting turbo-charged throughput, dense-WDM may be the answer.

**ATM: Sure thing, or leap of faith? (CED)**, Alan Stewart, March 1995, p. 68. Many consider Asynchronous Transfer Mode switches a crucial linchpin in the Information Superhighway, but is the hardward where it needs to be for MSOs to make such an expensive change?

**Cablephone not ringing yet (CED)**, Dana Cervenka, March 1995, p. 32. The rush to provide telephony services has created a hardware crunch. Manufacturer's product lines, trials and deployment schedules are reviewed.

**Cable TV data network system security (CED)**, Stephen Holmes, Zenith Electronics Corp., Dec. 1994, p. 60. A report on the security issues cable TV-based data communication systems face and some of the methods that can thwart system abuse.

**'Evangalizing' for server solutions (CED)**, Robert Wells, CableLabs Inc., Jan. 1995, p. 16. Initial impressions from soon-to-be-issued summary by CableLabs on an RFI analysis of digital media servers.

**HDTV field tests show VSB shines (CED)**, Nov. 1994, p. 12. News item on successful field tests that support HDTV's "broadcast coverage and cable robustness to the performance of the current NTSC television systems."

**Headend interconnects: Sonet or non-Sonet? (CED)**, Robert Harris and Thomas Hall, Nortel Ltd., May 1995, p. 58. A network cost comparison between Sonet and non-Sonet systems.

**ICTV, Sybase partner to deliver interactivity (CED)**, Nov. 1994, p. 14. News item on partnership announced between ICTV Inc. and Sybase Inc. to integrate Sybase products and services with ICTV's interactive TV system.

**Interconnect (CED)**, Return Path poll, Feb. 1995, p. 94. Operators sound off on the pros and cons of interconnecting with their cable neighbors and beyond.

**Jones fires up nations' first passive HFC network in Alexandria, Va. (CED)**, Oct. 1995, p. 12. News item talking about Jones' unique network design.

**Looking through a dim crystal ball (CED)**, Jim Farmer, Antec Technology Center, August 1995, p. 12. Farmer speculates on future trends and technology developments in the industry.

**Microsoft puts focus on broadband networks (CED)**, Dec. 1994, p. 16. News item on Microsoft's announcement that it is working with an array of companies to develop "an end-to-end software solution for interactive broadband networks."

**Op support systems hot at Cable-Tec Expo**

(CED), Roger Brown, Dana Cervenka, Leslie Ellis, July 1995, p. 64. An overview of the technology, software, sundry systems and other developments that debuted during SCTE's 1995 Cable-Tec Expo.

**New products bring hype closer to reality (CED)**, CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Powering options for cable telephony (CED)**, Chris Bowick, Jones Intercable, Nov. 1994, p. 20. Examination of the current options for powering cable telephony services.

**Satellites have operators looking skyward (CED)**, Fred Dawson, Nov. 1994, p. 62. A detailed overview of the challenges and opportunities presented by advanced satellite systems to providers of all landline services.

**Selecting DFB transmitters for broadband services (CED)**, Dr. Yaron Simler, Transmission Systems; Dr. Chien-Yu Kuo, Harmonic Lightwaves Inc.; Feb. 1995, p. 58. Important parameters that affect DFB laser transmitter operation that can be used when evaluating laser performance.

**Streamlining headend fiber organization (CED)**, William Seim, 3M Telecom Systems, Dec. 1994, p. 28. A brief description of the "hub in a box" concept, a high-density fiber organization for the head-end or hub office.

**Time to re-examine 1550? (CED)**, Don Vassel, Corning Inc., March 1995, p. 28. As cable evolves from television to full service telecommunications, 1550 nm transmission represents an important operating window of opportunity.

**Two-way services will finally work (CED)**, Jim Farmer, Antec Technology Center, July 1995, p. 22. Farmer believes two-way service is (finally) just around the corner.

**Unleashing the power of the PC (CED)**, LANcity staff, April 1995, p. 26. (Part 1 of two-part series) A detailed discussion of cable TV's unique position to provide high-speed data services.

## Interactive TV

**Analog architectures are alive and well (CED)**, Gregory Hardy, Scientific-Atlanta Inc., Feb. 1995, p. 70. Some analog system design alternatives that can also expand analog services (while waiting for full digital deployment) are discussed.

**Apple details interactive TV strategy (MCN)**, Leslie Ellis, 4/17/95, p. 41. The company unveils the set-top it plans to use with British Telecom.

**AT&T says future is now, via the phone (MCN)**, Fred Dawson, 1/16/95, p. 43. AT&T has a vision where people on their TVs and access a host of information, and interact with it.

**BT's video-on-demand technology trial (CED)**, Alec Livingstone, British Telecom, Oct. 1995, p. 50. A look behind the scenes at the hardware and technology being used in Britain.

**Cable looks at true VOD by '96 (MCN)**, Fred Dawson, 12/5/94, p. 1. Cablevision Systems commits to deploy 20,000 digital set-tops by the end of 1995. It signs with AT&T to provide the hardware.

**Cable trials leave Sega execs ecstatic (MCN)**,

Marty Levine, 11/28/94, p. 173. Based on a 12-city test, it looks like the Sega Channel will be a big winner in interactive TV.

**CableData will roll out cable-telephony system** (MCN), Linda Haugsted, 11/21/94, p. 26. The billing company announces a software package for joint cable/telephony networks.

**The challenge of the return path** (CED), John Stroman, Ortel Corp., Feb. 1995, p. 50. The challenging task of developing a viable return path laser that's affordable is discussed.

**A chicken and egg solution from Wink** (CV), Ken Freed, 9/18/95, p. 18. Wink Communications promises cross-platform interactivity without waiting for digital set-tops.

**Continental eyes first interactive TV tests** (MCN), Linda Moss, 3/13/95, p. 1. The MSO plans to test interactive ads and near-VOD service in the Boston suburbs later in the year.

**Convergence conference tackles the I-phrase** (CED), Dana Cervenka, Jan. 1995, p. 84. The Convergence '94 conference clears up a just a few of the nagging questions about the development of the Info Superhighway.

**Cox taps power utilities for interactive trials** (MCN), Fred Dawson, 5/15/95, p. 87. Cox and Virginia Power plan to test interactive energy management services in Hampton Roads.

**Data revenues waiting for two-way plant** (MCN), Leslie Ellis, 5/1/95, p. 85. Cable operators are poised to get revenue from interactive services, if there's a two-way path activated.

**DBS market should get crowded as new entrants make launch plans** (CED), May 1995, p. 14. News item about another DBS player (AlphaStar) that is poised to enter the market and Primestar's announcement of a new satellite dish configuration that will receive programming from high-powered satellites.

**DEC-Sybase latest effort to boost interactivity** (MCN), Fred Dawson, 6/26/95, p. 50. The partnership is an initiative to broaden the appeal of the ITV hardware platform.

**Delivering the promise** (CED), Andrew Paff, Antec Corp., May 1995, p. 32. The evolutionary path of HFC infrastructure development, both its unexpected problems and its unforeseen potential, is detailed and brought up-to-date.

**Designing an interactive services architecture** (CED), Mark Myslinski, General Instrument, Oct. 1995, p.64. Coming up with common interfaces and protocols will be key for future interactive networks.

**Disney, AT&T plan futuristic home** (MCN), Fred Dawson, 7/31/95, p. 2. Disney will build a state-of-the-art communications network in a new, planned community in Florida, called Celebration.

**The door is open, but ITV stumbles** (CED), Roger Brown, August 1995, p. 30. Reasons why the bloom is definitely off the interactive TV rose.

**'Evangelizing' for server solutions** (CED), Robert Wells, CableLabs Inc., Jan. 1995, p. 16. Initial impressions from soon-to-be-issued summary by CableLabs on an RFI analysis of digital media servers.

**Future set-tops begin to take shape** (CED), Dec.

1994, p. 18. News item on latest activity — by HP, Zenith, DiviCom and Broadband Technologies — in developing first-generation digital set-tops.

**GI launches 50-home near-VOD trial in Florida** (MCN), Linda Haugsted, 2/20/95, p. 8. General Instrument and a small cable company plan to test near-VOD in Hunters Creek, Fla.

**High-tech trials: Wait 'til '95** (MCN), by Leslie Ellis, 11/7/94, p. 3. Looking back, it's clear that 1194 was the year of limited field trials of new technology like interactive and digital.

**IBM pinpoints specific on-ramps** (MCN), Fred Dawson, 12/19/94, p. 41. IBM attempts to refocus on interactive broadband business opportunities.

**ICTV, Sybase partner to deliver interactivity** (CED), Nov. 1994, p. 14. News item on partnership announced between ICTV Inc. and Sybase Inc. to integrate Sybase products and services with ICTV's interactive TV system.

**IDS lays out road map for content developers** (MCN), Fred Dawson, 5/15/95, p. 90. Integrated Digital Services partnership lays out its hardware and software arsenal in battle for content support.

**Implementing telecom on broadband nets** (CED), Richard Lyford, Antec Corp., March 1995, p. 56. A discussion of some incremental service opportunities available that can keep revenue flowing while operators strive for full-service telecommunication systems.

**Interactivity comes on line** (CED), Fred Dawson, Feb. 1995, p. 86. Assessing the impact of Time Warner's debut of its Full Service Network trial in Orlando, Fla.

**Interactivity: Hype gives way to reality** (MCN), Leslie Ellis, 10/2/95, p. 37. Convergence conferees note that hype and missed deadlines have resulted in a poor public perception of interactive TV.

**Interactivity on-ramp** (CV), George Mannes, 5/8/95, p. 46. Sony and Mitsubishi form separate pacts to provide set-top boxes.

**IVDS coming to the Midwest; testing to begin** (CED), Oct. 1995, p. 14. The new interactive service is coming to Columbus, Ohio.

**Looking back on what was to be** (CED), Roger Brown, Dec. 1994, p. 56. A brief look back on the 1994 promises that were made, kept and broken, as well as those that have been put off.

**Making it work: Return systems 101** (CED), Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, August 1995, p. 66. The basics on operating a return network.

**Microsoft puts focus on broadband networks** (CED), Dec. 1994, p. 16. News item on Microsoft's announcement that it is working with an array of companies to develop "an end-to-end software solution for interactive broadband networks."

**New products bring hype closer to reality** (CED), CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Nuts and bolts issues of interactivity** (CED), Dana Cervenka, August 1995, p. 64. Customer service and training concerns of the coming interactive age.

**Optus Vision awards key technology contracts** (CED), June 1995, p. 16. Australian joint-venture

taps American suppliers for its integrated network. **Oracle, Hewlett-Packard to supply interactive system to Pacific Bell** (MCN), Leslie Ellis, 6/12/95, p. 1A. Oracle software will be meshed with HP's MediaStream video server to provide interactive TV capability for the RBOC.

**Oracle, HP team on PacTel ITV system** (CED), July 1995, p. 16. News item on Oracle/HP team effort to provide scalable interactive TV system to Pacific Telesis.

**Orlando to boast 2nd interactive network** (CED), Sept. 1995, p. 14. Disney and AT&T will build an interactive network in a new planned community.

**OS players Microware, S-A form alliances** (MCN), Fred Dawson, 5/15/95, p. 101. Microware and S-A sign up partners, but have radically different agendas.

**OSS: The backbone of interactive television** (CED), Ed Means, CableData, August 1995, p. 54. Factors to consider when searching for an Operations Support System for interactive services.

**RBOCs on track with digital TV rollout by '96** (MCN), Fred Dawson, 2/6/95, p. 1. Several RBOCs predict that, with swift FCC action, they could be offering digital TV to the market in about a year.

**The return system: A historical perspective** (CED), Jerry Marketos, Philips Broadband Networks, Sept. 1995, p. 84. A look at what happens to signals in the reverse band.

**Reverse issues stump cable engineers** (MCN), Leslie Ellis, 6/12/95, p. 9A. Designing reverse path capabilities aren't for the faint of heart.

**Studies predict how ITV will take shape** (CED), August 1995, p. 16. News item on Anderson Consulting research how telecommunication leaders think interactive services will eventually come about.

**Sun expands effort into digital area** (CED), Feb. 1995, p. 16. News item on two Sun Microsystems alliances to develop a MPEG-2 encoding system and a new interactive TV product.

**Sybase on interactive TV development: Get it on** (MCN), Fred Dawson, 7/24/95, p. 54. The company wants to spur the development of interactive TV.

**Time Warner takes stake in ITV venture** (CED), June 1995, p. 16. News item on TW's plans to become an equity partner in a venture to provide integrated multimedia software platforms for interactive TV.

**Time Warner unwraps Full Service Network** (CED), Feb. 1995, p. 14. News item on the debut of TW's new interactive network in a much touted (and long delayed) field test in Orlando.

**Two-way plant "performing well" at Cablevision** (MCN), Fred Dawson, 2/27/95, p. 47. Cablevision's test of PC service over two-way plant suggests telephony tests should be OK, too.

**Why the PC will rule the interactive house** (CED), Roger Brown, August 1995, p. 60. A PC professional (Avram Miller/Intel Corp.) explains why he believes the PC will be the interactive gateway in consumer homes.

**Zenith, AT&T partner on interactive device** (CED), Feb. 1995, p. 14. News item on new partnership that will bring voice and text (phone messages, headline news, etc.) to TVs via phone line and in-home box.



**Zenith sells company to LGE; cash infusion should help network group** (CED), Sept. 1995, p. 12. News item about acquisition of controlling interest in Zenith by Korea's LGE.

**Zing, 3 MSOs agree to distribution deal** (CED), August 1995, p. 16. News item on agreement by three MSOs who have agreed to distribute Zing's interactive encoded TV signals over their networks.

## In the Loop

*(In the Loop is a bimonthly CED column written by Tom Robinson of River Oaks Communications Corp.)*

**Cities of light for our age** (CED), Tom Robinson, River Oaks Communications Corp., Sept. 1995, p. 26. An overview of what cities look for from telecom providers.

## My View

*(My View is a monthly opinion column appearing in CED magazine written by Archer Taylor of Malarkey-Taylor Associates.)*

**Broadcast quality technical standards** (CED), Archer Taylor, Malarkey-Taylor Associates, Nov. 1994, p. 84. Discussion urging the cable industry to continue its work on developing interface standards, in lieu of the FCC doing so, to facilitate the transition between NTSC and ATV.

**The future is now — or the next decade** (CED), Archer Taylor, Malarkey-Taylor Associates, Jan. 1995, p. 100. The fast-evolving, ever-converging cable industry had best keep its eye on the true weathervane of success — the consumer.

**The good old days** (CED), Archer Taylor, Malarkey-Taylor Associates, May 1995, p. 124. "Interoperability" seems to be the key to the future and cable should consider getting behind it before it's too late.

**The irksome interface impediment**, (CED), Archer Taylor, Malarkey-Taylor Associates, Sept. 1995, p. 116. Archer buys a new TV set and has problems getting everything hooked up to cable.

**Milton Jerrold Shapp 1912-1994** (CED), Archer Taylor, Malarkey-Taylor Associates, Feb. 1995, p. 116. Taylor tips his hat to one of CATV's pivotal personalities, Milton Jerrold Shapp.

**Origins of British television** (CED), Archer Taylor, Malarkey-Taylor Associates, June 1995, p. 162. British inventor John Baird pioneers television in the British Isles.

**Philo Taylor Farnsworth: TV pioneer** (CED), Archer Taylor, Malarkey-Taylor Associates, July 1995, p. 100. Farnsworth's contributions to the development of modern television are explored.

**Revisiting the green scene** (CED), Archer Taylor, Malarkey-Taylor Associates, April 1995, p. 100. Operators FYI — recycling electronic equipment has caught on in Europe and is heading this way.

**The scalpel versus the machete** (CED), Archer Taylor, Malarkey-Taylor Associates, March 1995, p. 124. The development of the Cumulative Leakage Index established an

important precedent on how private and public sector groups can solve problems.

**The ubiquitous cable box**, (CED), Archer Taylor, Malarkey-Taylor Associates, Oct. 1995, p. 108.

Cable has experimented with lots of technologies, but always comes back to the set-top box.

**Where in the world are we headed?** (CED), Archer Taylor, Malarkey-Taylor Associates, Dec. 1994, p. 124. Cable's dive into residential voice and data telephony services is just a matter of time, technology and a clearly defined strategy.

**Zworykin's practical electronic television** (CED), Archer Taylor, Malarkey-Taylor Associates, Dec. 1994, p. 100. Zworykin's invaluable contribution to modern TV — an all-electronic TV system — is detailed.

## Network architecture

**1550 nm gear back on radar screen** (CED), Leslie Ellis, Feb. 1995, p. 44. For those cable operators strapped for capacity or wanting turbo-charged throughput, dense-WDM may be the answer.

**ADC, Electroline sign partner agreement on taps** (MCN), Leslie Ellis, 11/7/94, p. 52. The two companies sign a deal whereby ADC sells power passing and addressable taps made by Electroline.

**Analog architectures are alive and well** (CED), Gregory Hardy, Scientific-Atlanta, Feb. 1995, p. 70. Some analog system design alternatives that can also expand analog services (while waiting for full digital deployment) are discussed.

**ATM: Sure thing, or leap of faith?** (CED), Alan Stewart, March 1995, p. 68. Many consider Asynchronous Transfer Mode switches a crucial linchpin in the Information Superhighway, but is the hardware where it needs to be for MSOs to make such an expensive change?

**AT&T, BBT unveil new FTTC system** (MCN), Fred Dawson, 3/27/95, p. 39. The two companies work together to develop a next generation FTTC system.

**AT&T outlines San Jose network interface unit** (MCN), Leslie Ellis, 8/14/95, p. 50. The company thinks it has an answer to integrated service delivery while avoiding reverse path problems.

**AT&T preps cable platform** (MCN), Fred Dawson, 10/16/95, p. 55. The company plans to offer a cable-centric version of the integrated services platform based on the HFC system it built for the telcos.

**AT&T will combine FTTC, HFC designs** (MCN), Fred Dawson, 11/7/94, p. 51. AT&T and BroadBand Technologies have developed a way to use existing copper and tie it to a HFC network to support ATM video delivery.

**Bandwidth management in an HFC network** (CED), G. Keith Cambron, Pacific Bell and Fred Kemmerer, AT&T Bell Labs, Sept. 1995, p. 78. A look at how Pac Bell has engineered its broadband network.

**Best details Cox's "Ring in ring" plan** (MCN), Leslie Ellis, 12/5/94, p. 101. A detailed explanation of a new network architecture being developed and deployed by Cox Communications.

**Cable networks in the next millennium** (CED),

Dana Cervenka, Dec. 1994, p. 30. A crystal ball discussion of engineering professionals — five MSO representatives and three manufacturer representatives — on the network of the future and cable's future in telephony among other things.

**Cablephone not ringing yet** (CED), Dana Cervenka, March 1995, p. 32. The rush to provide telephony services has created a hardware crunch. Manufacturer's product lines, trials and deployment schedules are reviewed.

**Cable, telecom convergence on display** (CED), CED staff, May 1995, p. 88. Important developments and product debuts at Supercomm '95 are detailed.

**Cable TV data network system security** (CED), Stephen Holmes, Zenith Electronics Corp., Dec. 1994, p. 60. A report on the security issues cable TV-based data communication systems face and some of the methods that can thwart system abuse.

**Can coax support digital?** (CED), Bruce Carlson, General Instrument Corp., Nov. 1994, p. 52. Revisiting vital coaxial cable characteristics with a "digital perspective."

**The challenge of the return path** (CED), John Stroman, Ortel Corp., Feb. 1995, p. 50. The challenging task of developing a viable return path laser that's affordable is discussed.

**CATV bandwidth assessment** (CED), Gino Caira, GLA International, June 1995, p. 32. Current development of spectrum-saving technology provides a practical approach to system design.

**Is CDMA a viable choice for the upstream path?** (CED), Gihad Ghaibeh, Ericsson-Raynet Corp., August 1995, p. 40. The allure of Code Division Multiple Access is explored.

**Data revenues waiting for two-way plant** (MCN), Leslie Ellis, 5/1/95, p. 85. Cable operators are poised to get revenue from interactive services, if there's a two-way path activated.

**Debate still stirs over power-passing taps** (MCN), Leslie Ellis, 6/12/95, p. 20A. A group of manufacturers is addressing the need for power-passing cable TV taps.

**Delivering the promise** (CED), Andrew Paff, Antec Corp., May 1995, p. 32. The evolutionary path of HFC infrastructure development, both its unexpected problems and its unforeseen potential, is detailed and brought up-to-date.

**Designing an interactive services architecture** (CED), Mark Myslinski, General Instrument, Oct. 1995, p. 64. Common interfaces and protocols will be key for future interactive networks.

**The door is open, but ITV stumbles** (CED), Roger Brown, August 1995, p. 30. Reasons why the bloom is definitely off the interactive TV rose.

**Establishing a reliable network** (CED), Brian Bentley, Broadband Transmission Systems; Michael Pritz, Antec Corp.; Feb. 1995, p. 38. The Sonet solution to broadband network survivability is described and discussed.

**'Evangelizing' for server solutions** (CED), Robert Wells, CableLabs Inc., Jan. 1995, p. 16. Initial impressions from soon-to-be-issued summary by CableLabs on an RFI analysis of digital media servers.

**FCC official warns cable over '95 digital**

- advances** (MCN), Leslie Ellis, 1/9/95, p. 2. Senior FCC engineer warns operators not to wander too far into the digital realm before standards are set.
- FSN up and running: just the first step** (MCN), Kent Gibbons, 12/19/94, p. 1. Time Warner's Full Service Network in Orlando is up and running, but much more is planned for the future.
- Future proofing with hybrid fiber/coax** (CED), John Frederick, ADC Telecommunications, Sept. 1995, p. 52. Today's HFC networks can be designed to fit the future, too.
- Harnessing the power of the PC** (CED), LANcity staff, May 1995, p. 74. (Part 2 of two-part series.) How to turn cable plant into a high-speed Local Area Network is discussed.
- Headend interconnects: Sonet or non-Sonet?** (CED), Robert Harris and Thomas Hall, Nortel Ltd., May 1995, p. 58. A network cost comparison between Sonet and non-Sonet systems.
- HFC, SDV cost differential still muddy** (CED), Leslie Ellis, Sept. 1995, p. 48. Comparing the cost of installing HFC and SDV is a tough exercise.
- The high-speed CATV data revolution** (CED), Ken Pyle, E/O Networks, April 1995, p. 52. An overview of the issues, business motivations and implementation concerns behind one of the industry's newest (and potentially most lucrative) revenue streams — data communications.
- High-speed data for the consumer market** (CED), Ed Moura, Hybrid Networks Inc., April 1995, p. 44. An overview of a new system network architecture (i.e., Hybrid Access System) being tested in Castro Valley, Calif. by Viacom, Intel Corp. and General Instrument.
- The info highway: Who's going to be first?** (CED), Robert Stanzone, AT&T Network Systems, Sept. 1995, p. 44. Switched digital video and HFC networks are compared and contrasted.
- An integrated telecom network trial** (CED), Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, May 1995, p. 38. The varied aspects that should be taken into account to provide a wide area and regional telecommunications network are discussed.
- Jones fires up nations' first passive HFC network in Alexandria, Va.** (CED), Oct. 1995, p. 12. News item talking about Jones' unique network design.
- Jones goes passive actively in Alexandria, Va.** (MCN), Kent Gibbons, 9/4/95, p. 10. Jones' innovative fiber system to serve the Alexandria market.
- Looking through a dim crystal ball** (CED), Jim Farmer, Antec Technology Center, August 1995, p. 12. Farmer speculates on future trends and technology developments in the industry.
- Making it work: Return systems 101** (CED), Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, August 1995, p. 66. The basics on operating a return network.
- The mystique of reflection** (CED), Markus Giebel, Siccior Corp., Nov. 1994, p. 30. A discussion on whether or not APC connectors are needed to deal with reflectivity when upgrading systems or deploying new architecture.
- A new power paradigm in the making** (CED), Roger Brown, March 1995, p. 80. Those rushing to provide an expanded array of broadband services are taking a new look at a basic network building block: power. Who's doing what and why.
- Network powering: Looking beyond 60 volts** (CED), Leslie Ellis, Nov. 1994, p. 58. A discussion of the technical and economic challenges the cable industry faces in powering telephony services.
- Northern Telecom debuts HFC architecture, products** (CED), Dec. 1994, p. 14. News item on NT's development of a new architecture and related products to assist in the provision of digital telephony, video and data over HFC networks.
- NT details strategy for telco platform** (MCN), Fred Dawson, 11/21/94, p. 81. Nortel outlines its approach to several new products that will provide telephony over cable networks.
- Optimizing the return path** (CED), Jim Harris, Trilithic, July 1995, p. 50. How easier, more effective return maintenance can be achieved.
- Orlando to boast 2nd interactive network** (CED), Sept. 1995, p. 14. Disney and AT&T will build an interactive network in a new planned community.
- PacBell defends hybrid fiber/coax: 'Right technology at right price'** (MCN), Leslie Ellis, 7/3/95, p. 33. The RBOC details its California construction plans.
- PacBell poised and ready to proceed with HFC network; awaits FCC OK** (CED), August 1995, p. 14. News item on PacBell opening its broadband laboratory to the press and reaffirming its commitment to a HFC deployment.
- Powering options for cable telephony** (CED), Chris Bowick, Jones Intercable, Nov. 1994, p. 20. Examination of the current options for powering cable telephony services.
- The return band: Open for business?** (CED), Roger Brown, Dec. 1994, p. 40. A discussion of the ramifications of an upcoming report from the CableLabs Network Integrity Group that challenges the industry to actually produce what it's always advertised, i.e., a "two-way ready" capability.
- Return path a fantastic voyage?** (CED), May 1995, p. 28. A brief review of CableLabs' study (and its findings) entitled: "Two-Way Cable Television System Characterization."
- The return system: A historical perspective** (CED), Jerry Marketos, Philips Broadband Networks, Sept. 1995, p. 84. A look at what happens to signals in the reverse band.
- Residential shared tenant services** (CED), C. Derrick Huang and Dick Swan, Northern Telecom, March 1995, p. 52. Residential shared tenant service may just be the stepping stone into telephony that cable has been looking for.
- Rings, clamshells and spurs** (CED), Staff, Cox Communications Inc., Feb. 1995, p. 24. A detailed explanation of Cox's ground-breaking "Ring-in-Ring" fiber optic architecture.
- A robust digital link for in-residence distribution** (CED) Alastair Warwick and Robert Thomas, Broadband Access Technology Applications, Nov. 1994, p. 40. A new look at an old technology — BPSK, Bipolar Phase Shift Keying — proves to be a viable solution for improving digital cable reception in the home.
- S-A allies with two new partners** (CED), April 1995, p. 16. News item on Scientific-Atlanta's long-term agreement with Optical Transmission Labs to produce fiber gear that operates in the 1550 nm window and its announced joint venture with Siemens Public Communications Network Group to develop telephony-over-cable products.
- SDV: delivering multimedia to the home** (CED), Don McCullough, BroadBand Technologies, Sept. 1995, p. 36. The virtues of building networks in the switched digital video model.
- Siemens, Sun and S-A combine to offer turnkey HFC system** (CED), Jan. 1995, p. 12. News item on announcement of "turnkey end-to-end hybrid fiber/coax platforms" for cable operators and telcos alike.
- Streamlining headend fiber organization** (CED), William Seim, 3M Telecom Systems, Dec. 1994, p. 28. A brief description of the "hub in a box" concept, a high-density fiber organization for the head-end or hub office.
- The survivable network's next question** (CED), Jonathan Morgan, Fujitsu, Sept. 1995, p. 64. Which fiber design is best for survivable networks?
- TCI details new architecture** (MCN), Leslie Ellis, 4/3/95, p. 43. After all those RFIs, TCI publicly details its network architecture for the future.
- TCI issues RFI on node platforms** (MCN), Leslie Ellis, 1/30/95, p. 47. TCI issues the first of several planned RFIs on network platforms that provide flexibility to deliver targeted services.
- TCI issues second network RFI** (MCN), Leslie Ellis, 2/20/95, p. 77. The second RFI on network platforms goes out.
- Telco networks have come full-circle** (CED), Fred Dawson, Dec. 1994, p. 90. Fast moving technology developments and the slow moving Section 214 approval process have telcos considering a hybrid HFC / FTTC topology for their video dialtone.
- Telcos considering use of solar power for networks** (MCN), Fred Dawson, 10/9/95, p. 66. Solar power is gaining ground as an option for powering end-of-line components in fiber networks.
- Telephone system engineering** (CED), Steve Day, Comm DOC Services, March 1995, p. 46. Given the increased demands on CATV networks that are just around the corner, a new approach to designing CATV/HFC systems is discussed.
- Time Warner wins technical Emmy for HFC** (CED), Nov. 1994, p. 12. News item on Time Warner's Emmy win for developing hybrid fiber coax, "the architectural bridge spanning existing and future network applications."
- Unleashing the power of the PC** (CED), LANcity staff, April 1995, p. 26. (Part 1 of two-part series.) A detailed discussion of cable TV's unique position to provide high-speed data services.
- User-perceived availability of HFC networks** (CED), David Large, Connections Group, June 1995, p. 118. A reliability analysis of several architectures with performance comparisons.
- WDM technology poised to enter fiber market** (CED), Fred Dawson, April 1995, p. 74. Compelling options the industry should keep in mind when thinking about implementing wavelength division multiplexing.
- Where in the world are we headed?** (CED),

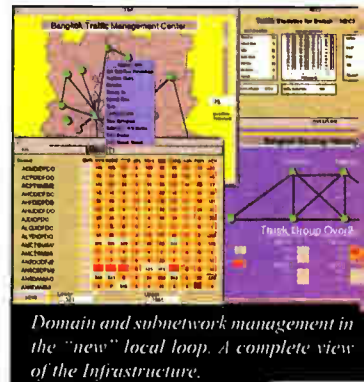


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**Selecting DFB transmitters for broadband services** (CED), Dr. Yaron Simler, Transmission Systems; Dr. Chien-Yu Kuo, Harmonic Lightwaves Inc.; Feb. 1995, p. 58. Important parameters that affect DFB laser transmitter operation that can be used when evaluating laser performance.

**Sizzle and spark: HFC power safety** (CED), Tom Osterman, Comm/net Systems Inc., May 1995, p. 26. New network services by both MSOs and telcos are generating new powering approaches and new concerns over safety as well.

**Telcos considering use of solar power for networks** (MCN), Fred Dawson, 10/9/95, p. 66. Solar power is gaining ground as an option for powering end-of-line components in fiber networks.

**User-perceived availability of HFC networks** (CED), David Large, Connections Group, June 1995, p. 118. A reliability analysis of several architectures with performance comparisons.

**Utilities and outages** (CED), Return Path poll, August 1995, p. 88. Operators express high interest in joining forces with local utilities, but outages continue to raise concerns about providing full-fledged telephony services.

## Rebuilds and upgrades

**1995 construction plans** (CED), Return Path poll, April 1995, p. 90. Operators provide details of upcoming capital expenditures spurred by increased competition.

**Analog architectures are alive and well** (CED), Gregory Hardy, Scientific-Atlanta Inc., Feb. 1995, p. 70. Some analog system design alternatives that can also expand analog services (while waiting for full digital deployment) are discussed.

**ATM: Sure thing, or leap of faith?** (CED), Alan Stewart, March 1995, p. 68. Many consider Asynchronous Transfer Mode switches a crucial linchpin in the Information Superhighway, but is the hardware where it needs to be for MSOs to make such an expensive change?

**The care and feeding of your existing plant** (CED), Joseph Waltrich, General Instrument Corp., Nov. 1994, p. 50. A brief discussion of factors that should be considered when introducing digital video into current analog systems.

**CATV bandwidth assessment** (CED), Gino Caira, GLA International, June 1995, p. 32. Current development of spectrum-saving technology provides a practical approach to system design.

**Construction from a contractor's point of view** (CED), Jeff Michaud, Cable Constructors Inc., Oct. 1995, p. 42. Some things to think about to help your rebuild go more smoothly.

**DBS competition** (CED), Return Path poll, June 1995, p. 146. While operators deny DBS has had little impact on their customer base, it has sped up the pace of upgrading systems and bandwidth.

**Denenberg and the new math** (CED), March 1995, p. 18. Leader of Southern New England

Telephone's leap into the fiber optic future, Dr. Charlotte Denenberg, is profiled.

**The drop cable dilemma continues** (CED), Chris Bowick, Jones Intercable, April 1995, p. 22. Some recommendations to curb drop cable waste.

**A field-installable fusion connector** (CED), Rodney Throckmorton and Rudolf Brugger, Siecor Corp. and Siemens AG, August 1995, p. 24. Details of a new field-installable connector are revealed.

**For a few pennies more** (CED), Dana Cervenka, April 1995, p. 18. A profile of Media General Cable's vice president of technical projects, Michael Nelson.

**The great disappearing drop cable issue** (CED), Chris Bowick, Jones Intercable, March 1995, p. 22. Results and implications of study on the apparent increased deployment drop cable throughout the industry

**Harris: Up to the (constant) challenge** (CED), Dana Cervenka, Nov. 1994, p. 16. Spotlight on Michael Harris, senior vice president of engineering and technology for Century Communications Corp. and Centennial Cellular.

**How one MSO got started in datacom** (CED), Roger Brown, May 1995, p. 46. An inside look at "ET Net," a metropolitan area network that ties 12 manufacturing companies together in Arizona.

**In-home wiring: an arm wrestling match** (CED), Dana Cervenka, June 1995, p. 62. Cable operators are in a real tug-of-war with their competitors over in-home wiring.

**An integrated telecom network trial** (CED), Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, May 1995, p. 38. The varied aspects that should be taken into account to provide a wide area and regional telecommunications network are discussed.

**Multimedia's \$150M rebuild** (MCN), Fred Dawson, 11/14/94, p. 53. Multimedia's rebuild plans include entering the telecom market.

**A new power paradigm in the making** (CED), Roger Brown, March 1995, p. 80. Those rushing to provide an expanded array of broadband services are taking a new look at a basic network building block: power. Who's doing what and why.

**Optus Vision awards key technology contracts** (CED), June 1995, p. 16. Australian joint-venture taps American suppliers for its integrated network.

**Preparing the drop for digital services** (CED), John Grothendick, Antec, Oct. 1995, p. 36. The weak link in digital will be the in-home wiring and the drop. But there are some steps that can be taken.

**Residential shared tenant services** (CED), C. Derrick Huang and Dick Swan, Northern Telecom, March 1995, p. 52. Residential shared tenant service may just be the stepping stone into telephony that cable has been looking for.

**SCTE group drafts construction guidelines** (CED), Dana Cervenka, Oct. 1995, p. 48. An update on the work being done by the SCTE Basic Construction Working Group.

**Sizzle and spark: HFC power safety** (CED), Tom Osterman, Comm/net Systems Inc., May 1995, p. 26. New network services by both MSOs and telcos are generating new powering approaches and new concerns over safety as well.

**Suppliers squeezed to meet demand** (CED), Leslie Ellis, Nov. 1994, p. 34. Worldwide demand for high bandwidth, high-quality equipment is putting a big pinch on U.S. operators who want to rebuild or upgrade their networks.

**TCI issues RFI on node platforms** (MCN), Leslie Ellis, 1/30/95, p. 47. TCI issues the first of several planned RFIs on network platforms that provide flexibility to deliver targeted services.

**US West rethinks broadband deployment, wants to contemplate MMDS and DBS** (CED), July 1995, p. 14. News item on how FCC approval delays have forced the telco to expand their options when it comes to delivering video to consumers.

## Regulatory Issues

**Addressable half-ASCII, a new compromise** (CED), Walt Ciciora, Oct. 1995, p. 24. Details surrounding the compromise struck on the decoder interface.

**Alert system worries ops** (MCN), David Kaut, 2/13/95, p. 47. Cable operators worry that new Emergency Alerting System rules will cost a lot.

**Amendment threatens decoder interface work** (CED), July 1995, p. 14. News item about a proposed amendment to the telecommunications bill that could jeopardize NCTA/EIA negotiations on decoder interface standard.

**Apple petitions FCC to create NII Band** (CED), July 1995, p. 14. News items on Apple's petition to the FCC to create a National Information Infrastructure band of the radio spectrum for high-speed data communications.

**Application of standards a delicate balance** (CED), Wendell Bailey, NCTA, April 1995, p. 20. Before jumping on any standards bandwagon, the industry has to determine whether they will degrade the delivered product or hinder competitiveness because they're too expensive.

**Beyond the basics of FCC test compliance** (CED), Bruce McPherran, HP CaLan, July 1995, p. 46. Full-time video signal monitoring can lead to improved customer satisfaction and retention.

**Broadcasters must repent before it's too late** (CED), Jeffrey Krauss, consultant, June 1995, p. 28. Broadcasters who want to use compressed HDTV signals to carry multiple SDTV channels are missing the point...and probably the boat as well.

**Broadcasters score big in digital** (MCN), Fred Dawson, 5/29/95, p. 1. The House telecom bill gives broadcasters additional spectrum, with few restrictions on how to use it.

**Cable piracy and the schizoid FCC** (CED), Jeffrey Krauss, consultant, August 1995, p. 22. The FCC falls short in its enforcement of cable signal piracy ban.

**CableWatch: one way to view outage time** (CED), Jan. 1995, p. 14. News item on simple device distributed by New Era Technology that allows cable operators (and customers) to keep track of signal outages.

**Cities of light for our age** (CED), Tom Robinson, Sept. 1995, p. 26. An overview of what cities look for from telecom providers.

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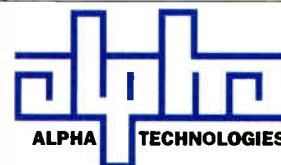
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**Digital set-top approaches become clearer** (CED), Fred Dawson, May 1995, p. 91. A report on how designs for digital set-tops have finally begun to crystallize.

**Emerging technologies/services** (CED), Return Path poll, Nov. 1994, p. 78. While the potentially huge impact of new technologies is readily recognized, operators are split on when those technologies will be commonplace.

**Getting close to the edge** (CED), Dana Cervenka, July 1995, p. 34. The coming switch from analog to digital will be a big leap of faith and a big jump into a whole new world of digital tests and training.

**GI focuses on telecom, expands training program** (CED), June 1995, p. 18. News item on General Instrument's establishment of business unit targeted to serve telco customers and its stepped-up broadband training program.

**The great convergence poker game** (Conv), Larry Yokell, Feb. 1995, p. 18. The stakes are high as telecommunication high rollers roll the dice in the big convergence game.

**Hardware is real; MSOs begin to commit** (CED), Fred Dawson, Jan. 1995, p. 62. Behind all the razzledazzle of the 1994 Western Show, a number of developments show the industry is finally on the move towards its multimedia, interactive future.

**HFC gathers steam as telco solution** (CED), Fred Dawson, August 1995, p. 74. Pacific Bell and Southern New England Telephone take the lead in promoting HFC as the solution to video dialtone delivery.

**High-tech trials: Wail 'Til '95** (MCN), Leslie Ellis, 11/7/94, p. 3. Looking back, it's clear that 1194 was the year of limited field trials of new technology like interactive and digital.

**Hooked up in Rochester** (MCN), Leslie Ellis, 2/27/95, p. 45. Time Warner announces plans to test telephone over cable gear from Tellabs.

**How one MSO got started in datacom** (CED), Roger Brown, May 1995, p. 46. An inside look at "ET Net," a metropolitan area network that ties 12 manufacturing companies together in Arizona.

**How they work on Silicon Mountain** (CV), Simon Applebaum, 9/18/95, p. 19. Century, MCI and Digital team up for a telecommuting trial in Colorado Springs.

**Hughes Network enters cable phone market** (MCN), Leslie Ellis, 10/30/95, p. 22. Hughes is girding to enter the market, already is testing with TeleWest in Britain.

**Implementing telecom on broadband nets** (CED), Richard Lyford, Antec Corp., March 1995, p. 56. A discussion of some incremental service opportunities available that can keep revenue flowing while operators strive for full service telecommunication systems.

**An integrated telecom network trial** (CED), Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, May 1995, p. 38. The varied aspects that should be taken into account to provide a wide area and regional telecommunication network are discussed.

**Interconnect** (CED), Return Path poll, Feb. 1995, p. 94. Operators sound off on the pros and cons of interconnecting with their cable neighbors and beyond.

**Keep your eye on the bear** (CED), Ted Harston, Post-Newsweek Cable, March 1995, p. 24. Harston believes cable's future depends on customer service, quality control, increased education and the ability not to get too overconfident.

**Key attributes of modern OSS** (CED), Steven Wright, consultant, April 1995, p. 58. (Part 2 of three-part series.) What to look for from vendors when shopping around for an operational support system.

**Looking back on what was to be** (CED), Roger Brown, Dec. 1994, p. 56. A brief look back on the 1994 promises that were made, kept and broken, as well as those that have been put off.

**MDUs could be first telephony target** (MCN), Kent Gibbons, 1/9/95, p. 31. Some small cable operators are already offering telephony via shared tenant services.

**Moderate costs propel MSOs to accelerate telephony trials** (MCN), Fred Dawson, 8/28/95, p. 53. Telephony gets the green light from MSOs who note that the costs are less than budget-busting.

**MSOs ally with Sprint; telcos turn up the heat** (CED), Dec. 1994, p. 16. News item about two alliances in the competitive cable and telco camps: Sprint, TCI, Comcast and Cox in one corner, Nynex, Bell Atlantic, Pacific Telesis and Creative Artists Agency in the other.

**MSOs stepping up to plate in PCS auction** (MCN), Kent Gibbons and Ted Hearn, 11/7/94, p. 1. It appears cable operators will be big bidders in the FCC's PCS spectrum auctions.

**'My kingdom for a modem'** (CED), Fred Dawson, June 1995, p. 127. The progress made and the challenges that lie ahead in the development of high-speed, low-cost cable modems.

**The need for telephone portability** (CED), Jeffrey Krauss, Telecommunications and Technology Policy, Dec. 1994, p. 5. A call for interim solutions to the question of service provider portability, i.e., being able to keep your telephone number when switching between telephone providers.

**NewChannels connected** (MCN), 1/16/95, p. 43. The NewChannels test of telephony over cable plant works—with just a few minor snags.

**NewChannels, Tellabs to test cable phone** (MCN), Leslie Ellis, 12/5/94, p. 2. NewChannels says it will test Tellabs cable telephone gear in Syracuse.

**NewChannels tests Philips Broadband phone gear** (MCN), Leslie Ellis, 3/27/95, p. 40. NewChannels agrees to test cablephone gear from Philips in Syracuse.

**A new power paradigm in the making** (CED), Roger Brown, March 1995, p. 80. Those rushing to provide an expanded array of broadband services are taking a new look at a basic network building block: power. Who's doing what and why.

**New services on your old network: telcos** (Conv), Larry Yokell, June 1995, p. 34. How telcos are coping with the expansion of their services.

**Network powering: Looking beyond 60 volts** (CED), Leslie Ellis, Nov. 1994, p. 58. A discussion of the technical and economic challenges the cable industry faces in powering telephony services.

**New products bring hype closer to reality** (CED),

CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**The North American numbering plan** (CED), Neal McLain, Communication Technologies Inc., Dec. 1994, p. 66. An overview report on previous telephone numbering plans (1952, 1960 & 1975) and a review of the new plan being introduced in 1995.

**Northern Telecom debuts HFC architecture, products** (CED), Dec. 1994, p. 14. News item on NT's development of a new architecture and related products to assist in the provision of digital telephony, video and data over HFC networks.

**NT details strategy for telco platform** (MCN), Fred Dawson, 11/21/94, p. 81. Nortel outlines its approach to several new products that will provide telephony over cable networks.

**Operational Support Systems** (CED), Steven Wright, consultant, March 1995, p. 74. (Part 1 of three-part series.) How to develop a process-based view of operations when implementing a successful OSS.

**Optus Vision awards key technology contracts** (CED), June 1995, p. 16. Australian joint-venture taps American suppliers for its integrated network.

**An OSS model with staged deployment** (CED), Steven Wright, consultant, May 1995, p. 66. (Part 3 of three-part series.) An overall structure of operational support systems is described in terms of basic building blocks.

**OSS: The backbone of interactive television** (CED), Ed Means, CableData, August 1995, p. 54. Factors to consider when searching for an Operations Support System for interactive services.

**PacBell poised and ready to proceed with HFC network; awaits FCC OK** (CED), August 1995, p. 14. News item on PacBell opening its broadband laboratory to the press and reaffirming its commitment to a HFC deployment.

**Powering options for cable telephony** (CED), Chris Bowick, Jones Intercable, Nov. 1994, p. 20. Examination of the current options for powering cable telephony services.

**Probita, GI will team on gateways** (MCN), Leslie Ellis, 1/9/95, p. 41. The two companies plan to co-develop Level 1 gateways for telco video dialtone applications.

**RBOCs are out of control** (CED), Jeffrey Krauss, consultant, May 1995, p. 12. The cross-subsidization of RBOC's broadband services continues and the FCC is just catching up to that fact.

**RBOC group issues set-top RFP** (CED), April 1995, p. 14. News item on request for proposals for up to 4 million analog and digital set-tops by consortium of Nynex, Bell Atlantic and Pacific Telesis.

**Residential shared tenant services** (CED), C. Derrick Huang and Dick Swan, Northern Telecom, March 1995, p. 52. Residential shared tenant service may just be the stepping stone into telephony that cable has been looking for.

**Resolving conflict and making progress** (CED), Jeffrey Krauss, Telecommunications and Technology Policy, Nov. 1994, pg. 5. Results of two months of negotiation between LMDS, FSS



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and MSS proponents regarding 27.5 GHz to 29.5 GHz spectrum sharing.

**The return band: Open for business?** (CED), Roger Brown, Dec. 1994, p. 40. A discussion of the ramifications of an upcoming report from the CableLabs Network Integrity Group that challenges the industry to actually produce what it's always advertised, i.e., a "two-way ready" capability.

**S-A allies with two new partners** (CED), April 1995, p. 16. News item on Scientific-Atlanta's long-term agreement with Optical Transmission Labs to produce fiber gear that operates in the 1550 nm window and its announced joint venture with Siemens Public Communications Network Group to develop telephony-over-cable products.

**Satellites have operators looking skyward** (CED), Fred Dawson, Nov. 1994, p. 62. A detailed overview of the challenges and opportunities presented by advanced satellite systems to providers of all landline services.

**Siemens takes on expanded S-A telephony role** (MCN), Fred Dawson, 3/20/95, p. 8A. With customers asking for a sophisticated cablephone product, S-A looks to a partner to help develop such a product.

**SNET starts tests of voice over hybrid fiber-coaxial** (MCN), Fred Dawson, 10/30/95, p. 57. Voice service over an HFC network is started by Southern New England Telephone in Stamford, Conn.

**Sprint/cable venture wins 29 PCS licenses** (CED), May 1995, p. 14. News item on long distance carrier/cable consortium's \$2.1 billion acquisition of 29 personal communication service licenses and its commitment to spend another \$2.3 billion on related infrastructure.

**Standards** (CED), Return Path poll, March 1995, p. 114. Operators express growing approval of setting standards, but disagree on what standards should be set and who should set them.

**Taking technology into the real world** (CED), Dana Cervenka, July 1995, p. 18. Profile of TCI's vice president of telephony services, Jerry Gaines.

**TCG Comcast phone test will target Baltimore** (MCN), Joe Estrella, 8/28/95, p. 53. Teleport and Comcast will test cablephone in Baltimore by the end of the year.

**TCI unveils software platform tied to frame relay network** (CED), April 1995, p. 14. News item on TCI's sneak preview of its advanced software platform for back office operations, e.g., billing, customer service and workforce management.

**Technology race tightens for MSOs, telcos** (CED), Fred Dawson, Sept. 1995, p. 88. Technology advances on all fronts make choosing a network architecture even tougher.

**Telco networks have come full-circle** (CED), Fred Dawson, Dec. 1994, p. 90. Fast moving technology developments and the slow moving Section 214 approval process have telcos considering a hybrid HFC / FTTC topology for their video dialtone.

**Telecom reform coming up fast** (CED), Wendell Bailey, NCTA, July 1995, p. 20. Progress on the telecommunication bill is reviewed.

**Telephone system engineering** (CED), Steve Day,

Comm DOC Services, March 1995, p. 46. Given the increased demands on CATV networks that are just around the corner, a new approach to designing CATV/HFC systems is discussed.

**Three more MSOs plan cablephone tests** (CED), April 1995, p. 16. Time Warner Cable, Cablevision Systems and Comcast join NewChannels Corp. to test telephony-over-cable hardware.

**Time Warner demos phone service ability** (CED), July 1995, p. 16. News item on TW's efforts to answer critics who disparage its ability to provide telecommunication services in Ohio.

**Time Warner shows off telecommunications nerve center** (CED), Dec. 1994, p. 14. News item on the unveiling of TW's new National Operations Center (NOC) that will serve as a network monitoring facility and a one-stop shop for cable/telephony transactions between customers and NOC staffers.

**Two-way activation for telephony** (CED), Fred Rogers, Quality RF Services, June 1995, p. 135. Some basic concerns about return path reliability that should be kept in mind when setting up telephony services.

**Two-way services will finally work** (CED), Jim Farmer, Antec Technology Center, July 1995, p. 22. Farmer believes two-way service is (finally) just around the corner.

**User-perceived availability of HFC networks** (CED), David Large, Connections Group, June 1995, p. 118. A reliability analysis of several architectures with performance comparisons.

**US West rethinks broadband deployment, wants to contemplate MMDS and DBS** (CED), July 1995, p. 14. News item on how FCC approval delays have forced the telco to expand their options when it comes to delivering video to consumers.

**US West teams with Cablevision on competitive access** (MCN), Fred Dawson, 4/10/95, p. 65. US West Interprise teams with several MSOs to develop bypass networks.

**Utilities energized for telecom business** (Conv), Judith Lockwood, Nov. 1994, p. 20. Utilities are looking to generate new revenues by building advanced telecommunication networks.

**Utilities and outages** (CED), Return Path poll, August 1995, p. 88. Operators express high interest in joining forces with local utilities, but outages continue to raise concerns about providing full-fledged telephony services.

**Vendors find demand high for cable telephony gear** (MCN), Leslie Ellis, 8/14/95, p. 45. Momentum is growing for cable telephony gear.

**Viacom, Tellabs team up on trial** (MCN), Leslie Ellis, 10/16/95, p. 3. Viacom's Castro Valley system is the latest to announce a telephony trial using Tellabs gear.

**Video dial tone sputters along** (CED), Jeffrey Krauss, Telecommunications and Technology Policy, Jan. 1995, p. 5. Potentially a strong competitor to cable, telco video dial tone (VDT) service is mired in an ongoing debate about who pays for its implementation.

**WDM technology poised to enter fiber market** (CED), Fred Dawson, April 1995, p. 74.

Compelling options the industry should keep in mind when thinking about implementing wave-

length division multiplexing.

**Will broadcasters, FCC derail digital TV?** (CED), Fred Dawson, March 1995, p. 92. The future of digital TV is far from clear with competing standardization pressures from cable and telco industries.

**Winning at the numbers game** (CED), Sept. 1995, p. 18. Some thoughts about the North American Numbering Plan from Wendell Bailey of NCTA.

**Wireless technologies and PSC applications** (CED), Raymond Schulz, GLA International, March 1995, p. 60. Personal Communication Service offers an array of opportunities and pitfalls for MSOs.

## Tests and measurements

**Beyond the basics of FCC test compliance** (CED), Bruce McPherran, HP CaLan, July 1995, p. 46. Full-time video signal monitoring can lead to improved customer satisfaction and retention.

**Billing vendors retool for ops' new demand** (CED), Dana Cervenka, May 1995, p. 84. Billing companies make surprising changes to meet changing needs of a converging marketplace.

**CableLabs issues RFP, is awarded 2 patents** (CED), June 1995, p. 16. News item on CableLabs' call to over 200 companies for telecommunications study and its acquisition of two wireless technology patents.

**Cable, telecom convergence on display** (CED), CED staff, May 1995, p. 88. Important developments and product debuts at Supercomm '95 are detailed.

**Is CDMA a viable choice for the upstream path?** (CED), Gihad Ghaibeh, Ericsson-Raynet Corp., August 1995, p. 40. The allure of Code Division Multiple Access is explored.

**Comprehensive testing of fiber infrastructures** (CED), Steve Grady, ADC Telecommunications Inc., July 1995, p. 40. Details of how successful management of fiber systems can be accomplished through thorough testing and on-line documentation techniques.

**A field-installable fusion connector** (CED), Rodney Throckmorton and Rudolf Brugger, Siecor Corp. and Siemens AG, August 1995, p. 24. Details of a new field-installable connector are revealed.

**Five ways to enhance the life of test gear** (CED), Michael McCaffery, CTV Inc., Oct. 1995, p. 74. Tips on how to keep test gear in tip-top shape and accurate.

**Getting close to the edge** (CED), Dana Cervenka, July 1995, p. 34. The coming switch from analog to digital will be a big leap of faith and a big jump into a whole new world of digital tests and training.

**High-speed data for the consumer market** (CED), Ed Moura, Hybrid Networks Inc., April 1995, p. 44. An overview of a new system network architecture (i.e., Hybrid Access System) being tested in Castro Valley, Calif. by Viacom, Intel Corp. and General Instrument.

**How one MSO got started in datacom** (CED), Roger Brown, May 1995, p. 46. An inside look at "ET Net," a metropolitan area network that ties 12 manufacturing companies together in Arizona.



**How to measure carrier-to-noise (CED).** Rex Bullinger, Hewlett-Packard Co., Nov. 1994, p. 68. Review of two important concepts (noise correction factors & measuring noise in-service) in measuring the visual carrier-to-noise ratio (CNR) prompted by new FCC technical standards.

**An integrated telecom network trial (CED).** Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, May 1995, p. 38. The varied aspects that should be taken into account to provide a wide area and regional telecommunications network are discussed.

**Making it work: Return systems 101 (CED).** Thomas Staniec, Time Warner Entertainment-Advance/Newhouse, August 1995, p. 66. The basics on operating a return network.

**Making the color measurements (CED).** Adolfo Rodriguez, Tektronix Inc., Jan. 1995, p. 74. Final part of series examining the entire suite of video tests required by the FCC.

**Measuring visual and aural levels (CED).** Mike Long, Zenith Electronics, Dec. 1994, p. 85. A detailed report on the NCTA recommended practice for signal level measurements that satisfy FCC technical standards.

**Microsoft puts focus on broadband networks (CED).** Dec. 1994, p. 16. News item on Microsoft's announcement that it is working with an array of companies to develop "an end-to-end software solution for interactive broadband networks."

**MSO's show apathy on tech standards (MCN).** Leslie Ellis, 11/14/94, p. 53. While numerous standards are being set on everything from protocols to tests, few MSOs seem to want to get involved in the process.

**New products bring hype closer to reality (CED).** CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Op support systems hot at Cable-Tec Expo (CED).** Roger Brown, Dana Cervenka, Leslie Ellis, July 1995, p. 64. An overview of the technology, software, sundry systems and other developments that debuted during SCTE's 1995 Cable-Tec Expo.

**Optimizing the return path (CED).** Jim Harris, Trilithic, July 1995, p. 50. How easier, more effective return maintenance can be achieved.

**Proof tests (CED).** Return Path poll, May 1995, p. 112. While performance tests can be a real pain for some, others report they're showing better results and the tests are gaining support.

**Putting fiber to the test (CED).** Todd Jennings, Sicom Corp., Oct. 1995, p. 26. Some real-world tips on how to test fiber in the field.

**The return band: Open for business? (CED).** Roger Brown, Dec. 1994, p. 40. A discussion of the ramifications of an upcoming report from the CableLabs Network Integrity Group that challenges the industry to actually produce what it's always advertised, i.e., a "two-way ready" capability.

**Return path a fantastic voyage? (CED).** May 1995, p. 28. A brief review of CableLabs' study (and its findings) entitled: "Two-Way Cable Television System Characterization."

**A robust digital link for in-residence distribution (CED)** Alastair Warwick & Robert Thomas, Broadband Access Technology Applications, Nov. 1994, p. 40. A new look at an old technology — BPSK, Bipolar Phase Shift Keying — proves to be a viable solution for improving digital cable reception in the home.

**Reverse testing and alignment for cable TV (CED).** Steve Windle, Wavetek Corp., April 1995, p. 68. The reverse sweep option, which provides fast, accurate measurements of the reverse bandwidth, is detailed.

**Spectrum analyzer in-service measurement (CED).** Jerry Harris, Fektronix Inc., March 1995, p. 86. Gated and non-gated in-service measurement techniques (applied to CSO, C/N and ICR) are compared, as well as their practical application.

**Synergistic swap meet, or no deal? (CED).** Dana Cervenka, May 1995, p. 52. As more cable operator/utility partnerships are announced, the pros and cons for each partner are detailed, as well as a look at what a successful partnership might entail.

**Technical overview of digital music services (CED).** Ed Krom, Krom Technical Services, Dec. 1994, p. 78. Summary of results from field test of three major suppliers of digital music programming and equipment for cable transmission.

**Test track, race track or fast track? (Conv).** Craig Kuhl, March 1995, p. 34. The Silicon Valley Test Track is fine tuning products and technologies.

**Three more MSOs plan cablephone tests (CED).** April 1995, p. 16. Time Warner Cable, Cablevision Systems and Comcast join NewChannels Corp. to test telephony-over-cable hardware.

**User-perceived availability of HFC networks (CED).** David Large, Connections Group, June 1995, p. 118. A reliability analysis of several architectures with performance comparisons.

**WDM technology poised to enter fiber market (CED).** Fred Dawson, April 1995, p. 74.

Compelling options the industry should keep in mind when thinking about implementing wavelength division multiplexing.

**Which is the best modulation? QAM vs VSB (CED).** Henry Samueli, Broadcast Corp., Leo Montreuil, Scientific-Atlanta Inc., Woo H. Paik, General Instrument Corp., Ron Lee, Zenith Electronics Corp., Dec. 1994, p. 44. Proponents for the two competing digital modulation technologies go head-to-head to make the case for their respective sides.

## Trade show coverage

**The 1994 Western Show Anaheim Convention Center (CED).** Dec. 1994, p. 106. Floor plan, exhibitor list and exhibitor contact information for 1994 Western Show.

**Antec debuts network management system ware (MCN).** Leslie Ellis, 5/8/95, p. 165. New software makes its debut during the National Cable Show.

**Cable hooks up to data at NCTA (CED).** CED staff, June 1995, p. 104. Attendees to the NCTA National Show are encouraged by the progress manufacturers have made with the introduction

of new equipment at the show.

**CableNET '94 doubles in size (MCN).** Leslie Ellis, 11/28/94, p. 173. More than 50 companies plan to take part in the massive integration project.

**Cable, telecom convergence on display (CED).** CED staff, May 1995, p. 88. Important developments and product debuts at Supercomm '95 are detailed.

**Cable-Tec Expo '95 (CED).** June 1995, p. 54. Floor plan and exhibitor summaries for SCTE's 1995 Cable-Tec Expo.

**C-Cube unveils first MPEG-2 encoder at Western Show (MCN).** Leslie Ellis, 11/28/94, p. 178. C-Cube Microsystems appears to be the first to offer an MPEG-2 encoder, which it debuted at the 1994 Western Cable Show.

**Datacom emerges as next wave (MCN).** Leslie Ellis and Fred Dawson, 5/15/95, p. 1. The National Show is dominated by news surrounding cable data modems.

**Debate still stirs over power-passing taps (MCN).** Leslie Ellis, 6/12/95, p. 20A. A group of manufacturers is addressing the need for power-passing cable TV taps.

**GI releases server specs, previews show focus (MCN).** Leslie Ellis, 11/14/95, p. 56. GI intends to release server specs for DigiCipher and plans to roll out new products at the Western Show.

**Hardware is real: MSOs begin to commit (CED).** Fred Dawson, Jan. 1995, p. 62. Behind all the razzledazzle of the 1994 Western Show, a number of developments show the industry is finally on the move towards its multimedia, interactive future.

**Hundt throws wrench into digital TV future (MCN).** Fred Dawson, 5/15/95, p. 1. The FCC will develop its own standards for digital broadcast TV, throwing cable's digital future into uncertainty.

**Hundt to deliver Cable-Tec keynote (CED).** June 1995, p. 50. Preview of program at 1995 SCTE Cable-Tec Expo.

**Lightwave leaps lead OFC show (MCN).** Fred Dawson, 3/6/95, p. 51. Multi-wavelength lightwave technology is making significant progress.

**Networking, in every sense of the word (CED).** Dana Cervenka, Dec. 1994, p. 96. The CableNET '94: The Convergence Laboratory exhibit at the 1994 Western Show offers great opportunity to network literally and figuratively.

**New products bring hype closer to reality (CED).** CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**Operation support systems gain steam at SCTE Expo (MCN).** Leslie Ellis, 6/19/95, p. 40. Status monitoring gets new life and a new name.

**Op support systems hot at Cable-Tec Expo (CED).** Roger Brown, Dana Cervenka, Leslie Ellis, July 1995, p. 64. An overview of the technology, software, sundry systems and other developments that debuted during SCTE's 1995 Cable-Tec Expo.

**A penguin on the telly? (MCN).** Leslie Ellis, 5/15/95, p. 87. Sony shows a set-top prototype during the National Cable Show.

**SCTE attendees looking for wide array of answers (MCN).** Leslie Ellis, 6/12/95, p. 9A. A

preview of the upcoming SCTE Cable-Tec Expo in Las Vegas.

**Sony allows first look at ad insertion system** (MCN), Leslie Ellis, 12/5/94, p. 14. Sony gives an early look at its digital ad insertion gear, which is scheduled for introduction in mid-1995.

**Supercomm '95 Booth Guide and Floor Map** (CED), March 1995, p. 104. A handy guide to Supercomm '95.

**Technical execs like data, telephony now** (MCN), Leslie Ellis, 6/19/95, p. 1. Those who attended the SCTE Expo note that data and telephony have overtaken interactive TV on their priority lists.

**Video takes back seat at telco meet** (MCN), Fred Dawson, 3/20/95, p. 1. Vendors showing gear at SuperComm '95 remain focused on telecom applications, not video.

### Training and education

**Hundt to deliver Cable-Tec keynote** (CED), June 1995, p. 50. Preview of program at 1995 SCTE Cable-Tec Expo.

**Getting close to the edge** (CED), Dana Cervenka, July 1995, p. 34. The coming switch from analog to digital will be a big leap of faith and a big jump into a whole new world of digital tests and training.

**GI focuses on telecom, expands training program** (CED), June 1995, p. 18. News item on General Instrument's establishment of business unit targeted to serve telco customers and its stepped-up broadband training program.

**Keep your eye on the bear** (CED), Ted Harston, Post-Newsweek Cable, March 1995, p. 24. Harston believes cable's future depends on customer service, quality control, increased education and the ability not to get too overconfident.

**MSOs prepare employees for digital literacy** (MCN), Gene Koprowski, 5/8/95, p. 184. As the industry prepares for the digital revolution, a number of companies are struggling to train their employees.

**NCTA '95 Technology Booth Guide** (CED), May 1995, p. 104. Floor plan and exhibitor summaries for 1995 NCTA exhibition.

**NCTA sets technical session slate** (CED), May 1995, p. 96. Summary of 11 technical sessions scheduled for upcoming NCTA convention.

**Nuts and bolts issues of interactivity** (CED), Dana Cervenka, August 1995, p. 64. Customer service and training concerns of the coming interactive age.

**Op support systems hot at Cable-Tec Expo** (CED), Roger Brown, Dana Cervenka, Leslie Ellis, July 1995, p. 64. An overview of the technology, software, sundry systems and other developments that debuted during SCTE's 1995 Cable-Tec Expo.

**Training and education** (CED), Return Path poll, Sept. 1995, p. 106. Results of a fax-in poll show that many are dissatisfied with the training they are getting on the job.

**Training for emerging technologies** (CED), Dana Eggert, Scientific-Atlanta Institute, Jan. 1995, p. 68. As convergence becomes more of a reality, the case is made for making a unified approach to training as part of the strategic plan.

**Training the trainers affordably** (CED), Dana

Cervenka, Dec. 1994, p. 98. The Association of Cable Trainers gives trainers, official and unofficial, the opportunity to share information and resources among themselves.

### Video compression

**ADC pens agreements with OSI and Optivision** (CED), Oct. 1995, p. 12. News item about new business relationships resulting in new products.

**ATM accord may spur VOD** (MCN), Fred Dawson, 2/6/95, p. 35. The ATM Forum makes progress on routing compressed video.

**Cable launches new initiative to find digital common ground** (MCN), Fred Dawson, 9/4/95, p. 4. MSOs want to determine which digital video compression approach is the best one for cable TV.

**C-Cube introduces real-time MPEG encoder** (CED), Dec. 1994, p. 14. News item on the introduction of a new family of MPEG-2 real-time encoder products for digital TV by C-Cube and some of the customers already in line to receive the products.

**C-Cube unveils first MPEG-2 encoder at Western Show** (MCN), Leslie Ellis, 11/28/94, p. 178. C-Cube Microsystems appears to be the first to offer an MPEG-2 encoder, which it debuted at the Western Cable Show.

**Compression comprehension: The quest for standards** (Conv), David Smith, June 1995, p. 27. Digital video compression is the key to vastly expanding content delivery options.

**DBS competition** (CED), Return Path poll, June 1995, p. 146. While operators deny DBS has had little impact on their customer base, it has sped up the pace of upgrading systems and bandwidth.

**Different things to different people** (CV), Chris Nolan, 5/8/95, p. 42. There are a lot of different kinds of MPEG available, depending on what features you want.

**Digital tests hearten wireless cable execs** (MCN), Leslie Ellis, 3/13/95, p. 6. Digital video compression tests undertaken recently have MMDS operators ecstatic over their prospects for success.

**The door is open, but ITV stumbles** (CED), Roger Brown, August 1995, p. 30. Reasons why the bloom is definitely off the interactive TV rose.

**FCC's chief engineer promised action on digital standards soon** (CED), Feb. 1995, p. 14. News item on announcement that FCC plans to begin a new proceeding on digital transmission standards for the cable industry soon (and reaction to it).

**MPEG encoders make their debut** (CED), Nov. 1994, p. 14. News item reporting the debut of two MPEG-2 real-time digital video encoders, one from Toshiba, the other from DiviCom.

**MPEG-2 market heats up at NAB** (CED), May 1995, p. 16. News item on the debut of new MPEG-2 encoders and servers and the announcement of an initial royalty model for digital decoders, videodisk players and pre-recorded storage media.

**New products bring hype closer to reality** (CED), CED staff, Jan. 1995, p. 40. Summary of new products, technologies, field test partnerships and alliances that made their debut at the 1994 Western Cable Show.

**SGS Thompson gets DigiCipher license** (MCN), Leslie Ellis, 12/12/94, p. 49. SGS Thompson Microelectronics signs on to make DigiCipher chips.

**Sun expands effort into digital area** (CED), Feb. 1995, p. 16. News item on two Sun Microsystems alliances to develop a MPEG-2 encoding system and a new interactive TV product.

**Time Warner unwraps Full Service Network** (CED), Feb. 1995, p. 14. News item on the debut of TW's new interactive network in a much touted (and long delayed) field test in Orlando.

**Which is the best modulation? QAM vs VSB** (CED), Henry Samuelli, Broadcom Corp.; Leo Montreuil, Scientific-Atlanta Inc.; Woo H. Paik, General Instrument Corp.; Ron Lee, Zenith Electronics Corp.; Dec. 1994, p. 44. Proponents for the two competing digital modulation technologies go head-to-head to make the case for their respective sides.

**Zenith gets encryption ally** (MCN), Leslie Ellis, 11/21/94, p. 81. Zenith signs a deal with Teledyne for a secure encryption technology it will use in new digital set-tops.

**Zenith, Teledyne ally on digital encryption** (CED), Jan. 1995, p. 14. News item on announcement that Zenith will use Teledyne's military-grade encryption technology in its new "Media Access" set-tops.



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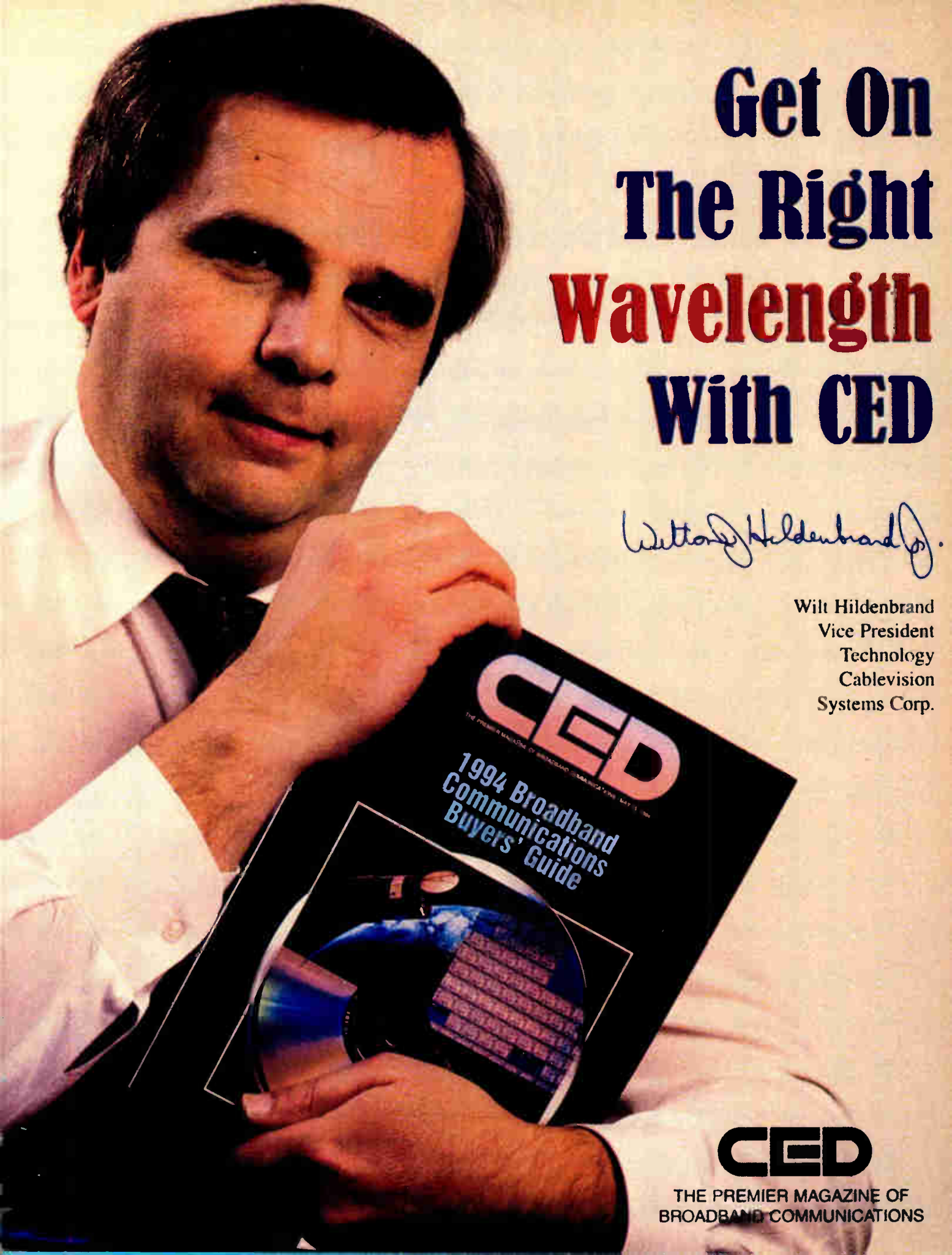
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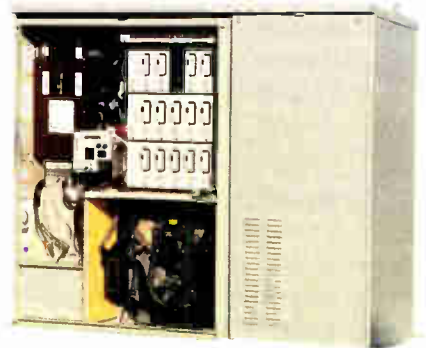
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# Future cable TV Is HFC adequate? network configurations

By Alan Stewart, President, Network Interface Corp.

Even though the cable industry is less enthused about providing interactive, multimedia services than it was a year ago, most recognize that the future will feature subscribers accessing a digital network brimming with entertainment and information in a transaction-type environment. But can today's hybrid fiber/coax network reliably provide such services, or will it trip over two huge obstacles: the return path and its tree-and-branch topology?

Consensus seems to show that, with fairly straightforward changes, the current cable infrastructure can provide subscribers with access to the broadband information highway. "There's probably not a lot that needs to be done to improve the downstream direction," observes David Large, a principal with Media Connections, a consulting company.

Major cable TV companies are testing their networks extensively to prepare for services such as voice, data and interactive video. "These kinds of tests form the basis for our launch of advanced services," says David Fellows, senior VP of engineering and technology at Continental Cablevision.

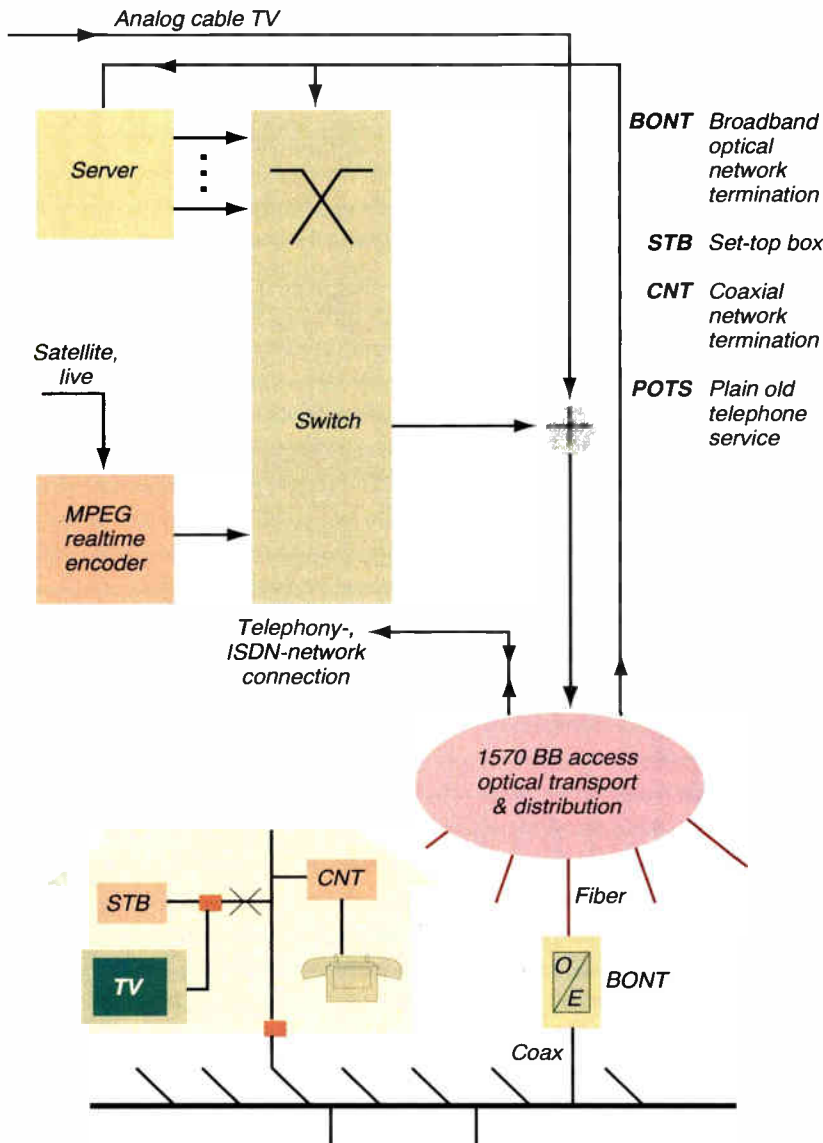
Yet much remains to be done. There are even those who say it would be best to replace all coax drops with fiber. "It's tragic for the U.S. to deploy hybrid fiber/coax (HFC) bus networks," MIT Professor Nicholas Negroponte told major end-users during a recent telecom conference. "Fiber all the way to the home is the only solution consistent with the information age." But the price tag for this is estimated to be \$1 trillion—and it will not be academia that foots the bill.

Telecommunications engineers are studying the capabilities of HFC networks to handle new services, and their findings are encouraging. At Bellcore, the research and development facility funded by the regional Bell operating companies, the capability of two-way coaxial cable to deliver 500 interactive TV programs to the home has been demonstrated under simulated service conditions.

## Testing the network

As part of an extensive program at its Morristown, Chester and Red Bank facilities, Bellcore is conducting extensive tests on up to 5,000 feet of coaxial cable to determine Level 1 (physical layer) transmission properties for 500-channel interactive video systems at frequencies below 1.0 GHz (See *CED*, October 1995). These tests use distributed scattering

Figure 1: Full service network demonstrator, Telecom '95  
Alcatel 1570 BB + Berlin pilot system



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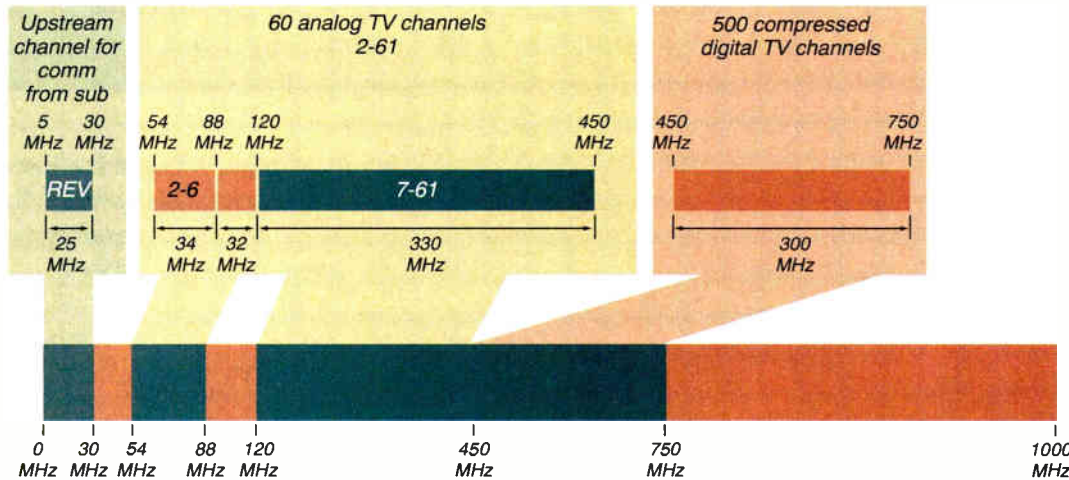
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## ◇ FUTURE NETWORKS

Figure 3: 500 channel video systems. Example use of spectrum on coax "last mile."



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### Relevance to the cable TV industry

Although Large feels that Bellcore's program tends to downplay the capabilities of existing coaxial networks, some of the tests being undertaken are important, he says.

"For example, there is a debate in the industry on the degree to which microreflections from the home, particularly those that are time variant, will impact high order digital modulation systems such as 64- and 256-QAM systems that will be used for digital video.

"Tests at CableLabs have shown that changing channels on a TV set causes substantial mismatches when connected to a splitter with a cable modem or similar device at the other port," Large continues. "This leads to a varying mismatch that may only be 20 dB down. This level is high enough to disrupt multi-level transmission systems. Although an adaptive equalizer can solve the problem, it has to be fast enough to keep up with the time variant reflections."

Another factor is radio frequency ingress at the customers' premises. These signals are short duration, narrowband and of high amplitude. It is this last factor that can cause problems in the network. If it's high enough, the return laser at the node goes into clipping, impacting the entire spectrum.

"The fact is we need to learn statistically how bad these kinds of problem really are," Large continues. "This can be done by going out in the field and making measurements, simulating things in the lab, just as Bellcore is doing. Then, in many cases, we can come back and say, yes, this is a one percent problem. You can put an isolation amplifier on that drop going to the TV set and eliminate the problem. If it's a 20 percent problem, then the cost of such fixes gets really high, and we have to

look at a broad-based solution."

Although Fellows says he is unfamiliar with Bellcore's cable TV research program, he points out that cable TV companies are conducting similar research. "CableLabs has performed two extensive sets of tests across the country—one looking at reverse path noise and performance, and another on digital transmission over FSA plant. It is this kind of evaluation that forms the basis for our launch of advanced services in the network," he concludes.

As part of the network upgrade program detailed earlier, Continental is addressing similar issues as Bellcore, including:

- ✓ How signal reflections are handled by adaptive equalizers in the receivers
- ✓ How to power remote sites over the coaxial cable
- ✓ How to utilize concentration to improve voice and two-way data grade of service.

"We can control concentration in the radio frequency plant and between the headend and the switch, as well as in the links to other carriers," Fellows explains. "The interactive voice and data signals are terminated at the side of the home, avoiding interference from in-home wiring. Digital set-top boxes can contain adaptive equalizers."

In summary, Continental believes that many of the standards that will enable voice, data and video-on-demand to be transmitted are already in place. "We interface with telephones with standard tip and ring," says Fellows. "We interface with computers using standard Ethernet connections. We interface with other carriers in the same manner that telephone

companies use today. We interface with television sets using standard NTSC signals."

As a result of the studies, tests and deployments discussed here, it is possible to predict the shape of things to come in cable TV networks. Further evidence is provided by a major vendor in Europe.

During the recent Telecom '95 trade show in Geneva, Alcatel demonstrated its 1570 BB full service cable network based on a pilot system in Berlin, Germany (see Figure 1). This network provides conventional analog cable TV, real-time digitally encoded MPEG compressed video via satellite, and both POTS and ISDN (Integrated

Services Digital Network) telephone services. The key elements in this network include a broadband video switch, an optical access device and a hybrid fiber/coax termination unit.

### Tomorrow's networks

"The design of the broadband access portion of this network is crucial to its overall performance," explained Jurgen Otterbach, of Alcatel's Stuttgart Research Center. The equipment multiplexes video, voice and data on to a fiber feeder, which terminates at the coaxial network. At this point, cable TV, VOD, interactive data and voice signals are analog modulated and distributed in a conventional manner. At the residence, the set-top box is connected to the coaxial drop wire.

The set-top thus forms an integral part of the Alcatel system (see Figure 2). This contains circuits that tune, demodulate and error correct the incoming RF signal. Conditional access and descrambling are controlled using a smart card interface. This is followed by an MPEG-2 demultiplexing and decoding unit. Finally, a video/audio backend provides con-

Table 1a: HFC system equipment for telephony

ADC...	Homework
AT&T...	HFC-2000
COM21...	ComPORT
Ericsson Raynet...	RVS
FPN...	FPN-1000
GI...	Mediaspan
Motorola...	CableComm
NEC...	ISC-303
Nortel...	Cornerstone
Philips...	Broadband Communication Gateway
S-A...	CoAxiom
Tellabs...	Cablespan
Unisys...	Digital Cable Services System

Source: Bellcore



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Table 1b: HFC system equipment for data

		Down/up bit rate
DEC...	ChannelWorks	10/10 Mbps
Gl...	PCLinX	30/1.5
H-P...	(n.a.)	30/10
Intel...	CablePort	27/0.096
LANCity...	LANCity Router	10/10
Motorola...	CyberSURFR	10/0/768
S-A...	(n.a.)	27/1.5
Zenith...	ChannelMizer	4/4
Zenith...	Homeworks	0.5/0.5

Source: Bellcore

nectors for TV, VCR and audio.

Such system configurations offer several advantages:

- ✓ Fiber is deployed to the neighborhood
- ✓ The existing coaxial access infrastructure remains in place
- ✓ Separate fibers carry upstream voice and data; downstream switched video; and conventional cable TV.

In the United States, the signals in this network will utilize a spectrum within the coax of from 5 MHz to 750 MHz (see Figure 3). In this hybrid system, 60+ channels of analog TV occupy the conventional cable TV band.

Frequencies from 450 MHz to 750 MHz can accommodate 500 channels of MPEG-compressed digital video (for video-on-demand in highly compressed form).

The diagram shows the frequency allocation from the optical networking unit to the home. Most typically, the analog video and digital video will be carried separately on the fiber backbone between the headend and the optical network unit (ONU).

A network deployed by US West as part of its trial program extends the reach of the fiber

to an ONU serving smaller groups of subscribers (see Figure 4). In this deployment, broadcast analog cable TV signals are carried on one-way HFC, while voice and switched video are carried on what amounts to an FITL system.

At the subscriber pedestal, a twisted pair drop carries voice and data, while switched video is carried at baseband frequencies on coax, frequency multiplexed with analog television signals.

This arrangement supports large upstream signaling and communications channels.

### The vendor role

The vendor community plays a major role in determining the configuration of future HFC networks. In many cases, de facto standards for transmission loss, frequency response, signal-to-noise ratios, signal reflection, crosstalk, and so forth are established for products designed, tested and deployed by this community.

The downside to this is that there is no common approach to network configuration, particularly in the upstream direction.

"A major problem is that everyone is doing something different," observes Large. "A high-speed downstream channel and a virtual low-speed upstream channel look dynamically different from a LAN-like network where everyone shares one wideband pipe up and one wideband pipe down."

His point is valid. In Europe, most cable telephony deployments utilize a subscriber carrier approach where subscriber access is switched by the network.

Some of the vendors involved in HFC system equipment for telephony and data are shown in Tables 1a and 1b. The rapid pace of change in the industry is personified by LANCity's data modem, which provides sufficient error correction to provide a reliable upstream channel in the 5 MHz to 25 MHz band. The company recently lowered the price of this product to around \$500.

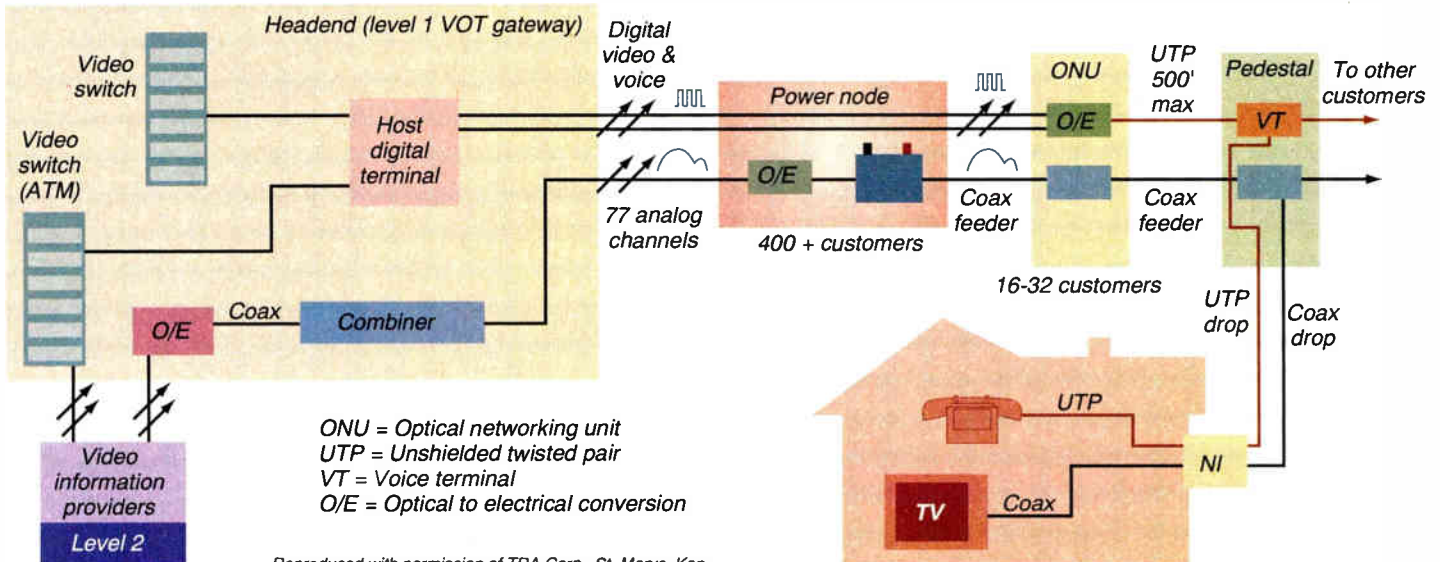
### Conclusions

Although many believe that the long-term interests of U.S. subscribers would be best served by fiber-to-the-curb, it is too expensive and time-consuming to deploy on a national basis any time soon. On the other hand, hybrid fiber/coax can evolve gracefully from today's predominantly coax cable TV network. Fiber is already being deployed from the headend to the city and, in many cases, to the neighborhood.

The examples shown in this article have demonstrated that HFC provides adequate bandwidth in the downstream direction to accommodate future services. Laboratory evaluations at Bellcore, and field tests by CableLabs and Continental Cablevision prove that with minor changes, analog and digital multimedia services can be provided over this network.

The upstream direction poses the most problems. Reflections and interference caused by TV tuner switching and ingress can lead to deterioration of signals across the spectrum. The best solution in this area appears to be the provision of some kind of subscriber network interface unit either adjacent to, or located at, the house. **CED**

Figure 4: US West switched video deployment. 1995 deployment (?)

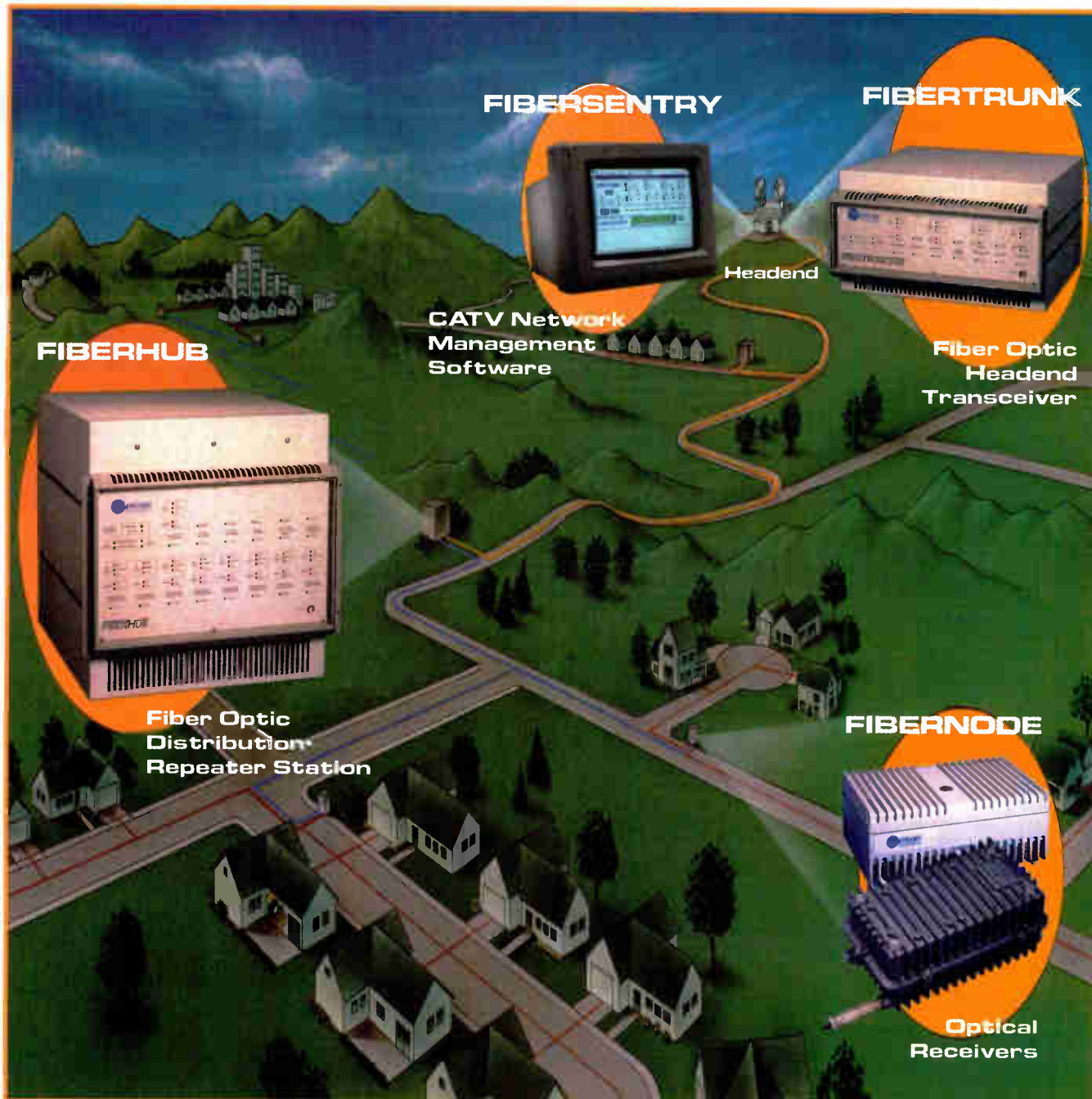


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# Cable TV Center's Various programs are being weighed new home taking shape

By Michael Lafferty

While the decision to relocate the National Cable Television Center and Museum to the University of Denver received scant attention nearly a year ago, recent developments will soon refocus industry attention on the matter. And, according to those involved in coordinating the relocation, increased industry attention and input is a big part of the plan to switch the center from its present location at Penn State University.

Planning for the Penn State facility began in 1984 as an outgrowth of discussions begun among members of the Cable Television

opened a temporary facility in 1988.

The impetus to move the center and museum began in May 1993 when the managing board of the Cable TV Pioneers voted unanimously to relocate the facility. Few close to the situation then or now are willing to discuss the details of the departure from Penn State. But there appears to have been differences of opinion between the school that administered the day-to-day operations of the center and cable industry professionals who made up a majority of the managing board. In fact, discussions are still underway to finalize the details of the departure, including the disposition of the archives, artifacts and programs

of the SCTE) among others.

It was also during this period that the Cable TV Pioneers relinquished its advisory role with the center and museum they helped found. An independent, non-profit corporate entity was formed, and its board of directors, chaired by Bresnan, took charge of the search and long-range planning for the center.

When it was all said and done, "No one rolled out the red carpet like Denver did. They really went all out to make us feel at home," says Bresnan. Since the Denver decision in December 1994, the board has been pursuing the relocation on several levels, retaining consultants where needed.

A key factor in the Denver decision was the establishment of a special relationship with the University of Denver, the details of which are still being worked out as plans for the new center take shape. While a specific site for the center and museum has not been settled on yet, Bresnan reports the university "has offered us several sites for \$1 a year in a 99-year lease-type arrangement."

But, before a definitive site decision can be made, says Bresnan, the board is determining exactly what the center and museum will actually do. To help them determine that, the board retained the services of White Oak Associates Inc., a Massachusetts-based consultant that has advised on and planned various science centers, museums and cultural tourism sites around the world since 1974.

"I am so grateful and thankful that we have them on board," exclaims Bresnan. "They are real professionals and they know their business.... They have really forced us to think about the center and museum and what it should do. They've come up with important issues that we probably would have eventually faced on our own, or would have blindsided us farther down the road."

Three broad functions of the new facility have been identified by the board. They include the museum itself; a full-fledged, multimedia library for research and preservation of industry archives; as well as an active educational institute that will tap University of Denver resources on various levels.

The institute is a particularly lively topic of discussion among board members, which includes SCTE's president, William Riker. Riker thinks the institute will serve the invaluable task of working with other universities and learning institutions throughout the country, and someday overseas, to create a variety of degreed programs in broadband communications.

"This is due in part," explains Riker, "to the fact that most, if not all of the people in our



The Cable TV Center and Museum's new home, the University of Denver, is the oldest independent university in the Rocky Mountain region.

Pioneers, an informal group of men and women who have distinguished themselves in the field. The Pioneers, working in association with such groups as the National Cable Television Association, the Community Antenna Television Association, the Pennsylvania Television Association and Penn State University, raised the money and

currently housed at Penn State.

Once the relocation decision was made, a committee was formed under chairman William Bresnan, president of Bresnan Communications Co. in White Plains, N.Y. As the search began, discussion involved such cities as Washington, D.C., New York, Philadelphia, Atlanta and Exton, Pa. (home



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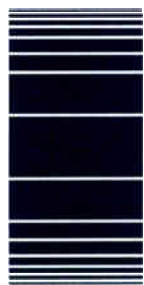
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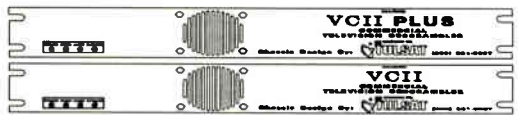
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business right now didn't really go to school for the business they're in per se. We all learned on the job. You really can't go someplace and come out with something that will prepare you for all that goes on in our business. There's certainly the desire to help speed up the process of being able to bring people into the business that have a well-rounded background in all that we do."

The board and White Oak consultants have also been discussing the role the new center and museum will play outside the industry. "What we're doing right now," says Bresnan, "is defining some alternative scenarios. Is it a totally captive thing for industry people? Or do we want to reach out to the public as well? There are so many different ways you can go on a project like this one." He says this includes the possibility of establishing "satellite" displays or exhibits around the country to help educate the public on cable television's role in telecommunications, past, present and future.

### The board is also on the lookout for a chief executive officer for the non-profit organization

Bresnan reports White Oak is putting together what is called a "concept development plan" that will present possible programs and activities that might take place in the new facility, how such programs might be funded (e.g., membership dues, endowments, admission fees, etc.) and general space allocations for such activities.

Once those programs have been discussed within the board, the ideas will be circulated among other industry professionals for additional feedback. With all that input, the board will then make some hard decisions about the

exact breadth and scope of the new center and museum, ideally by January 1996. White Oaks will take those decisions and produce a "strategic development plan" by mid-1996 that will include plans for an actual facility. Toward that end, the board has retained the services of one of Denver's larger architectural firms, RNL Design.

The strategic development plan will also recommend various ways to fund the new facility and its future operating expenses. That aspect of the project will be directed by Robert F. Harstook & Associates in Wichita, Kan., a professional fund-raising consultant hired by the board.

Bresnan reports the board is also on the lookout for a chief executive officer for the non-profit organization. "It's almost a person who doesn't exist," jokes Bresnan. "It has to be a person who is a good executive. Someone who can get things done, particularly during the first three years or so. I think it's important that the person understand the industry...that they have an appreciation for what the industry is trying to do. But, it's like any other search. You have a number of criteria, and nobody fits all of them the same way."

To assist in the search, the board has retained Mike Wein at Media Management Resources (Gulfbreeze, Fla./Denver), an executive headhunter with considerable experience in the industry.

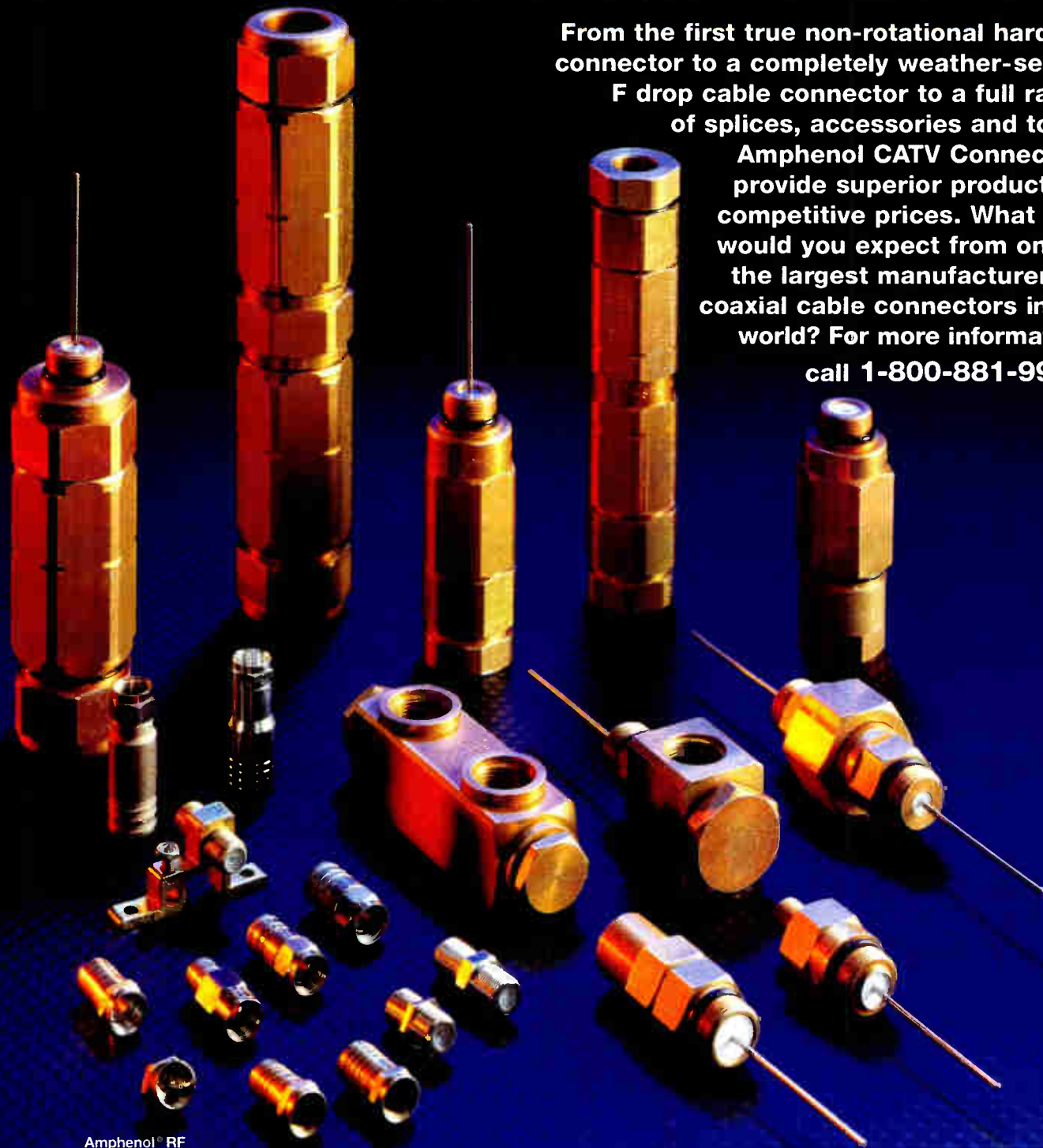
Additional members of the board of directors overseeing the relocation include: William Arnold, Texas Cable TV Association; Yolanda Barco, Pennsylvania Cable TV Network; Frank Drendel, Comm/Scope Inc.; Marlowe Froke, State College, Pa.; Joseph Gans, Northeast Cable; Richard Leghorn, Leghorn Telepublishing; Richard Loftus, Lake Lure, N.C.; Trygve Myhren, Providence Journal; Sandford Randolph, Bridgeport, W.Va.; Leslie Read, Home Box Office Inc.; Michael Rigas, Adelpia Communications Corp.; and Robert Russo, Daniels & Associates. **CED**



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question is, how can the industry reach consensus on protocols fast enough to avoid seeding the market with a considerable amount of incompatible and potentially obsolescent equipment.

"We don't see any way around a first wave of commercialization that implements some degree of incompatibility," says a senior engineering executive, asking not to be named. "But we're determined to make that phase as short-lived as possible—probably much shorter than many people realize."

Horowitz acknowledges that, with some MSOs moving to high-speed solutions in the 28-40 Mbps range, while others are deploying modems at anywhere from 500 kilobits to 10 Mbps, the best hope for compatibility is to ensure that all systems conform to certain basic protocols so that content providers can adjust to variations in speed from one operator's territory to the next.

"Everyone's intent is to get to agreement," Horowitz says. "The key word is scalability, where the speed will fit the machine at the end of the network, but agreement on protocols will permit scalability on the content side as well. MTV might offer service that takes full advantage of a high-speed modem, but it has to look good at 9,600 baud as well."

Along with the downstream speed variations, another key point of incompatibility is between equipment that supports symmetrical connections, with the same speeds up and downstream, and those with asymmetrical data rates. While the vendor community as a whole appears to be moving in the direction of asymmetrical connectivity as the speeds increase on the downstream side, there will remain disparities in upstream approaches.

For example, Gerald White says LANcity is not wedded to a symmetrical approach, given the option to go to higher speeds downstream. "But we believe 10 Mbps upstream remains the appropriate level," he adds, drawing a distinction between his company's approach and others which are pegged to 1.5 Mbps upstream.

As things now stand in CableLabs' efforts to sort through the many vendor approaches, it looks like there is one point of consensus that has already been reached

that will be important to achieving compatibility early on, says Scott Bachman, vice president for operations technologies performance at CableLabs. "There's widespread support for 10baseT between the PC and the modem," he notes. "It makes a lot of sense because of the availability of PC cards off-the-shelf that support that interface."

**The competition**

Along with sorting out the protocol issues, the cable industry must be alert to the growing support telcos are providing for ISDN after years of letting the service languish. Suddenly, in Pacific Bell, Bell Atlantic, BellSouth and Southwestern Bell territories, ISDN is available on a dialup basis at low monthly rates.

"ISDN is becoming a driving force in those telephone territories where dialup service is offered at low flat rates," says Jeffrey Shapard, senior product manager at Performance Systems International Inc., a leading Internet access provider which has worked with Continental in offering a handful of users high-speed access via cable modems.

While PSI's cable connection is in limbo pending a clearer picture of where the industry is going on the protocol front, the company is now equipped to deliver ISDN rate Internet access at 128 kilobits per second in 20 cities and will soon be able to do so in all its markets, Shapard says. The company charges the same flat rate of \$9 per month for the first nine hours of usage for 64 or 128 kbps Internet access, as it does for standard analog access, with a premium of \$1.50 per hour over the standard \$1.50 rate for additional prime time usage at 128 kbps, and no premium for 64 kbps.

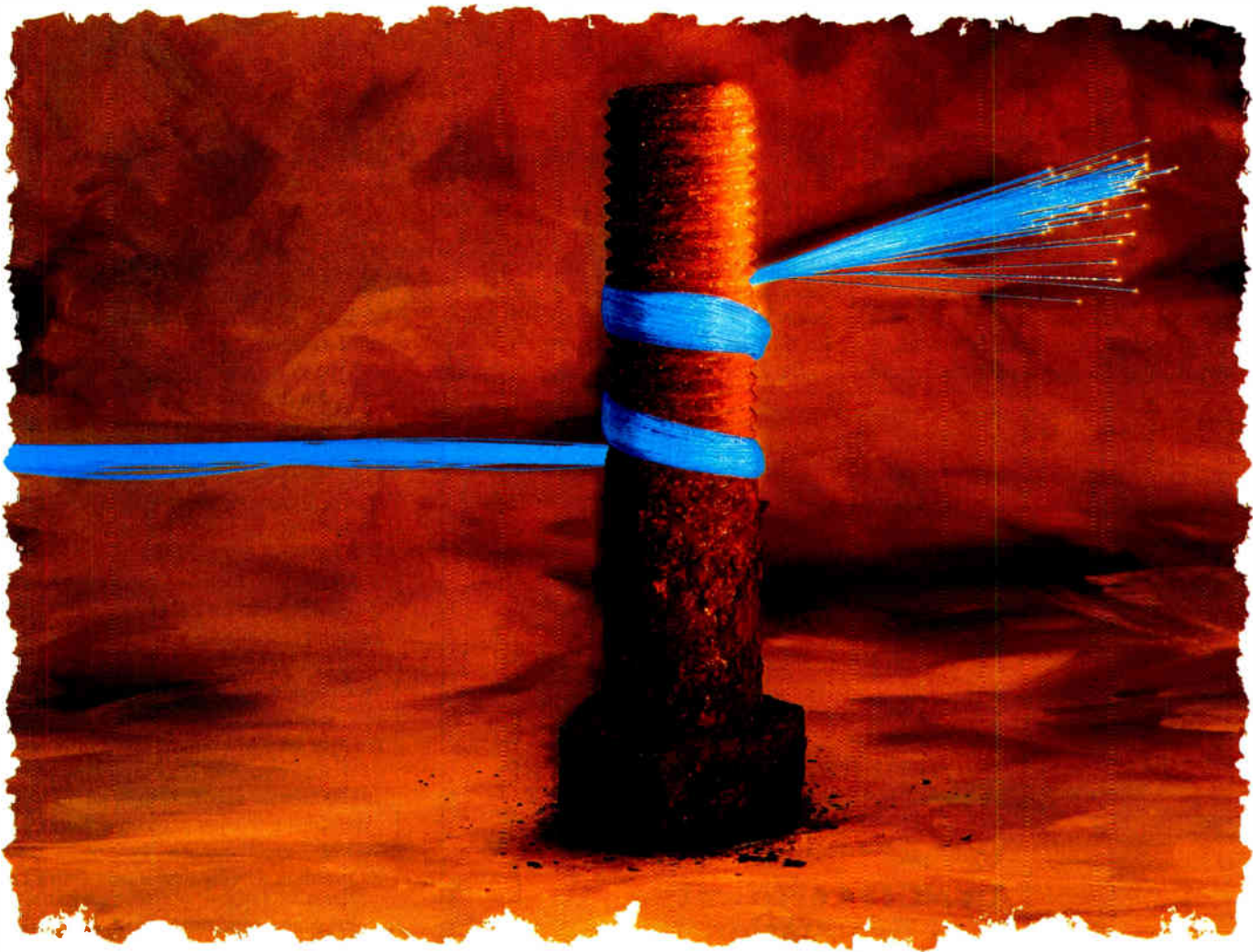
ISDN modems are becoming easier to use and cheaper, as is evidenced from a new line introduced by 3Com Corp. of Santa Clara, Calif. Designed for home or small office use, the firm's new 128 kbps unit allowing for bandwidth-on-demand applications ranging from two-line voice or voice/data combinations to full-throttle data throughput, is priced at \$649. ZyTEL, another ISDN modem supplier, says it, too, is delivering a multiple use unit with prices starting at \$549.

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*Nick W...*  
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DECEMBER

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**4-8 Broadband ComForum and TecForums.** Produced by the International Engineering Consortium. Location: Sheraton Bal Harbour, Bal Harbour, Fla. Call Customer Support (312) 938-3500.

**5 Southeast Texas Chapter, Testing Session.** BCT/E and Installer Certification exams to be administered. Location: Walden, Texas. Call Richard Grahn (713) 579-6319.

**5 Southeast Texas SCTE Chapter, Testing Session.** Location: Houston, Texas. Call Richard Grahn (713) 579-6319.

**5-6 Interactive Broadband Delivery System Overview,** produced by Scientific-Atlanta Institute. Location: San Antonio. Call Bridget Lanham (800) 722-2009, press 3.

**6 Delaware Valley SCTE Chapter, Technical Seminar.** Topic: Advanced systems and competitive access. Location: Williamson's Restaurant,

**January 8-10 SCTE Conference on Emerging Technologies.** Location: San Francisco, Calif. Call SCTE headquarters at (610) 363-6888.

**February 14-15 Sixth Annual Northern California Vendors Day.** Location: Holiday Inn, Fairfield, Calif. Call Steve Allen (916) 786-1610.

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**6 Smokey Mountain SCTE Chapter, Technical Seminar and Testing Session.** Topic: Cable Technology Expo '95 (Vendor Show). BCT/E certification exams to be administered. Location: Quality Inn, Johnson City, Tenn. Call Roy Tester (615) 878-5502.

**6-8 Hybrid Fiber/Coax Operation & Maintenance,** produced by Scientific-Atlanta Institute. Location: Atlanta, Ga. Call Bridget Lanham (800) 722-2009, press 3, to register or for information.

**7 New England SCTE Chapter, Technical Seminar.** Topic: Convertors—current and future

compatibility, with representatives from Scientific-Atlanta, General Instrument and Prevue. Location: Best Western Motel, Marlboro, Mass. Call Tom Garcia (508) 562-1675.

**7-8 Utility Industry Handheld and PDA Forum.** Location: San Francisco, Calif. Call World Market Strategies (415) 252-8008.

**11-13 Fifth Annual Safety & Training Conferences & Exhibition.** Location: Inverness Hotel and Golf Club, Denver, Colo. Call Gary (303) 393-7449, ext. 225.

**12-15 Antec Fiberworks Digital Networks Training (DNT).** Location: Denver, Colo. Call Karen Olheiser (800) FIBER-ME.

**13 Heart of America SCTE Chapter, Testing Session.** BCT/E certification exams to be administered. Location: Kansas City, Mo. Call David Clark (913) 599-5900.

**13 Miss/Lou SCTE Chapter, Technical Seminar.** Location: Ramada Inn, Slidell, La. Call Austine Matthews (601) 374-5904.

**13-14 Building the Optimum Business Model: Telecommunications Providing Internet Access and Services.** Produced by ICM Conferences

Inc. Location: The Sheraton Hotel, Washington, D.C. Call Pam Watson (312) 540-3856.

**14 Mount Rainier SCTE Chapter, Testing Session.** BCT/E certification exams to be administered. Location: Viacom, Everett, Wash. Call Bruce Gladner (206) 869-4116.

**14 SCTE Satellite Tele-Seminar Program.** Topic: Fault location in fiber optic and coaxial cables (part II) from Expo '94 in St. Louis. To be transmitted on Galaxy 1R, Transponder 14, 2:30-3:30 p.m. eastern time. Call SCTE national headquarters (610) 363-6888.

**14 Northern New England SCTE Chapter, Technical Seminar.** Topic: Telephony/head-ends, with speaker TBA. Location: Ramada Inn, Portland, Maine. Call Bill DeRochers (207) 646-2672.

**14 Central Florida SCTE Chapter, Technical Seminar.** Location: Sheraton Inn East, Tampa, Fla. Call Pam Kernodle (813) 371-3444.

**18-19 Antec Fiberworks Compressed Video: Concepts and Transmission (CVCT).** Location: Denver, Colo. Call Karen Olheiser at (800) FIBER-ME.

**29 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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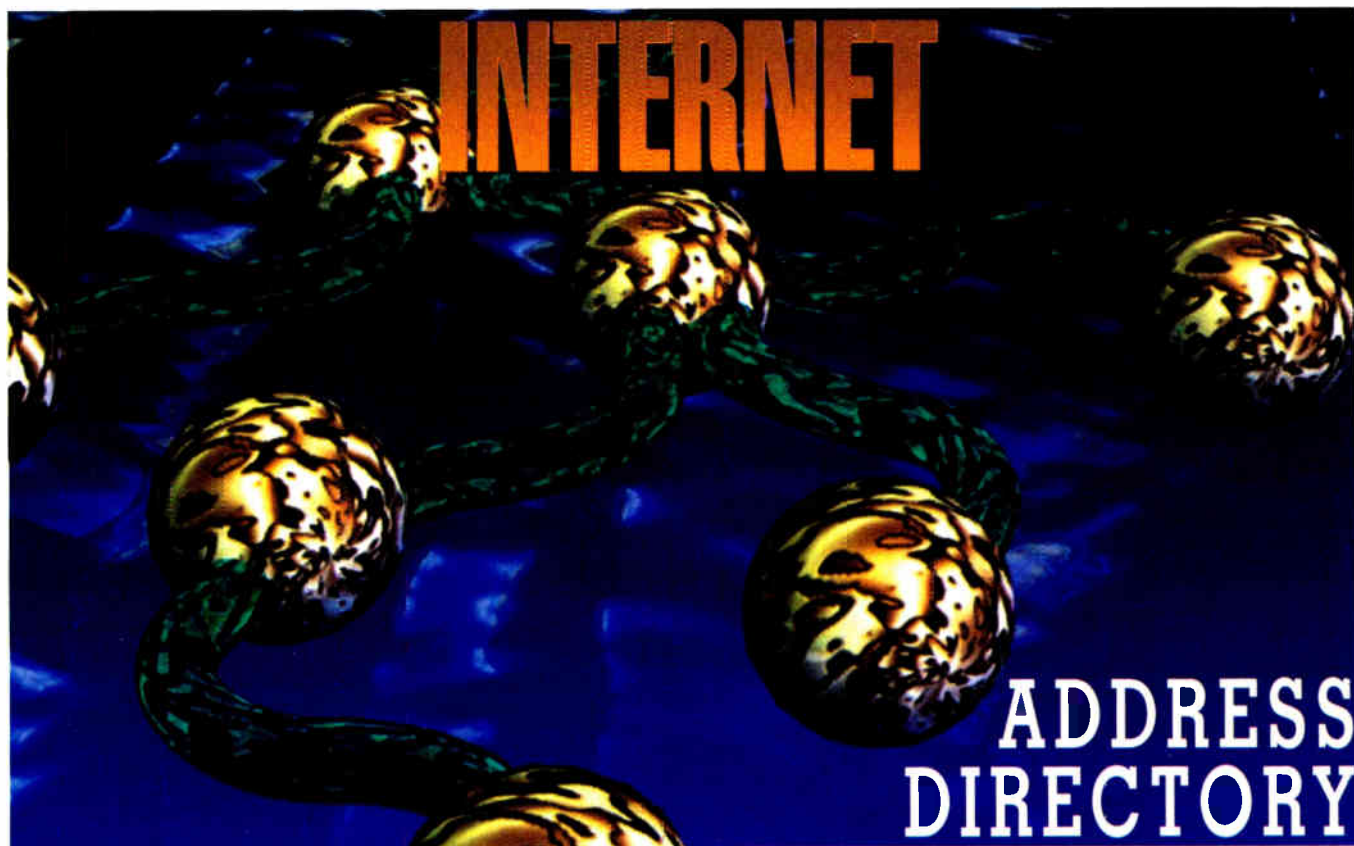
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CED magazine is not responsible for any omissions or any inaccuracies.



# People on the move

Zenith Electronics Corp.'s board of directors has named **William Luehrs** as president of the Zenith Network Systems Division.



**William Luehrs**

Luehrs is responsible for all aspects of Zenith's business that are related to set-top boxes, cable modems and related equipment. With overall P&L responsibility for the division, he oversees its engineering and research, sales and marketing, and purchasing and manufacturing activities. Luehrs joined the company in November 1994 as corporate vice president, Zenith Electronics Corp., and senior vice president for Zenith Network Systems.

**Scientific-Atlanta Inc.** has named **Donald Upton** as president of the new Worldwide



**Donald Upton**

Service Organization reporting to **Larry Enterline**, president of the International Division for the Broadband Communications Group. Upton is the former president of the company's Private Networks Division responsible for sales, service and system integration.

**Thomas Richards** has joined **Ameritech** as president of its network services unit. Richards replaces **Gary Drook**, who has retired. Previously, Richards was vice president of network operations for Bell Atlantic. In his new position, he heads the unit responsible for managing and operating Ameritech's five-state communications network and for providing related technical and operations support.

**Randy Lintecum** has been promoted to president and general manager of U.S. Computer Services subsidiary **International Billing Services**. IBS currently produces over 33 million cable bills for USCS subsidiary CableData. Lintecum was previously senior vice president of marketing and business development for USCS. In his new role, he will oversee all of IBS' operations, including production, sales, customer service, finance, postal relations, engineering and development.

**IFR Systems Inc.** has named **Fred Arnold** as chief operations officer. He now oversees strategic and tactical planning, marketing and

new product development. Arnold has more than 20 years of experience in operations and general management. He has served as president and CEO of Dorne and Margolin/CHU Technology and ANCOM Electromagnetique.

**Pioneer New Media Technologies** has appointed **David Nicholas** as senior vice president for sales. Nicholas will manage the previously separate sales teams for Pioneer's cable, broadcast, multimedia and optical storage product lines. Nicholas had previously served the company as senior vice president of its cable and display groups.

**Belden Wire & Cable Company** has



**Stephen Lampen**

appointed **Stephen Lampen** to the newly-created position of technology development manager.

**Hughes Communications Inc.** (HCI) has announced several organizational changes. **Hal**

**McDonnell** has been promoted to executive vice president and a member of the HCI executive office. McDonnell was previously senior vice president of HCI's systems engineering and technology unit, a position he maintains in an acting capacity. **Carson Agnew** has been named vice president of the newly-formed business development unit. In addition to developing business strategies for HCI, Agnew will evaluate technology for commercial applications and assess the potential for joint venture, acquisition and merger opportunities.

**ADC Telecommunications Inc.** has named **Lakshmi Raman** as director of network management for its Access Platforms Systems Division. In her new position, Raman heads the network management engineering organization responsible for ADC's Homeworx hybrid fiber/coax access platform. Before joining ADC, Raman was the director of network operations protocols and standards for Bellcore. She sits on standards boards for Open Systems Interconnection (OSI) and Common Management Information Service Element (CMISE) development.

**Rod Cormier** has been appointed manager of the test department at **Fiber Options Inc.** Cormier moves into the position to administrate the interdepartmental liaison work and expansion for the test department.

**Newlin Warden** has been named the new international sales manager at **Standard Communications Corp.**'s Satellite and Broadband Products Division. Before joining Standard, Warden served as director/national sales for an industrial products division of Pioneer Electronics. In his new position, Warden is heading up international sales and marketing, including establishing new overseas markets.

**Brian Boyd** has been named to the position of Internet services coordinator for United Video Satellite Group Inc. Boyd is responsible for coordinating and developing Internet and World Wide Web applications throughout the UVSG companies, including Prevue Networks, SpaceCom Systems, Superstar Satellite Entertainment, UVTV and SSDS. Boyd was promoted to his new position from another UVSG company, SpaceCom Systems, where he was project manager.

**Telstra Corp.** has named **William Costa** as the new vice president of its U.S. corporate sales and marketing division. Costa was promoted from the position of regional manager, where he was responsible for generating new business and overseeing account activities for Telstra's existing multinational customers in the greater New York area.

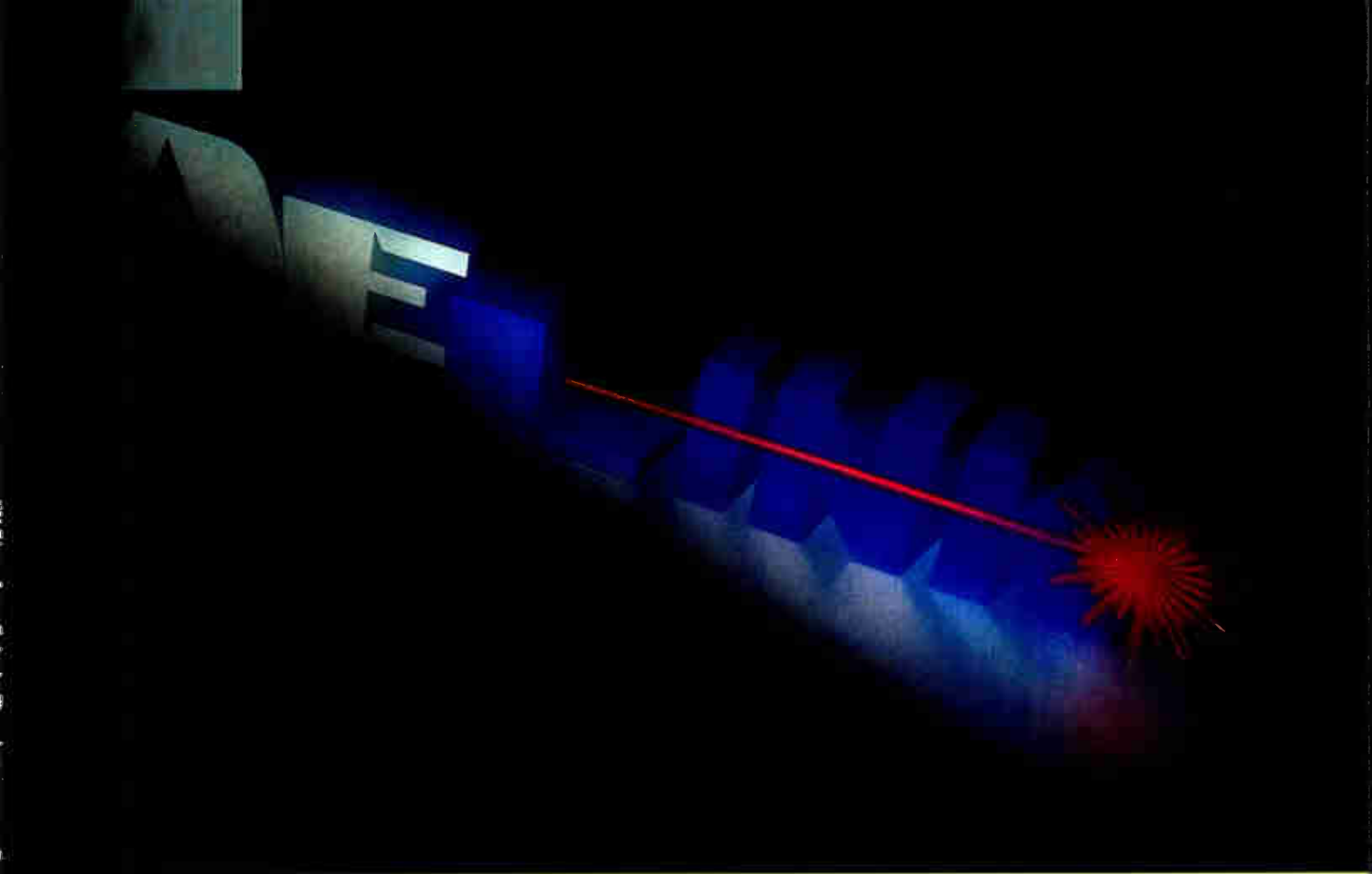
**Digital Video**, a division of Antec Corp., has announced the appointments of **Dennis Campo**, **Dave Allen**, **Nancy Cramer** and **Charles Almand** to the organization. Campo, who has been appointed vice president of sales, was president of Marketing Source Ltd. before joining



**Charles Almand**

Digital Video. Dave Allen has joined Digital Video as regional sales manager for the company's southeast territory. He previously served as vice president of sales for Salt Lake City-based SkyConnect Ad Systems, responsible for the company's commercial insertion hardware products. As product manager/general manager, programming services, Cramer is responsible for new business development for Digital Video's program provider market. She previously served as vice president, sales and marketing for New York City-based Personal Network Partners. And Charles Almand brings more than 13 years of experience in the telecom industry to his position as product marketing manager responsible for business development for Digital Video's telephony market. Almand most recently served as business manager for AT&T Tridom, with the responsibility for private video network products and services. 





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### **C-COR to supply StarVision newbuild**

STATE COLLEGE, Pa.—C-COR Electronics Inc. will supply RF and AM fiber optic equipment to StarVision Cable for a 1,000 mile newbuild in Clinton, N.C. Construction, which is underway, is slated to be completed in about three years. At that time, the operator plans to deploy a personal communications system.

StarVision is owned by Star Telephone Membership Corp., the telephone cooperative in the area. The equipment is being purchased through a distributor, Communications Supply Service Association (CSSA).

### **GI will sell to Indian market**

CHICAGO—General Instrument Corp. has signed a memorandum of understanding with HCL Corp. to enter into an India-based joint venture agreement to manufacture and sell broadband communications equipment in the Indian market. Products include cable set-tops, RF and fiber optic distribution equipment and headend electronics. The venture is expected to generate \$300 million in revenue by the fifth year of operation.

“General Instrument and HCL will establish the capability in India to design, manufacture and distribute broadband communications products as well as provide technical support to meet the needs of the Indian market,” said Richard Friedland, CEO of General Instrument, in a prepared statement.

India’s cable subscriber base is expected to pass 50 million by 2000. Nearly 80 percent of India’s installed base of television sets presently have the capability to tune 12 channels or fewer, and there are virtually no set-tops in the market.

Pending Indian government approvals, GI and HCL plan for the venture to commence operation in early 1996, with manufacturing operations expected to begin by the end of that year. HCL is a \$430 million transnational group with interests in computers, networking, office automation equipment, computer education and software services.

### **Lasertron wins big AT&T order**

BURLINGTON, Mass.—Lasertron has announced a multi-million dollar contract with AT&T Network Systems in Andover, Mass. to supply 980-nm pump lasers over a period of 18 months. Initial product shipments have already begun and will be used in AT&T’s Next Generation Lightwave Network (NGLN) program. The pump lasers will be used to drive AT&T erbium-doped fiber amplifiers (EDFAs). EDFAs are used to boost light signals over fiber optic telecom lines without first converting them to electronic pulses, further increasing network reliability.

### **Zenith enters Malaysian pay TV market**

GLENVIEW, Ill.—Zenith Electronics Corp. has announced plans to supply wireless addressable set-top decoders to Malaysian cable operator Mega TV.

According to Shamsul Khalid Ismail, CEO of Mega TV, Malaysia’s exclusive pay TV provider, Zenith will be the sole decoder source for the multi-year project, which could reach nearly 3.6 million TV households, when completed.

The first Malaysian deployment will utilize Zenith’s wireless technology in the city of Kuala Lumpur. Another roll out in three other Malaysian markets will follow soon afterward. Zenith plans to supply 100,000 set-top decoders in the balance of 1995, and another 100,000 during 1996, according to Bryan Ollila, vice president of sales, Zenith Network Systems.

Zenith Electronics Corp. also announced that it has produced its 10 millionth set-top decoder at its plant in Chihuahua, Mexico.

Al Moschner, Zenith Electronics Corp. president and CEO; Bill Luehrs, president, Zenith Network Systems; and Eduardo Solis, director of manufacturing, Zenith Network Systems, were all on hand to witness the milestone.

Enrique Terrazas, director of economic development for the state of Chihuahua, was presented with the decoder.

### **Corning beefs up fiber production**

CORNING, N.Y.—Corning Inc. will add \$100 million to a previously-announced expansion of its optical fiber manufacturing facility, for a total investment of \$250 million.

The decision was made in order to keep pace with the growth in worldwide fiber demand that has occurred during the past year, according to Robert Forrest, senior vice president and general manager of Corning’s Telecommunications Products Division.

Overall, Corning expects to increase its fiber-making capability by more than 75 percent over the next three years. Fiber production will increase throughout 1995 and ’96, fueled by manufacturing process enhancements. The most significant portion of the capacity increase will begin in mid-1997 and will be fully on-line in 1998 as the result of investments in equipment upgrades and new equipment.

In related news, the Telecommunications Products Division of Corning Inc. has been awarded the Malcolm Baldrige National Quality Award for excellence in quality management in the large manufacturing category.

The Commerce Department’s National Institute of Standards and Technology manages the annual award, which is named for the late Commerce Secretary Malcolm Baldrige and was first made in 1988.

Corning formed its Telecommunications Products Division (TPD) in 1983 to commercialize the optical-fiber product and process technology the company first developed in 1970.

U.S. companies applying for the Baldrige Award are judged by a board of examiners on seven quality-management criteria: leadership, information and analysis, strategic planning, human resource development and management, process management, business results and customer focus and satisfaction.

### **Trilithic signs Mega Hertz as rep**

INDIANAPOLIS, Ind.—Trilithic Inc. has signed Mega Hertz to be sole sales representative for Trilithic broadband instruments in the states of Colorado, Iowa, Kansas, Missouri, Nebraska, New Mexico and Wyoming. Mega Hertz’ home office is located in Englewood, Colo. and may be reached by calling (800) 525-8386, or (303) 779-1717; fax (303) 779-1749.

### **Reliance Comm/Tec now RELTEC**

CLEVELAND, Ohio—Reliance Comm/Tec Corp. has been renamed: the company’s new moniker is RELTEC Corp.

Reliance Comm/Tec was recently sold by Rockwell International Corp. to K-Tec Holdings, an affiliate of Kohlberg Kravis Roberts & Co., following Rockwell’s acquisition of the former Reliance Comm/Tec parent, Reliance Electric Co., in January. RELTEC Corp. is now an independent, privately-held firm focused exclusively on the worldwide communications industry.

### **S-A to support Scarlet for Games**

ATLANTA—Scientific-Atlanta will provide advanced video processing and transmission equipment to support the Scarlet video distribution network for the 1996 Olympic Games.

As the Official Broadband Television Distribution Systems Sponsor, S-A will supply the system that provides broadband video to competitive venues and Olympic Committee sites including the Olympic Village and the International Olympic headquarters hotel. The video distribution system will incorporate a broadband network that includes digital video compression encoders and decoders, modulators, broadband integrated gateways, advanced analog Home Communications Terminals and fiber optic and coaxial cable distribution systems.

S-A will provide video distribution systems and more than 6,600 advanced analog 8600X Home Communications Terminals to control 10,000 television monitors supplied by Panasonic, according to Dr. H. Allen Ecker,



# R...CED

# Just What The Doctor Ordered

*Ted Hartson*

Ted E. Hartson  
Alias "Dr. Strangereak"  
Vice President &  
Chief Engineer  
Post-Newsweek Cable

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BROADBAND COMMUNICATIONS



chief technical officer at Scientific-Atlanta. The system also includes MPEG 2 digital encoders, analog and digital headend equipment, S-A's digital Broadband Integrated Gateways, and RF and fiber optics electronics equipment.

In other news, Scientific-Atlanta has shipped its 500th headend system for the delivery of the Sega Channel. The Sega Channel is utilizing headend equipment and in-home adapters designed and manufactured by S-A. Cable operators use the Scientific-Atlanta equipment to offer subscribers a variety of different Sega Genesis video games, as well as game play tips, news, contests and promotions. Customers include Time Warner Cable, Tele-Communications Inc., Jones Intercable, Post Newsweek, Falcon Cable and Continental Cablevision.

Utilizing a satellite transmission system, the Sega Channel is delivered to the operator's headend, where a specially-designed S-A receiver and modulation system re-transmits the signals over the broadband network.

And finally, Scientific-Atlanta also announced that the New York Racing Association (NYRA) has chosen its digital video compression equipment to enable the horse racing broadcaster to expand its live simulcast program offering to a second channel, to better support New York State off track betting.

### **Siecor adds to training capabilities**

HICKORY, N.C.—Siecor Corp. has announced the opening of its new West Coast training facility, located in Santa Ana, Calif. The center is part of the company's network of training sites, including numerous regional and two other permanent facilities—Hickory, N.C. and Keller, Texas.

The new, 1,500 square-foot center will house a state-of-the-art training room and a completely-equipped product demonstration room. The new building was designed specifically for hands-on fiber optic training, according to Scott Andrus, Siecor training supervisor, and includes unique features such as 6,000 feet of fiber optic cable for training, and hardware racks for a complete system mock-up.

"The training room is set up to allow our customers to build an entire passive fiber optic system, just as it would be done in the field," according to Andrus. Courses for Siecor's training program are taught by the company's engineers and technicians, who rotate between the classroom and the field.

### **Augat Photon Systems receives award**

MANSFIELD, Mass.—Augat Photon Systems Inc. has won the Canada Awards for Excellence in the category of Innovation.

Augat Photon was chosen for its achievement in the design, manufacture and installation of

## **SCTE announces Emerging Tech program details**

*The Society of Cable Telecommunications Engineers (SCTE) has released the program for its upcoming and highly successful Conference on Emerging Technologies, which will take place Jan. 8-10, 1996, in San Francisco.*

*Predictably, the conference will focus on four major themes that are occupying the thoughts of many broadband engineers: system reliability, data communications, telecommunications and digital TV.*

*Panel discussions get underway on January 9, beginning at 9 a.m.*

*Presentations will include:*

- ✓ "HFC network availability—The real world" by Jim Farmer of Antec and Tony Werner of TCI;
  - ✓ "Evolution of HFC networks to a high-reliability, full-service network" by Raja Natarajan and Paul Vilmur of Motorola;
  - ✓ "Integrating residential telephony into the HFC network" by Andy Paff of Antec;
  - ✓ "Analysis of the capital, operating cost and reliability effects of choices in network powering" by David Large of Media Connections Group;
  - ✓ "Alternate power sources for telecommunications applications" by Peter LeBlanc of SatCon Technology; and
  - ✓ "Monitoring HFC network devices" by Brett Price of Superior Electronics.
- On Tuesday afternoon, the focus shifts to implementation of telecom networks and services. Presentations include:*
- ✓ "Cable telecommunications services business perspectives" by John Harrison of Sprint Telecommunications Venture and Ken Wright of Intermedia Partners;
  - ✓ "Modeling new service payback" by Carl Podlesny of Scientific-Atlanta;
  - ✓ "Home education and telecommuting services implementation" by Don Sawyer of Bell Northern Research;
  - ✓ "Customer premises equipment—beyond set-tops" by Shawn Hayes of Digital Video;
  - ✓ "Two-way cable plant telephony and data experience" by Tony Werner of TCI, Jim Farmer of Antec, Paul Gemme of Time Warner, Charles Cerino of Comcast and Mark Millett of Cox Communications;
  - ✓ "Cable telecommunication digital transmission techniques" by Jack Terry of Nortel; Edward Granger, Charles Anderson and Lawrence Wang of ESP;

*and Kenneth Williams of Cox Communications; and*

✓ "ATM in MPEG-2 transport—or vice versa?" by Itzhak Gurantz of Comstream Corp., Mike Maslaney of Digital Video and Adrian Jones of Nortel.

*On Wednesday, the focus turns to data:*

- ✓ "Considerations for deploying packet switched data services on broadband HFC networks: An overview of frame relay and SMDS" by Gaylord Hart of XEL;
  - ✓ "Broadband data—More than a cable modem" by Ilja Bedner and Daniel Pitt of Hewlett-Packard;
  - ✓ "HFC return system: Management of subscriber induced noise" by Bob Chamberlain, Brian Johanson and Aravanan Gurusami of Philips;
  - ✓ "Broadband interactive networks for full digital services" by William Beck, David Brown and Dean Stoneback of GI;
  - ✓ "Field evaluation of reverse band channel impairments" by Majid Chelehemal, Richard Prodan and Tom Williams of CableLabs; and
  - ✓ "The design and operation of the reverse path" by Henry Kallina of Broadband Engineering Solutions and Technology.
- The conference's final session focuses on delivering digital video signals over HFC networks, with the following:*
- "An end-to-end digital services delivery system for EPA and VOD" by Thomas duBreuil and Cecil Dean of AT&T Bell Labs and Wilt Hildenbrand of Cablevision Systems;
  - "End-to-end integration and delivery of MPEG-2 digital video in an HFC environment" by Keith Bechard and Jim Wood of US West Technologies;
  - "Overcoming problems in the CATV return path" by John Barsellotti and Brian Langlais of West End Systems;
  - "Performance of multichannel AM/256-QAM video transmission systems for HFC" by Hongxing Dai, Chinton Lin and Shlomo Ovadia of Bellcore;
  - "Employing the OFDM technique in hybrid multichannel analog/digital transmission over the HFC network" by Qun Shi of Panasonic Technologies; and
  - "Using frequency domain digital techniques for de-ghosting and demodulating VSB transmission" by CableLabs.



# FIBER OPTICS

## MOORE MAKES IT AS EASY AS 1-2-3!

**1. INSTALLATION** Moore puts the proper tools in your hands right from the start for the installation of fiber optic cable.



For example the popular OptiRack, which provides for figure-8 looping of slack cable for aerial installation. The bend radius of this aluminum slack rack maintains the integrity of your cable. It's another way Moore ensures trouble-free performance right on down the line.



## 2. MANAGEMENT

At the heart of any cable network are its fiber nodes, and here again, Moore takes quality to heart. Our Fiber Node Cabinet combines easy access doors with a multi-point locking system for security. Rugged 12 gauge frame construction and a tough exterior polyester paint system stand up to any weather conditions. Universal Vertical Mounting Rods let you quickly install any brand amplifier or splice enclosure with strand mounting brackets. You can store up to 300 feet of cable for future deployment. Finally, a management concept you can rely on.



**3. STORAGE** Building a reliable fiber optic network requires equipment that is durable, safe and easily accessible. The Moore Surface Entry OptiVault offers a cost-efficient alternative to buried concrete chambers. Light enough to be installed by hand, yet durable enough to last for centuries, the OptiVault provides an excellent below grade, surface access chamber for storage of up to 800 feet of cable. Flexible design, in-field assembly, watertight fittings, and fiber storage racks make this unit an installers dream, and proof that Moore continues to build quality from the ground up.

# MOORE

*With innovative solutions like these, it's no wonder so many companies turn to Moore for all their fiber optic equipment needs. We offer a full line of durable, high performance products designed to make your job easier. If you count on quality, you can count on us.*

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fiber optic equipment for the telecommunications industry. These awards are Canada's only honors to recognize excellence in both private and public organizations on a national scale.

Recipients of the Canada Awards are selected by an independent panel of private sector experts. The program is sponsored jointly by the National Quality Institute (NQI) and Industry Canada.

### **CSG, Continental sign contract**

ENGLEWOOD, Colo.—CSG Systems Inc. has finalized a contract with Continental Cablevision to provide a convergent customer management system for the operator's expanding array of global services, including cable and telephony.

"Continental Cablevision is the first major customer to purchase our newest product, called CSG Phoenix, through a licensing arrangement that allows Continental or Continental-designated personnel to run the system," according to Dr. George Haddix, president of CSG Systems.

Phoenix offers Object-oriented development that is flexible, reusable, and which can be modular. It runs on a Unix platform and features a three-tiered architecture, graphical user interface presentation logic, transaction processor to capture processes and business rules and a database to manipulate and store data.

Over time, the contract will add more than four million new subscribers to CSG Systems' customer base, which is currently estimated at about 17 million.

### **Applied Signal Technology tapped by TCI**

SUNNYVALE, Calif.—Applied Signal Technology Inc. has been selected by Telecommunications Inc. as a primary supplier of advanced digital test equipment for qualifying and maintaining TCI's 500-channel digital cable network.

Under the terms of the contract, Applied Signal will provide an initial 80 QAMalyzers and related accessories. The QAMalyzer is designed to provide the necessary analysis capability to properly qualify and maintain cable systems carrying 64 QAM digital modulation.

Field techs will have access to a portable unit that can quickly diagnose common cable problems and provide diagnostics to aid in troubleshooting and repair of those problems, according to the company. The technology is made possible through a patented advanced application-specific integrated circuit (ASIC) and patent-pending DSP algorithms.

Applied Signal Technology has been conducting 64 and 256 QAM digital TV field tests since 1993.

### **Prevue, SeaChange ink agreement**

TULSA, Okla.—Prevue Networks Inc. and SeaChange Technology Inc. have finalized a technology exchange and license agreement which signals the next step in Prevue's planned deployment of a digital video file server network, in addition to a strategic alliance which will impact current products and potential future businesses for both Prevue and SeaChange.

The agreement means that both companies will work closely on the development of new products, applications and services in their respective areas of expertise.

The server network, which was announced last year, will transform Prevue's existing 3,500 site distribution infrastructure into a digital platform capable of delivering current services such as Prevue Channel and Sneak Prevue, interactive services and other services in development.

### **Singlemode market to hit \$3.1 billion**

NEWPORT, Rhode Island—The worldwide market for singlemode optoelectronic devices will grow at a compound annual growth rate of 22 percent from 1994 to the year 2000, according to a new study from KMI Corp., "Worldwide Markets for Fiber Optic Singlemode Transmitter and Receiver Components."

Strong growth in demand for transmission equipment by cable TV, telecom and other networks is driving the market for transmitter and receiver devices, according to Richard Mack, who directed the research.

The market is expected to grow to \$3.1 billion in the year 2000. The projection includes markets for all communications sources used with singlemode fiber, such as ELEDs, Fabry-Perot lasers, distributed feedback lasers and hybrid transmit modules, as well as corresponding detector and receiver products.

The figure also includes duplex transceiver modules, lasers used to pump gain media in doped fiber amplifiers, lasers and detectors used in instrumentation, and devices used in research and development.

### **Primestar wins Emmy**

NEW YORK, N.Y.—Primestar Partners has been honored with an Emmy Award for Outstanding Achievement in Technological Development in the category of "Pioneering Development of Direct-To-Home Digital Satellite Broadcasting."

The Primestar partners are Comcast Cable, Continental Cablevision, Cox Cable Communications, Newhouse Broadcasting, Telecommunications Inc., Time Warner Cable and G.E. American Communications Inc.

### **EAS passes second round of tests**

SANTA CLARA, Calif.—The Emergency Alert System (EAS) mandated by the FCC to replace the Emergency Broadcast System (EBS) has successfully completed a second round of tests, held in California. The tests proved that EAS works not only with television and radio, but also with cable video systems.

EAS is a digital technology, specified by the FCC, that will alert the public to natural and manmade disasters. The technology allows broadcasters and cable operators to either issue or pass through alerts, according to the geographic area of the reported disaster. The latest EAS test was conducted in San Francisco, between KCBS-FM and Viacom's Castro Valley cable system.

### **CableData makes pact with Tandem**

RANCHO CORDOVA, Calif.—CableData Inc. has reached an agreement with Tandem Computers Inc. to port CableData's Intelecable to Tandem's Integrity NR and Non Stop Kernel platforms. Intelecable, a transaction management system designed specifically to support converged telephony and cable operations, is currently available only on the IBM AIX platform.

Tandem's Integrity NR platform features a range of integrated, scalable servers running on the Unix operating system. Non Stop Kernel is the foundation software that enables Unix personality and other standard interfaces to have access to the Tandem fundamentals of scalability and reliability.

CableData expects to begin a beta test of Intelecable on the Integrity NR platform in the fourth quarter of 1995, with a general release in the first quarter of '96. Beta testing for the OSS/NSK platform is planned for mid-1996.

### **Motorola picks Ortel's linear fiber optics**

ALHAMBRA, Calif.—Ortel Corp. has been selected by Motorola to supply fiber optic products for use in the latter's INReach in-building wireless system. Ortel's Series 5800 in-building fiber optic antennas will be used in the Motorola INReach system, which enables cellular telephone coverage indoors. INReach enables a person to use a cellular phone to place and receive calls throughout a building or a campus-like setting.

### **Pioneer supplies set-tops to Time Warner**

LONG BEACH, Calif.—Pioneer New Media Technologies announced a contract with Time Warner Cable to supply 85,000 advanced capability home terminals over a two-year period. Time Warner will install the BA-6310CA version of Pioneer's BA-6000 Series addressable home terminal units in homes in the Houston area to provide subs with enhanced TV viewing and recording capabilities. **CED**





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## Uncooled return path DFB lasers

ALHAMBRA, Calif.—Ortel Corp. has announced further details on its new product line for return path applications.

The Model 1650A and 1651A lasers for return path links are uncooled DFB lasers. They use a proprietary new high-temperature DFB chip design which minimizes the variation in chip performance over wide temperature ranges that are encountered in standard chip designs. This eliminates the need for internal thermoelectric coolers, which dramatically reduces the size of the package. The result is a DFB laser module that can be manufactured at high volume and low cost.

The Model 1650A is a receptacle-style package with a DFB laser designed for data signals such as telephony and high-speed modems. The Model 1651A adds a low-cost optical isolator, providing a significant performance advantage for operators who wish to provide upstream AM video signal transmission in their networks. Each product provides up to 250 MHz of bandwidth, enabling the use of "frequency stacking" architectures.

Circle Reader Service number 121

## Fiber optic monitoring

CONOVER, N.C.—Norscan Inc. has introduced the 2000 CMS, which monitors outside plant fiber optic cable and splice enclosures for damage, security and moisture ingress. Operating over the cable armor, Norscan's system is able to monitor 1,000 cable kilometers and more than 7,000 splice enclosures.

Alarms and routine status reports are sent over the DDD network to maintenance centers with precise damage location information. Remote control and outside plant data retrieval are available via computer modem. The system consists of a central office terminal and coded sensor units at each enclosure.

Circle Reader Service number 122

## Power supply upgrades

ROSWELL, Ga.—Performance Cable TV Products has announced a new series of power supplies designed to simplify the transition from 60 volts to 90 volts.

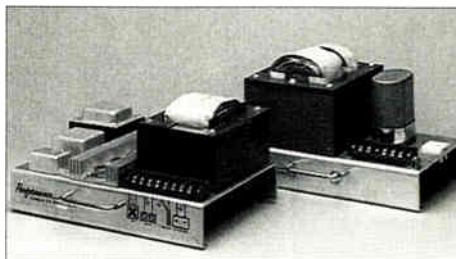
The company's new Flexi-Power power supplies consist of an inverter and a ferro, configured with triple output taps so that the user may select either 60, 72 or 90 volts RMS. The power supplies will work with present-day 60 volt systems and can then be



## Network management system

switched to a higher voltage later on. An intermediate voltage of 72 volts is offered as a safer alternative to 90 volts, which is a continuing topic of controversy, according to the company.

The power supplies have an output rating of 960 VA and are specifically designed to operate into highly capacitive power factor



Power supply upgrades to 90 volts

loads without tripping the power line circuit breaker during transfer. Performance inverters all feature a unique pulsating battery charger that ensures that batteries will last four or more years. The "Flexi-verter" multiple output inverter operates in tandem with the "Flexi-ferro." The standby unit operates from 24 volts and has exceptionally long

standby time due to the efficiency of the advanced design inverter and the increased life expectancy of the batteries.

Circle Reader Service number 123

## Heat shrinkable products

MENLO PARK, Calif.—A family of heat-shrinkable tubing and molded part products is now available from Raychem Corp. for providing sealing and strain relief to wire and cable terminations at the back end of connectors and switches.

The connector sealing products are designed for the most common connector types used in the communications market: those are cylindrical, coaxial and fiber optic connectors. The product family provides solutions that can be installed in a one-step process.

Technicians would place heat-shrinkable tubing or molded shapes in position over the termination of wire or cable to the connector or switch. When heat is applied, the tubing or molded shape shrinks, conforming to whatever objects are contained within its walls. The inner adhesive layer melts and flows, providing a seal and additional strain relief.

Circle Reader Service number 124



### **AppliedView, a network management system**

DUBLIN, Ohio—Applied Innovation Inc. has introduced AppliedView, a network management tool for the connections between operational support systems and network elements.

AppliedView is an open standards-based management system for the AISwitch. The management system's graphical user interface (GUI) is based on OSF/Motif. Because it is based on Hewlett-Packard's OpenView, the same platform may be used to manage other data comm networks. AppliedView may be used as a platform for telecommunications management network (TMS) and the element manager layer (EML) functions in support of providing efficient telecommunications services.

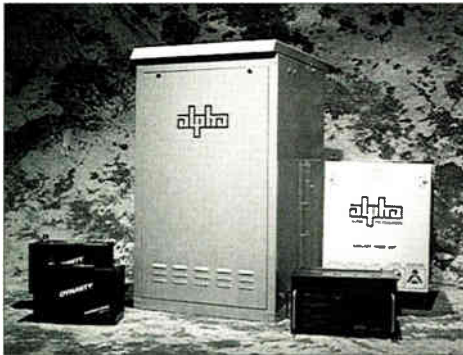
Whether from a control station or a remote PC or laptop, staff can ascertain status—through color-coded reports—of connections between various AISwitches as well as connections between AISwitches and NEs or OSS. Network alarm conditions are immediately displayed on the administrator's screen and predetermined responses can be launched.

Circle Reader Service number 120

### **Broadband power systems**

BELLINGHAM, Wash.—Alpha Technologies has introduced a complete line of Broadband Power Systems, the BPS Series, for use in combined and full-service broadband applications.

The fundamental design premise for the



**The CPS Series**

series is modularity. Equipped with programmable output voltage levels, the BPS series allows the use of 90, 75 or 60-volt output. With input from many customers, Alpha has developed a menu of power system components that can be used as functional blocks. System engineers can create a custom powering solution

through a process of selecting the appropriate component blocks, then fitting them into one of several enclosure configurations.

Also new from Alpha is the CPS Series—expandable UPS systems for cable television and broadband communications networks. Designed for local powering of HFC nodes, CPS provides powering flexibility.

The standard CPS configuration consists of a single power supply module and battery string. By adding an additional power supply module, the overall capacity can be expanded to more than 3KW.

Circle Reader Service number 125

### **QPSK modem**

PHOENIX, Ariz.—RF Networks Inc. has announced the availability of its high-speed QPSK modem, the RF Networks Model 5750 Frequency Agile Broadband Coaxial Cable Modem. Frequency agility over the 5-750 MHz range, data rates to 10 Mbps and a range of data interfaces provide the flexibility to meet varying customer needs.

The Model 5750 is ideal for LAN interconnect as well as telephone (T-1) bypass, compressed video distribution and high-speed computer links. Frequency agility allows the Model 5750 to operate in high frequency channels or between existing signals. Signals are spectrally limited to coexist with other signals for transmission over broadband coaxial cable, wideband microwave and modulated fiber optic cable.

Data rates can be easily changed through field exchange of a small daughter board and configuration switch settings providing customers with a convenient growth path. Early shipments have begun to both U.S. and European customers.

Circle Reader Service number 126

### **Signal level meter**

INDIANAPOLIS, Ind.—Wavetek Corp. has introduced the Interceptor CLI-1450, a combination leakage detection and signal level meter.

The CLI-1450 incorporates a highly sensitive leakage detection mode and MicroStealth measurement technology. It's a lightweight, handheld meter which still incorporates all of the features of the MicroStealth Signal Level Meters, including; multi-channel measurement displays, a Go/No-Go Quick Check function (ensures FCC compliance and reduces subscriber call-backs) and an easy-to-read, high resolution LCD. The unit can also be used by leakage crews and with leakage GPS tracking systems. It also provides signal level measure-



**The Interceptor CLI-1450**

ments in cases where repairs are required. In addition, the headend video "tagging" option differentiates leaks in overbuilt systems, increases detection range and limits false alarms.

Wavetek Corp. has also released a new fiber optic power loss measurement converter, the FPC850KIT. The converter, combined with a Wavetek or any brand digital multimeter (DMM) with a DC millivolt range, is a tool for qualifying fiber optic connections and cables easily and conveniently.

The power meter module's output has standard banana-style connectors which directly plug into the DMM's jacks. The module is coded for correct polarity and outputs millivolts directly proportional to dBm. The output is 1 mV per 1 dBm. Because it measures loss, typical readings are negative: for example, -6.8.

The FPC850KIT can be used with any DMM with a  $\pm 100$  or  $\pm 200$  mVDC input range and banana-style input jacks. Higher performance DMMs with a relative measurement mode or differential reading function can be used most effectively as they allow the power losses of the connectors to be zeroed or nulled out.

Circle Reader Service number 127

### **Frequency agile processor**

VENTURA, Calif.—Holland Electronics Corp. has introduced two low-cost agile processors, model HP40 and HP60. The new units feature microprocessor-based controls and a front panel LED channel display for easy operation.

The HPs use SAW filtering to maintain exceptionally clean conversions, as well as a switching power supply for efficient low heat operation with AC inputs between 80-230VAC. The units are available in both 40 and 60 dB outputs respectively and are available from stock with a two-year warranty.

Circle Reader Service number 128

### **Trenchless equipment**

NEWTON, Kan.—StraightLine Manufacturing Inc. has announced another in its series of DirectLine horizontal directional drills. The DL2610 is a self-contained unit, with a 152 hp Cummins diesel providing power to the track drive, drilling fluid delivery system and the

## ◆ NEW PRODUCTS

drill rack's robust thrust and rotary systems.

The DL2610 can be configured with simultaneous drilling fluid delivery and mixing capabilities, allowing for uninterrupted bores. The drill provides 24,900 pounds of thrust, 2,400 ft/pounds of torque and 1,900 psi maxi-



**DL2610 directional drill**

mum drilling fluid pressure delivery. The DL2610 is designed to directionally bore distances of 800-plus feet and pullback 12 inches and under product pipe, dependent upon soil conditions.

Circle Reader Service number 129

## Loop carrier test

MORGAN HILL, Calif.—LoopMate, a loop carrier test system providing a complete solution for testing POTS, special services and ISDN circuits at a Next Generation Digital



**LoopMate loop carrier test system**

Loop Carrier (NGDLC) or DLC facility, is now available from Wiltron Telecom.

The LoopMate family provides a modular solution for testing POTS, specials, ISDN or any combination of these services, in small to large configurations. The family features a space efficient remote unit requiring only one rack mounting space, allowing it to fit into virtually any remote digital terminal.

Circle Reader Service number 130

## Bandpass filter

EAST SYRACUSE, N.Y.—Communications & Energy Corporation Inc. has introduced the Model 4001-BPF(5)-429(6) hyperband cable TV bandpass filter, which suppresses adjacent channel interference in the hyperband.

The filter has a bandwidth of 6 MHz with a pass band insertion loss of 1.0 dB (maximum). Selectivity is typically 20 dB at  $\pm 12$

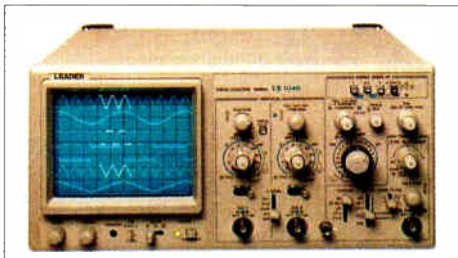
MHz from the center frequency.

Input and output connectors are 75-ohm Type F (female). The unit measures 3 x 4 x 15 inches and weighs five pounds.

Circle Reader Service number 131

## Oscilloscope

HAUPPAUGE, N.Y.—Leader Instruments Corp. has introduced the Model LS 1020, a new 20 MHz dual-trace oscilloscope to meet general-purpose bench and field needs. The unit features a maximum sensitivity in both channels of 0.5 mV per division and a maximum cali-



**The Model LS 1040, delayed sweep oscilloscope**

brated sweep speed of 50 nanoseconds per division.

Also new is the Model LS 1040, a 40 MHz analog oscilloscope added to Leader's line. It features three-channel operation with up to 6 traces on screen in the delayed sweep mode. Sensitivity ranges from 5V/div down to 5 mV/div in 10 steps (to 0.5 mV/div with the X10 magnifier). Bandwidth drops to 5 MHz with the magnifier on. CH 3 only is switch selected to 0.1 or 0.5 V/div.

Vertical modes are CH1, CH2, CHOP, ALT and ADD (subtract with CH2 inverted) and CH3 (TRIPLE).

Circle Reader Service number 132

## Modulator

ATLANTA—Barco has introduced Pulsar, a microprocessor-controlled modulator for cable TV headend applications where high output RF signal quality, remote monitoring and automatic provisioning/alignment are desired. Pulsar modulators feature complete software control capability via an RS-485 interface, providing remote monitoring and control of all modulator functions.

In the event that a lost or degraded signal is detected, software control enables alternative signal routing and remote configuration for back-up modulators to quickly restore programming without the expense or delay of dispatching a technician to the headend.

Pulsar provides both remote and local control. Front panel keys allow direct control of

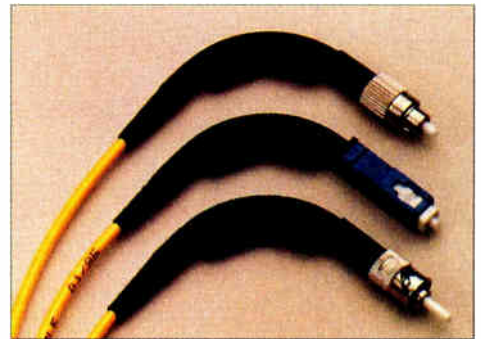
video and audio RF levels, modulation depths, frequency deviation and input switching. When used in conjunction with Barco's FMS 860 headend supervisor, alignment of RF levels can be accomplished automatically.

The modulators are supplied as fixed channel units to provide the highest carrier-to-noise performance. Frequency agile (tunable) versions are also available. Phase Locked Loop (PLL) techniques are employed to assure longterm signal stability.

Circle Reader Service number 133

## Right angle boot

LISLE, Ill.—Amphenol has announced the availability of its new right angle boots for fiber optic cable assemblies. The new boots are designed to increase the reliability of any fiber optic system by ensuring that the mini-



**Right angle boots**

mum bend radius of the cable is not violated.

The design (patent pending) consists of two halves which totally enclose the cable after they are snapped together. These boots are quickly and easily installed and are available for FC, SC or ST connectors.

The right angle boots can be ordered separately, or can be ordered already assembled onto the cable.

Circle Reader Service number 134

## OTDR

UTICA, N.Y.—GN Nettest, Laser Precision Division, has introduced the TD-3486 Optical Time Domain Reflectometer.

The new OTDR incorporates a 486DX processor and a design architecture which permits very fast waveform capture. In addition, FAS, Fiber Analysis Software, ensures accurate, almost instantaneous analysis and display of trace information, according to the company. Users can test, display and print results in many instances, in less than 22 seconds, according to company officials.

The TD3486 retains true, one-button test



capability first introduced in the TD-3000. The unit not only selects pulse width, range and resolution, but also runs FAS and automatically displays each features type, loss, reflectance and distance from the origin, the loss and average loss of each fiber section, and the end of fiber. Dual wavelength testing, printing and results storage, including file naming, are also fully automated so that an entire test suite is done with the push of a single button.

Circle Reader Service number 135

## Mini pulse suppressor

ORISKANY, N.Y.—New to Fiber Instrument Sale's line of manufactured fiber optic products is the FIS Mini Pulse Suppressor.

The pocket-sized pulse suppressor or break



**FIS Mini Pulse Suppressor**

out box is well suited for use as an OTDR launch box or for field troubleshooting. The pulse suppressor holds up to 200 meters of fiber in any core/clad size and is connectorized with a choice of connector styles with PC, Ultra and Angle finishes available. It's designed to be used with the industry's latest OTDRs and measures only 4.5 x 0.875 x 2.75 inches.

Circle Reader Service number 136

## Fiber design

ATLANTA—Cadix International Inc. has launched its new Fiber Design and Management software.

The CX-2001 is a full-featured cable TV design system that totally automates the plant design process, performs engineering analysis and assists in plant maintenance.

The CX-2001 was developed to automate cable TV plant design and analysis. The system automatically calculates signal losses and analyzes each component for design specification compliance as the plant is being designed.

In addition, it only takes one minute to scan a base map which can immediately be used to start a design. The flexibility of the system also allows the designer to perform repetitive "what if" designs that result in optimum plant layout.

The CX-2001 design system operates on a Hewlett-Packard RISC-based workstation. The structure of the system's database manages all the data for a design in one database, regardless of its size or complexity.

Also new from Cadix is the FX-7001 Series for cable management. The FX-7001 delivers decision-making information to all segments of cable and telephone company operations. The user-friendly system removes the traditional barriers caused by differing computer technologies, merges fiber, RF design and analysis data with business application files and provides the tools to manage a new, enterprise-wide relational database.

Circle Reader Service number 137

## Character generators

SASKATOON, Canada—Display Systems International Inc. has announced its enhanced line of Elite character generators, which includes the Elite2000, the TextPro Sr. and the TEBBS (Televised Educational Bulletin Board System).

The TEBBS is designed for small cable companies and in-school display systems. It's a low-cost, text-only system, according to the company, that includes 20 different typing colors, multiple fonts and sizes, 23 page transitions, analog clock display, easy-to-use scheduler and unlimited page capacity.

The TextPro Sr. is designed to meet the needs of medium cable TV and private cable TV companies. The text-only system includes all the features of TEBBS, and in addition, has a horizontal crawl line, remote communications, graphical scheduler and optional local weather display.

The Elite2000 is well-suited for photoadvertising and real estate channels, as well as classified advertising channels.

It has all of the features of the TEBBS and TextPro Sr., and includes advanced features such as graphic page creation, compatibility with .PCX, .BMP and .GIF computer images, sound capture, advanced scheduling, multiple crawl lines and remote communications.

DSI's new products are available as software only, or as full turnkey systems including all hardware and software.

Circle Reader Service number 138

## Pole mounting frame

MANKATO, Minn.—For overhead fiber optic cable installations, Condux International has developed a Pole Mounting Frame for use with fiber optic cable pullers.

The puller attaches to the pole mounting

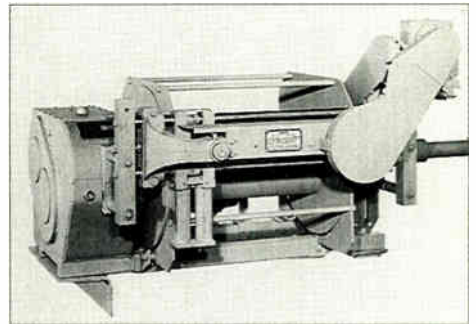
frame, requiring no modifications to the puller. The frame provides a secure mount for the cable puller for both vertical and horizontal applications on wood or steel poles. For added stability, a frame spike is included for insertion into wood poles.

Circle Reader Service number 139

## Winches

TREVOSE, Pa.—General Machine Products Company Inc. has announced two new models in its Adams CD Winch family—the CD3 Continuous Duty Winch and the Adams CD lite Continuous Duty Winch.

The CD3 features a compact design—taking up less than 52 inches of space between cabi-



**Adams CD3 Continuous Duty Winch**

nets—with no sacrifice in capacity. Other advances include a bare drum pulling capacity of 24,000 pounds, 230 ft./min. maximum line speed and a 24-inch drum with a capacity of 1,500 feet of 9/16-inch wire rope.

The Adams CD lite Continuous Duty Winch is computer-designed from the frame up to efficiently handle innerduct and fiber/coax placement. Performance features of the CD lite include 7,400 pounds max. bare drum pull, 2,000-pound top layer line pull and 400 ft./min. maximum line speed (100 rpm @ 24 gpm).

Circle Reader Service number 140

## Fiber testing

VANIER, Quebec—EXFO E.O. Engineering Inc. has introduced the IQ-200 product family, designed to offer flexibility for fiber optic testing in laboratory research and industrial testing.

The IQ-200 system is comprised of the IQ-203 optical test system controlled via Windows application software. The addition of a keyboard, mouse and color monitor give the IQ-203 PC-like characteristics.

Using IQ-206 Expansion Units in a rack-mount format, up to 27 IQ modules can be monitored and controlled simultaneously, such as power meters, laser/LED sources, variable

## ◆ NEW PRODUCTS

attenuators, return loss meters, variable reflectors and optical switches.

Circle Reader Service number 141

### ISDN enhancement

MERIDEN, Conn.—ADC Video Systems Inc. has announced enhancements to its PixlNet Multipoint Videoconferencing System.

The PixlNet system now includes two Integrated Services Digital Network (ISDN) interfaces using a standalone, PC-based device called the Primary Rate Interface controller. Using this device, both Basic Rate Interface (BRI) and Primary Rate Interface (PRI) capabilities with multisession bonding are available. Multisession bonding is a protocol for allowing the transmission of multiple users over a single PRI line, providing efficient bandwidth management.

Additionally, ADC is implementing Non-Facility Associated Signaling (NFAS) and triple BRI interface. Using NFAS allows up to 20 PRI lines to be controlled by a single "D" channel.

The PixlNet system is ADC Video Systems' real-time, interactive multipoint videoconference control system which provides multiple virtual networks for both private and switched network applications. The system provides multipoint video connectivity and real-time conference management to what have traditionally been point-to-point networks.

Circle Reader Service number 142

### ATM switch

HERNDON, Va.—Newbridge Networks has announced Release 3 of the 36150 MainStreet ATMnet Access Switch. The new release adds significant new capabilities and applications to the company's ATM access/edge switch.

Release 3 addresses both end user and service provider ATM needs by enhancing the switch's overall system to make it more robust, as well as adding new interface cards to give end users more capabilities. The new interfaces include FDDI, 4-port Ethernet, 3-port Token Ring, E-1/T-1 ATM, E-3 G.804 (for markets outside North America), T-3 TDM (circuit emulation), OC-3/STM-1 Electrical and SMDS DXI.

Additionally, the new release will facilitate higher quality video through an enhanced version of the existing JPEG video card and the inclusion of JPEG/PAL, for markets outside North America. Specific enhancements for the card include a programmable quality factor and a user selectable option for frame or field discard. These enhancements will ensure consistent video quality for diverse

applications, according to the company.

Altogether, Release 3 of the 36150 MainStreet ATMnet switch will offer users more than 15 interface cards, the largest number of available interfaces on an ATM switch today, says the company.

Circle Reader Service number 143

### Economy network analyzers

MORGAN HILL, Calif.—Anritsu Wiltron has introduced its 54000A Series Scalar Measurement Systems offering low-cost RF models to 1.0 and 3.0 GHz. Microwave models are available to 8.6 GHz and 20 GHz. The analyzers perform traditional transmission and return loss (SWR) measurements for manufacturing applications. A rugged housing allows reliable use in field service applications.

The 54000A offers: low harmonic sources, linearized YIG tuning for stable sweeps, 50 ohm and 75 ohm measurement systems, a small, portable package and 10,000 hour MTBF.

Circle Reader Service number 144

### Singlemode splitter

SYOSSET, N.Y.—Porta Systems Corp. has announced that its line of Aster Products has been expanded to include two new devices which address the special requirements of cable TV networks.

The Asymmetrical Unitary Singlemode 1x3 Splitter is well-suited for application in cable TV architectures. It provides a cost-effective means of dividing transmitted light into three paths with different loss requirements. The unitized construction eliminates the need for concatenating 1x2 components, thereby increasing performance and reliability in the form of low excess loss, stable coupling ratio and superb environmental characteristics, according to the company.

Another device applicable to cable networks is the Optical Amplifier Wavelength Division Multiplexer. This WDM distinguishes itself by providing low insertion loss over the optical bandpass, while maintaining high isolation. The product is ideal for use in 980 nm laser pump systems for erbium-doped fiber optical amplifiers.

Circle Reader Service number 145

### Video codec

RICHARDSON, Texas—The Alcatel 1743 VC video codec (release 2.0) now features up to four encoders or decoders per shelf, bi-directional DS-3, a 4:2:2 serial digital component video interface, two transparent AES/EBU

stereo audio channels or four 20 kHz analog channels, one bi-directional DS-1 interface, an RS-422 remote control interface, a linear time code interface and a basic supervisor.

The Alcatel 1743 VC uses a Discrete Cosine Transform (DCT)-based algorithm to process the high bitrate component (4:2:2/CCIR 601) digital video format into a 45 Mbps stream for transport across the telephony network.

Circle Reader Service number 146

### Field data collection

CORVALLIS, Ore.—PenMetrics has announced a new release of its automated field data collection software package with mapping functionality. FieldNotes 4.0 includes major enhancements in its FieldForms custom form generator, a new one-to-many database capability, and integration with PenMetrics' new FieldNotes Manager product for data management, migration and merging from the office to the field and back again. FieldNotes continues its support of ODBC compliant databases as well as seamless integration with popular GPS receivers.

The new additions to FieldForms simplify custom data entry. FieldForms supports multiple page forms with tabbing to keep data organized. Images associated with specific records can be dynamically linked into the form. Control over the data table setup makes viewing data easier.

Databases can now be linked to multiple drawings or multiple drawing layers, simultaneously. This is essential for large applications that use many different maps but need to keep attributes consolidated in one file. The introduction of the one-to-many feature links database records in a parent database to many records in associated child databases.

In addition, images can be dynamically moved and resized, image registration is interactive with the map and support is provided for retrieving images from TWAIN-compatible digital cameras.

Circle Reader Service number 147

### Digital modulator

MILLERSVILLE, Md.—Gould Fiber Optics has announced the addition of a 10 Gbps digital modulator to its line of distributed products. The 10 Gbps modulator from IOC Ltd. is designed for use within Sonet OC192 and SDH STM64 transmitter systems. This device incorporates many new design concepts and process innovations.

The 10 Gbps modulator combines the advantages of IOC's device stabilization tech-



nology with excellent 50 Ohm impedance matching, low drive voltages (< 4.5 volts) and extinction ratios in excess of 20 dB. The device is housed in a package that is footprint and pin compatible with IOC's 2.5 Gbps modulator.

Circle Reader Service number 148

## Ad insertion system

ANAHEIM, Calif.—At the Western Cable Show, Sony Electronics will introduce new features and benefits to its VideoStore disk-based ad insertion system. The enhancements include options that provide Wide Area Networking (WAN) capability, increase the number of channels to which a VideoStore system can playout, offer the ability to playout commercials at two resolution levels and provide increased video quality through an expansion board that augments horizontal and vertical motion estimation/compensation.

Other newly-announced options for the VideoStore system include embedded clip identification for absolute traffic and billing verification, a dedicated RS-232C port for remote diagnostics and a vertical interval closed caption board.

Sony's VideoStore system is designed to replace tape-based ad insertion and NVOD systems. It can be used to increase the operating efficiency of small cable systems, or to automate the complex feeds of larger interconnects and MSOs through a flexible integrated data network.

The newly-announced enhancements will provide the VideoStore system with: digitally encoded MPEG 2 output via an Ethernet connection, variable compression rates selectable at 5 or 10 Mbps, embedded clip ID numbers for precise trafficking records on aired spots, selectable two or four channel audio, closed caption support, advanced motion estimation/compensation to improve video quality for fast motion sequences, simultaneous two-channel loading into the VideoStore unit, four GPIs per playout channel, a single video/four channel audio channel gen-lockable decoder board, real-time clip exchange between multiple VideoStore systems and a new, cost-effective data tape streamer drive and cassette.

Circle Reader Service number 149

## Digital video ICs

SAN JOSE, Calif.—VLSI Technology Inc. has unveiled three new Digital Video Broadcast (DVB)-compliant ICs for set-top box applications. The VES4143X, an enhanced, variable-rate version of the VES4123 QPSK demodula-

tor chip serves primarily direct broadcast satellite (DBS); the VES4113 64/256 QAM digital demodulator is used primarily in digital cable television (set-top box) applications; and the VES5453X is a forward error-correcting (FEC) digital channel decoder for either digital cable or DBS applications.

Both of the demodulator products, the VES4113 for digital cable, and the VES4143X for satellite systems, are designed to seamlessly interface to the VES5453X FEC channel decoder. This provides the system integrator with one-stop shopping for two critical components in the set-top and also reduces glue logic requirements. Two reference platforms are also available today to provide engineers with real-world design evaluations and speed time to market.

For cable applications, the VES4113 is a fully DVB-compliant digital demodulator for 16, 32, 64, 128 and 256 QAM modulated signals. The device directly interfaces to the bandpass input signal after analog-to-digital conversion and provides demodulated output that is fed directly to the VES5453X FEC channel decoder. The VES4113 requires only a pair of RC filter circuits and a voltage-controlled crystal oscillator (VCXO) to complete the demodulator design. It performs digital downconversion and filtering with a half Nyquist filter DVB-compliant with a roll off factor of 0.15.

Circle Reader Service number 150

## Digital base mapping

DENVER, Colo.—CompuSyst Inc. has announced a new package of "intelligent" digital base mapping and GIS (geographic information system) services designed for the cable telecommunications industry.

CompuSyst utilizes aerial stereoscopic photogrammetry, which allows CAD operators to remotely digitize as-built roads, structures, railroads, hydrological features and aerial utilities.

Using MapInfo, a Windows-based GIS software package, CompuSyst is able to geocode (link database information to geographic map points) and visually display customer data, addresses, actives, power supplies, pole data and many other types of user specific data, on top of or "overlayed" on the digital base map.

Applications for a GIS system using digital base mapping include construction projects, system status monitoring, marketing analysis, dispatch operations, system troubleshooting, routing, monitoring field operations to help assure "on-time guarantee commitments" and others.

Circle Reader Service number 151

## F-Connectors

HARRISBURG, Pa.—The AMP sealed F-connector offers enhanced performance up to 1 GHz and is designed to meet the requirements of Bellcore TA-NWT-001503 (4.3 and 4.4) and SCTE specifications. Connector impedance is 75 ohms nominal with an operating temperature of -40 degrees to +115 degrees Fahrenheit.

There are several versions available in sealed and unsealed styles for indoor and outdoor applications. The sealed version for standard or quad shielded cable uses 0.250/0.250 standard strip dimensions.

The outdoor sealed connector, available in crimp and clamp styles, offers an O-ring interface seal and a grease-free gel in the back end of the connector to provide environmental protection and eliminate the requirement for an external sealing boot or nut during field assembly. The indoor unsealed connector is available in crimp or screw-on styles.

The crimp connector is terminated using a standard hex-crimp hand tool, and the clamp and screw-on connectors require no special tools and are reusable. A positive stop in the sealed connector enables proper insertion and a rotating coupling nut reduces twisting of the cable.

Also available are board-mount receptacle connectors with polypropylene dielectric or high-temperature tolerant Teflon dielectric for surface-mount processing compatibility.

Circle Reader Service number 152

## ATM load testing

COVINA, Calif.—Ameritec Corp. has introduced its Vista Model 155 ATM Load Tester product line.

Vista represents the latest in Ameritec's expanding family of switch and network load testers and simulators.

Vista provides 100 percent density load testing of Asynchronous Transfer Mode switches with Switched Virtual Connections and Permanent Virtual Connections while simulating all ATM Adaptation Layer types and traffic profiles via user programmable scripts and protocols.

Vista is equipped with an X-Windows Graphical User Interface and is accessed via a LAN from a workstation or PC. It accommodates eight to 16 ports with various optical and electrical interfaces. The product also provides extensive cell layer testing and a wide range of statistics used to evaluate ATM switch performance.

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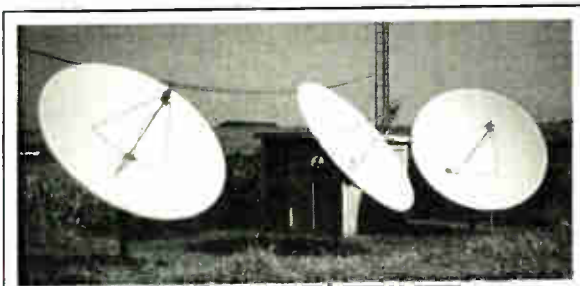
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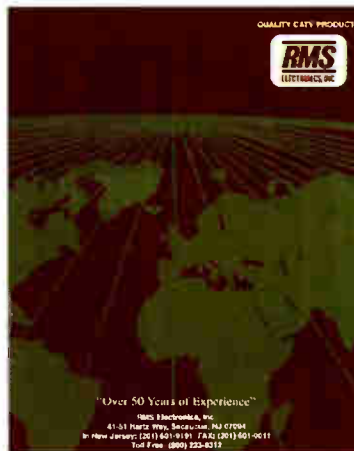
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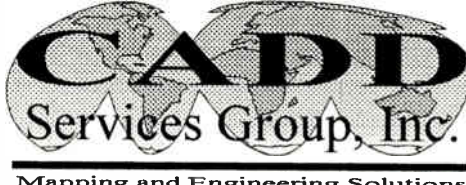
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# Thoughts on a rare miss and probability



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

In his commentary in the October issue celebrating the 20th anniversary of *CED*, Roger Brown graciously referred to my prediction in the January 1988 issue of the magazine as a “rare miss.” Here is what I wrote in 1988:

*“One thing seems certain: within five years, we will see wide-screen TV sets in dealer’s show rooms, with most of the artifacts scrubbed and the scan lines no longer visible, even at close viewing distance.”*

Actually, I have seen a wide-screen set in a dealer’s show room, but with an NTSC picture slightly distorted to make it look like it nearly fills the screen. I believe we will see more of this, although it is more likely to be SDTV (standard definition TV), than HDTV.

If I were looking for an alibi for my “rare miss,” which I am not, I would be inclined to point to the cable TV industry, or at least General Instrument. It was not until June 1990 that Jerrold detonated its explosive all-digital DigiCipher proposal in the midst of the more or less orderly HDTV standards procedures. Painstakingly crafted schedules were shattered. Shrapnel screamed in all directions, cutting down 20 years of Japanese R&D on the MUSE system. Names like Yves Faroudja, Karen and Bill Glenn of the N.Y. Institute of

Technology, Richard Iredale of the Del Rey Group and Scientific-Atlanta’s HD-MAC simply faded away. Even the Europeans had to acknowledge that their analog D2-MAC system was obsolete before it got a good start.

The survivors—Zenith, Sarnoff Laboratories, Philips and the MIT group—quickly moved to get on board with GI. The future of HDTV was in a shambles, wallowing badly. After excruciatingly difficult negotiations over patents, pride and paternity, the survivors formed a Grand Alliance to submit what they hoped would be the best of all worlds. Nevertheless, the schedules had been moved back far enough for the broadcasters, who had promoted the idea in the first place, to have second thoughts about the cost, marketability and regulatory consequences of HDTV. Now, five years after my failed prediction, it is appropriate to speculate that SDTV and MPEG compressed digital programs may well leave HDTV to the history of what might have been.

Thus, it was Jerrold, the long-time provider to the cable industry, which led the way with its stunning proposal that shook the world. That is how I missed. But I do acknowledge a sense of pride that one of cable’s own actually led the parade in such a substantial way.

That may have been a “rare miss,” but there are others. I remember the time in 1944 when I was chatting with my boss, Dan Hunter, chief engineer of WMAL radio in Washington. RCA had introduced television to

the nation in a dramatic presentation at the 1939 New York World’s Fair. Within a few months, preparations for war forced an end to the establishment of new TV stations and the manufacture of TV sets.

By 1944, people like Dan and the WMAL management were dreaming of sugarplums. They could hardly wait for the war-time freeze to be lifted so the gold rush could begin. Dan was excited. Television was going to change the world. With my 28 years of accumulated wisdom, I said I just could not visualize myself sitting in front of a TV set watching movies all the time. It sounded like a loser to me. Now, that was a genuine miss, although I still do not spend much time watching movies.

## The magic of probability

A couple of years before my “rare miss,” I adopted the technique used by the U.S. Weather Service for reporting rain forecasts. I made a bunch of rash predictions, all securely armored with the magic of probability. One of the worst was a “90 percent chance that cable TV will abandon the convertor interface in favor of IS-15 [the Multiport] or other user-friendly technology compatible with modern TV receivers.” Like the meteorologist who forecast a 90 percent chance of rain, we also forecast, by implication, a 10 percent chance that it wouldn’t happen. That is one way to avoid a “miss.” Another is to surround the prediction with so many nullifying conditions that there will always be an escape route. Roger caught me with my armor down.

Probably the most risky endeavor in the prediction business, at least in our industry, involves prospects for interactivity, however that elusive term may be defined. More than 30 years ago, I was a member of the NCTA Policy Council. The council chairman was J. Leonard Reinsch, president of Cox Broadcasting and Cox Cablevision and former radio secretary to President Truman. The council was charged with investigating the potential of “auxiliary services” that might be provided by cable TV networks. Ten years later, my firm was engaged by the White House Office of Telecommunications Policy (OTP) to identify all possible services that might be provided by cable TV networks, examine the technology and suggest ways in which the government might help to bring about the “critical mass” needed to demonstrate viability.

One by one, ideas such as remote utility meter reading, load management, remote home security alarms, home shopping, home banking, education, teleconferencing and all the others have, from time-to-time, seemed to be “killer apps.” One by one, each has failed to achieve a viable market, partly because of inadequate technology, but primarily because it has been all too easy to project personal enthusiasm to the marketplace.

Gary Arlen, “contributing curmudgeon” to *Multichannel News*, quotes David Abraham, president of a communications investment firm, with the warning: “Extrapolation is an extremely dangerous form of self-delusion.” **CED**



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