

# CEED

THE PREMIER MAGAZINE OF BROADBAND COMMUNICATIONS

## OSS: Grinding out the issues

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**WHAT**  
DOES THE NEXT  
GENERATION  
WANT FROM US,  
ANYHOW?

JULY 1994

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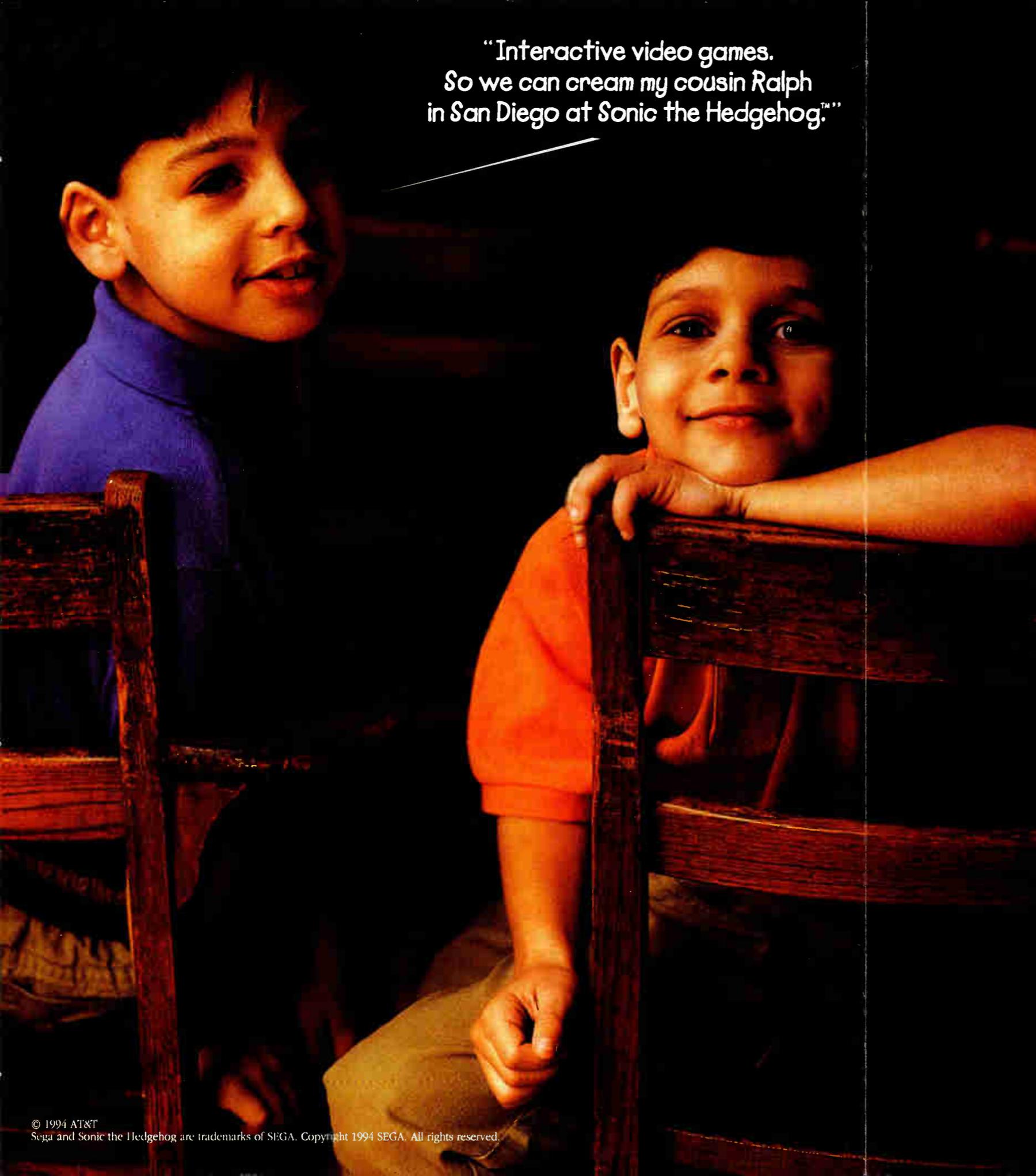
OSS

Set-top standards

Network planning

Convention coverage

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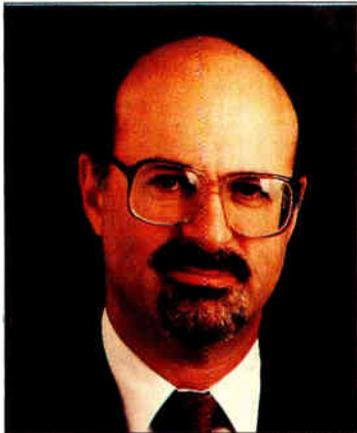
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# Should subscribers own set-top boxes?



By Jeffrey Krauss,  
independent  
telecommunications  
policy consultant and  
President of  
Telecommunications and  
Technology Policy of  
Rockville, Md.

The FCC's recent decision on compatibility between cable systems and consumer electronics equipment contains a big surprise: subscriber ownership of set-top boxes. The FCC has decided to redesign equipment so that the security components are physically separate from other features and capabilities.

Subscribers will be prohibited from owning the security components, but permitted to own the hardware that supports other features and capabilities such as digital decompression and channel guide services. This has significant implications for future services and a substantial impact on cable operators and subscribers alike.

FCC Docket No. 93-7, required by Section 17 of the 1992 Cable Act, has the goal of allowing subscribers to use the full capabilities of TVs and VCRs. With current set-top descramblers, it is difficult or impossible to tape one scrambled program while watching another, or to tape a sequence of programs that come in on different cable channels.

In order to satisfy these consumer needs in the near term, the FCC has decided that cable operators must supply convertors with RF bypass circuits, timers to change channels for VCR recording, convertors with dual tuners to support picture-in-picture, etc.

In the longer term, a new "decoder interface connector" on TVs and VCRs will eliminate the tuner from the set-top box and replace set-top boxes with "component decoder modules." This much is no surprise.

The surprise comes in the FCC's decision to "... separate signal access control functions from other functions served through the connector. This capability will allow non-security functions to be provided through new products offered by retail vendors or to be incorporated into TV receivers and VCRs . . ." The FCC has recognized that subscriber ownership of the descrambling circuitry would degrade security, but subscribers will be allowed to own the circuitry that provides other cable system services.

## What services are affected

Today, apart from interference rejection, the typical set-top descrambler provides little more than descrambling. There really are no significant services that can be separated from the security function and included in a separate box the subscriber can own.

In the future, however, circumstances will change. Digital decompression, channel guide services, interactive home shopping and digital information services will be offered as more cable systems adopt digital technology. These service capabilities will be affected by this decision.

In the future, this FCC decision requires that subscribers have three options: they can buy stand-alone boxes with the service functions while they rent the security functions from the cable operator; they can

buy TV sets that have the service functions built in while they rent the security functions from the cable operator; or they can continue to rent boxes from the cable operator that contain both the security functions and the service functions.

## Impact on cable industry

This FCC decision will have an impact on the way cable operators do business. Operators will have to educate subscribers about what kinds of equipment are compatible with the new services. (If the cable industry handles this the way it has handled cable's public image in the past, expect a public relations disaster.)

This policy could impede technical advances. If subscribers have made a substantial investment in equipment that would become obsolete, an operator may be reluctant to upgrade technology. Operators will get complaints from subscribers who move from one cable system to another and find that their equipment no longer works, because different cable systems employ different technology or offer different services. (For example, subscriber equipment that supports the StarSight channel guide service might not support the TV Guide or Prevue services.)

But this new policy could decrease operators' capital requirements. If new digital set-top units cost between \$200 and \$300 apiece, maybe it's better to allow subscribers to make that investment. In these days of rate regulation, an 11 percent return on that investment may not be very attractive to cable operators.

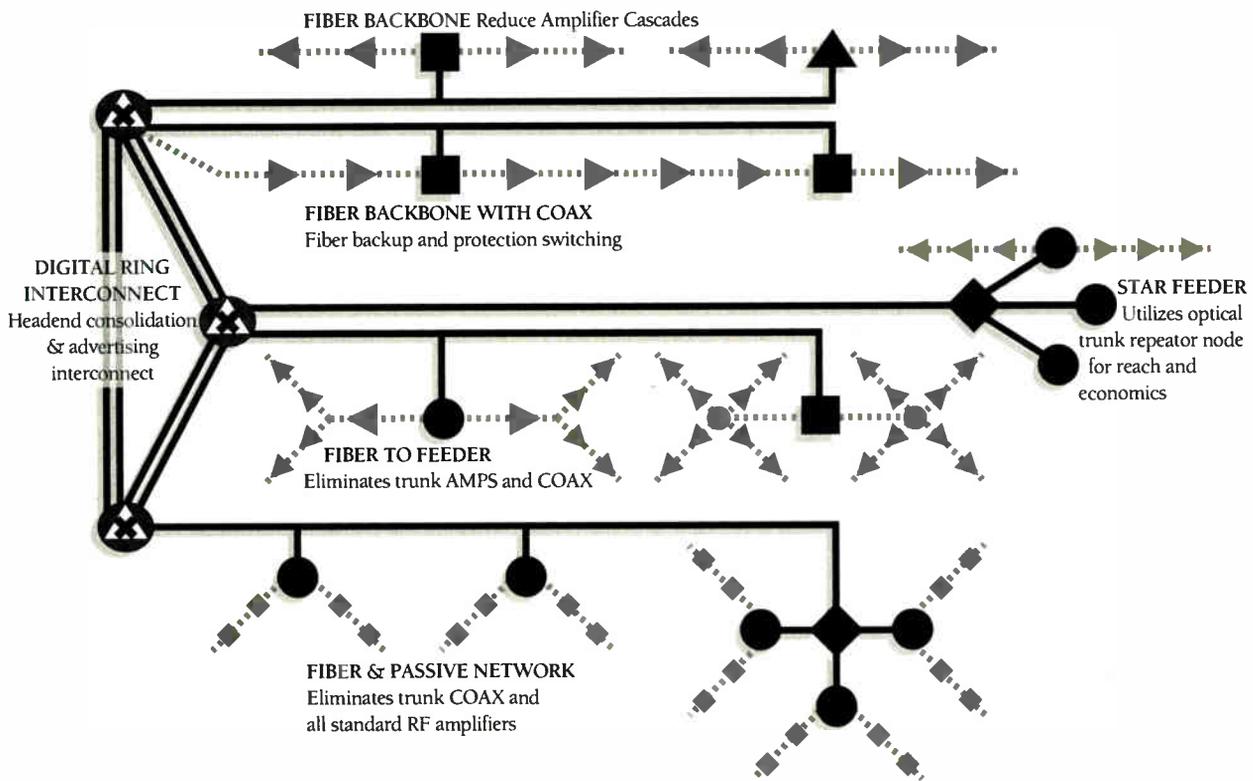
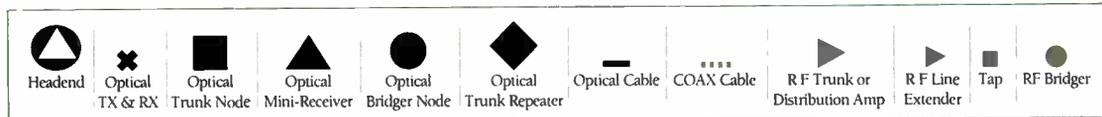
## Subscriber ownership limits

The FCC was very clear that subscriber ownership rights do not extend to the descrambling circuitry and related security components. This includes, for example, the data receiver that receives the entitlement messages that are addressed to each descrambler, telling which programs and services the subscriber has paid for. Subscriber ownership of these functions would compromise security, the FCC has determined.

In addition to security functions, privacy functions should also be excluded from subscriber ownership. As operators begin to offer telephone services over cable, privacy emerges as an important concern. The cable bandwidth will be shared among all the subscribers in a neighborhood, in the same way that cellular telephone and cordless telephone bandwidth is shared. Although your neighbors may easily listen to your cellular and cordless calls, they should be prevented from listening to your cable telephone calls. Excluding the network control functions from subscriber ownership will help.

This new regime of subscriber ownership presents many challenges. For an industry that has never placed a high priority on standards and interoperability, priorities may have to change. Subscribers may gain some benefits from competitive supply of equipment, but incompatibilities may eliminate the benefits. And subscriber ownership may exacerbate signal leakage problems. If you sense that I'm skeptical, you've got it right. **CED**

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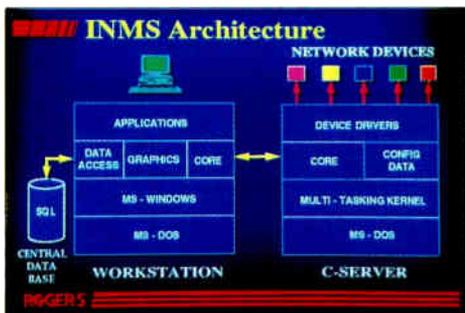
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**FEATURES**



**30 Building the perfect OSS for cable TV**

*By Roger Brown, CED*

While the focus on the full service network has been on pieces and parts, relatively little attention has been paid to a universal infrastructure that can support interactivity. This article points out the need for such systems and the likelihood that they'll be built in time.

**36 Standardizing the set-top**

*By Leslie Ellis, CED*

There is growing momentum to establish a set of standards for digital set-tops so they can be moved from one system to another. But there are several sticking points, the most important being conditional access. This story attempts to sort out the issues and discuss what's on everyone's mind.

**42 Preparing for new services**

*By Dilpreet Jammu and Jim McEachern, Bell Northern Research*

What will be the network impact of deploying such services as video on demand, telephony and data? How should operators configure the drop connections to homes? This article looks at those questions and models a real cable system with costs.

**54 All that jazz**

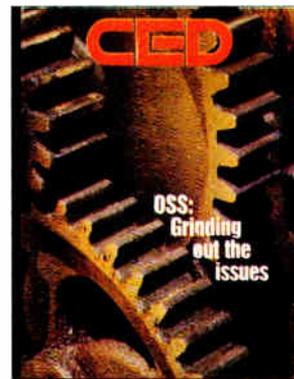
*By CED staff*

The NCTA Show in New Orleans was a smashing success, with more booth space purchased than ever before. This article details the new products and business deals that characterized the annual confab, with special emphasis on how several announcements will impact future set-tops.

**64 Future gateways**

*By CED staff*

The Society of Cable Television Engineers met in St. Louis last month and took a "hands-on" approach to provisioning new services. Our coverage includes the election of this year's chairman, member of the year and other award winners, as well as complete coverage of new products and the technical sessions.



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*Can cable get the OSS gear turning? Photo by Benn Mitchell*

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The info superhighway



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rack space, external wiring and AC power requirements, and reduces heat generated in the headend.

### A few refinements.

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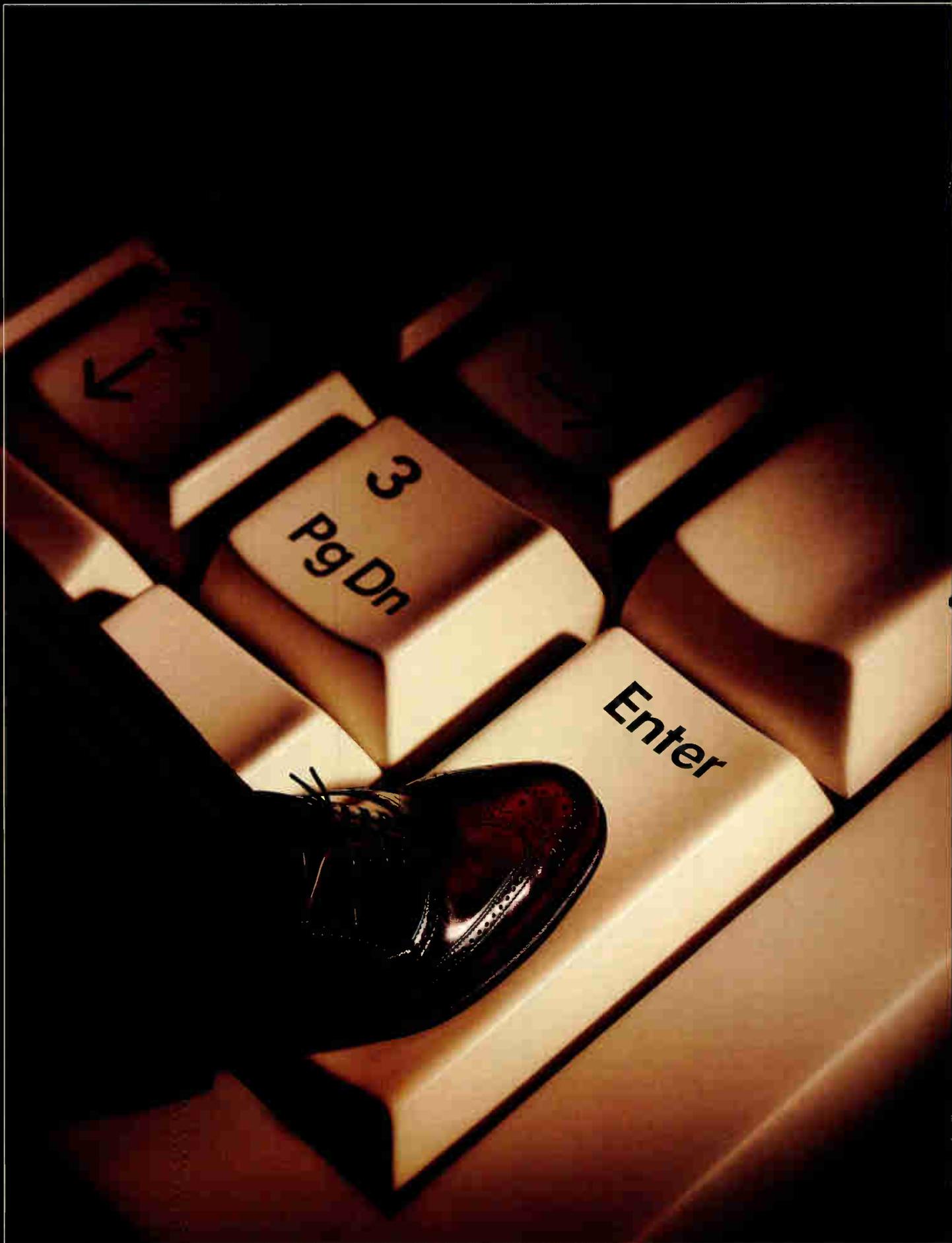


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# Hot idea.



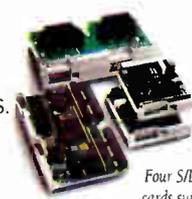


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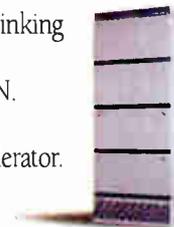
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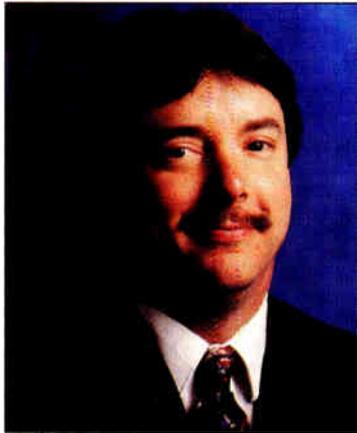
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As cable operators and their competitors race to build two-way multimedia networks that will enable delivery of services like interactive games, home shopping, and data, a behind-the-scenes battle is shaping up between companies that envision the TV as the interactive appliance and those who see the PC fulfilling that role.



# The interactive home of the future

There are some visionaries who predict the television and personal computer will some day merge into an intelligent device capable of an almost infinite number of functions. A case can be made for that scenario based on what's occurring with display systems as a result of high-definition TV.

Up until HDTV is launched, TVs will use round pixels to display analog NTSC signals, and they'll rely on two interlaced fields of images that make up a single frame. That's in direct conflict with computer monitors that use progressive scan monitors and square pixels, which offer high resolution and more detail.

When the first HDTV monitors hit the market in a couple of years, they'll obviously feature high-resolution pictures. But owing to early uncertainties, they'll be able to work with either progressive scan or interlace formats, display square or round pixels and accommodate several different levels of resolution.

But can the functionality of TVs and computers be merged? In some respects, yes. But not if today's paradigms are followed. What is key is that the display, or monitor, must be treated as a module—a detached device that perhaps hangs on the wall and can display different sized pictures derived from a telephone call, a television, a computer or virtual reality machine.

If the display is one day cheap enough, keyboards, printers and devices such as a mouse could be "attached" through wireless interfaces to permit both passive viewing of broadcast video entertainment as well as interaction with others over the Internet, for example. The only issue would relate to the number of people in the home vs. the number of displays a person might own.

Right now, however, the battle rages on now about whether it's the TV or the computer that becomes the device by which we all communicate with one another. With established territory to defend, companies that have supplied products to one industry or the other have opposing views.

It gets interesting when companies like Intel and General Instrument, for example, link up to develop high-speed modems for datacom delivery over cable networks. Should that cable be connected to the TV or the PC? Depending upon whether the view is "TV-centric" or "PC-centric" is the way those answers are currently being formed. But what if both devices share the same, detached monitor?

If the display is physically separated from both the PC and the TV, it may turn out that by using a simple splitter, everyone's right in the long run.

Roger Brown  
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# Time Warner's PCS-over-cable test in Orlando pronounced a success

Time Warner Telecommunications announced that it has successfully completed a wide-area test of Qualcomm's CDMA (code division multiple access) technology to transport PCS signals over the Full Service Network in Orlando, Fla.

According to Time Warner officials, the system provided seamless coverage in the home, neighborhood, workplace and car during the trial, which studied coverage and capacity issues as well as connections with personal computers via data provider America Online. Significantly, the six-month test showed that wireless digital calls can be successfully handed off from a radio network to a fiber-based cable system without interference to either the calls or the video programming being watched by subscribers.

"Assuming adequate spectrum is made available to new entrants, the cable industry will be a major participant in realizing the full potential of next-generation mobile services," said Dennis Patrick, CEO of Time Warner Telecommunications.

Time Warner has constructed cell sites for

wireless applications in its own office building, at the base and the top of a ham radio tower, on the roof of the Sheraton Orlando North hotel and at the Wekiva golf course. Lex Felker, TWT's VP of technology, said the test showed that a transceiver located 18 feet above ground could adequately penetrate homes, allowing the signals to be sent and received by low-power wireless telephones.

In addition, tests showed the wireless system could successfully connect with computer data services like American Online and to E-mail services provided by the Internet.

## Bell Atlantic, SWBell select vendors

Bell Atlantic Video Services has tapped AT&T Network Systems as systems integrator and prime contractor and General Instrument as a major contributor to the construction of BAnet, the company's full service network that is planned for 20 cities over the next five years. BroadBand Technologies was also cho-

sen to provide the components necessary for the switched digital fiber-to-the-curb systems planned for 50,000 homes in New Jersey.

According to Stuart Johnson, chairman and CEO of Bell Atlantic Video Services, the company will focus primarily on constructing hybrid fiber coax (similar to fiber-to-the-feeder) systems that will deliver video programming separate from telephony signals. At some later time, when marketplace forces dictate, services may be integrated over the same network, he said.

In its role as a systems integrator, AT&T will assure that all aspects of the network—from central office to set-top—work together. It will also be the major network equipment supplier. GI will supply analog and digital set-tops that will support interactive multimedia, distribution gear as well as end-to-end access control, encryption and digital compression technology.

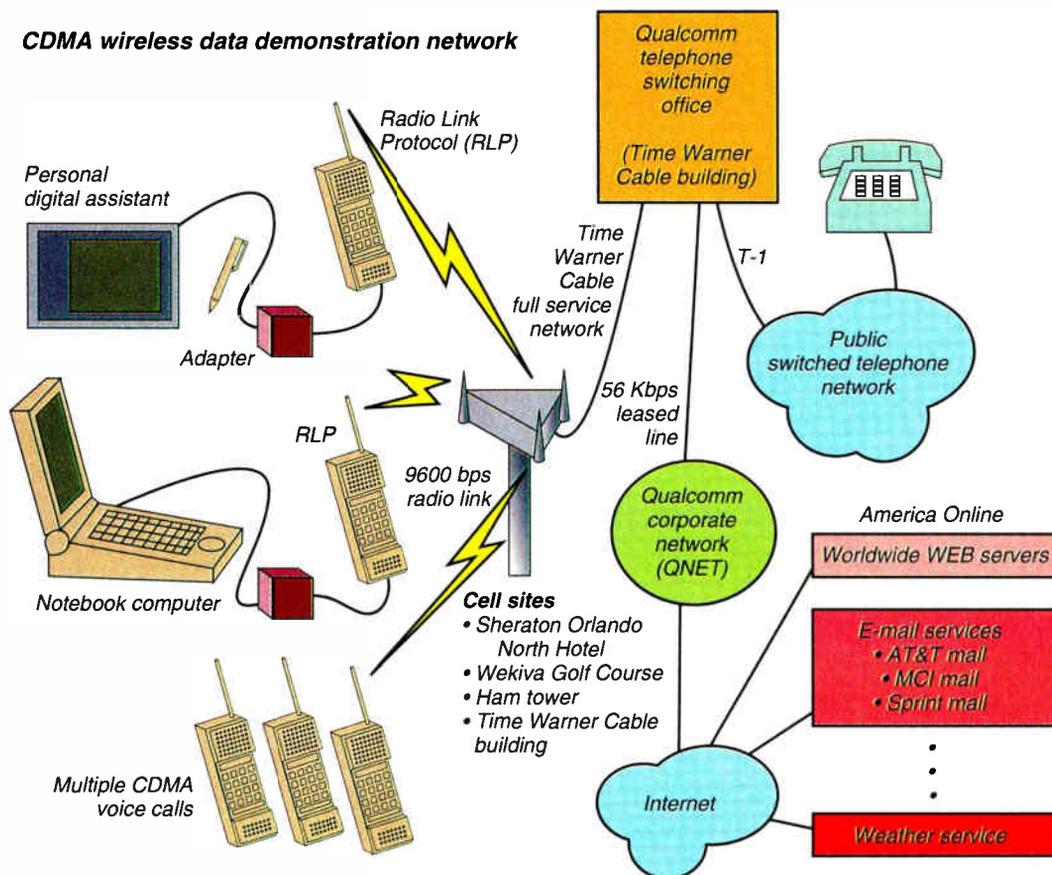
In a separate announcement, the Bell Atlantic Video Services announced that it has restructured its executive offices as a result of former president Art Bushkin's resignation from the company to pursue other entrepreneurial interests. Under the new structure, Frank Pereira was named president of video services; Robert Beran becomes president of new media ventures; Robert Townsend has been tapped as acting president of interactive multimedia services; and Ken Van Meter becomes acting president of interactive multimedia platforms.

Meanwhile, Southwestern Bell said it will install BroadBand Technologies digital networking and AT&T's telephony gear for its 2,000-home broadband trial scheduled for construction this fall in Richardson, Texas.

BBT will install a variation of its Fiber Loop Access 1100 digital, fiber-to-the-curb system, which will carry voice and video in ATM format to a series of curbside optical network units. The ONUs serve from four to 64 homes, said Sam Quattrocchi, VP of marketing for BBT. From there, the voice and video signals travel over coaxial cable to the home. Southwestern Bell has not yet identified which brand of set-top or residence-mounted box will escort the voice and video signals into the home.

The RBOC hopes to have the telephony portion of the network up and ringing by the end of the year.

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Video delivery of basic cable services, interactive games, home shopping and educational services will follow, said a company spokesperson.

## H-P acquires CaLan

In a move that gives the company an increased toehold in the cable television testing marketplace, Hewlett-Packard Co. announced last month it will acquire CaLan Inc. of Dingmans Ferry, Pa. Over the next six months, the CaLan operation will be shifted to the H-P facility in Santa Rosa, Calif. The 55 employees will be eligible for positions within H-P, the company said in a statement.

H-P officials said the agreement demonstrates the company's commitment to supporting the testing needs of the cable-TV industry. (H-P has also become involved in the cable industry through another division by agreeing to supply digital set-top terminals to TCI and Comcast.)

By adding the CaLan line of product to its own, H-P will now be able to offer a full line of test, measurement, monitoring and network management products to cable operators. CaLan's line of products included a non-interfering high-resolution sweep system and a signal level measurement system, among others. H-P was the first to offer an integrated, single-box tester that performs all FCC-required RF and video proof test measurements.

According to H-P, the CaLan return-to-factory service and upgrade policy will remain in place and be incorporated into H-P's worldwide service program.

## ADSL put on shelf by Northern Telecom

Hybrid fiber coax architectures for video won a huge endorsement from Northern Telecom last month when it said it will shelve its ADSL investments and will instead redirect those resources, including three dozen ADSL researchers, into "productization" of its hybrid fiber/coax designs.

Following the informal announcement, GTE and regional Bell operating companies including US West, Southwestern Bell, Nynex, Bell South and Pacific Bell practically dismissed ADSL, citing a desire for broadband HFC instead. ADSL was designed to send digital video signals over twisted copper pair lines at VCR or better quality.

"This is a vote of confidence in our new cable business," says Stephen Fleming, associate vice president of global marketing for

Northern Telecom's broadband network services division, referencing the formation of that division earlier this year. "To some extent, we're taking dollars and resources which had been targeted to our traditional telco base and moving them into products aimed at the core cable business."

The news didn't appear to shock blooming telco broadband players. "We're putting our main emphasis on hybrid fiber/coax," says David Hinshaw, VP of growth for U S West, which has video trials slated for Omaha, Neb., Denver, Minneapolis, Salt Lake City, Portland, Ore. and Boise, Idaho.

Officials with Pacific Bell also dismissed ADSL as a strategic video plan. "We're not using here, nor do we plan to use it. We've looked at it carefully and it doesn't provide the bandwidth we think we need," explained a company spokesman.

Northern Telecom disbanded with further ADSL work because it had reached a critical design juncture. "The issue was that these were hand-built prototypes, using discrete components," said Fleming. "We're continuing to do some technical work related to what's required to put ADSL on one chip, but basically need to see a volume of 1 million units per year to continue profitably."

Because it's unlikely that ADSL deployment will generate that kind of volume, Northern Telecom will reallocate the majority of its ADSL resources, including 36 of 250 broadband services division staffers, to hybrid fiber/coax development, notes Fleming.

## CableLabs issues RFI; plans to test QAM

Cable Television Laboratories has issued an RFI on digital media servers and begun digital modulation testing at its headquarters near Denver.

The server RFI was issued to more than 250 vendors in late May; responses were due June 30. The RFI requested information on servers to support video on demand and events on demand services. A key aspect sought is a delay feature that would allow live events to be viewed from the beginning even if the viewer tunes in late.

The RFI sought information on servers for systems with 500,000 subscribers, 100,000 subscribers and 10,000 subscribers. Responses were requested to address either 4 megabits per second or 9 mbps data rates while seeking comment on the impact of other data rates.

Meanwhile, CableLabs will be working with General Instrument, Scientific-Atlanta

and TV/COM International to test digital modulation to determine how a cable system might affect digital signal transmission.

The initial tests, which were slated to begin last month, will focus on QAM technology. GI will supply a prototype DigiCable 64-QAM system that includes forward error correction and adaptive equalization. S-A will supply production 64/256 QAM modulator and demodulator boards featuring its custom 64/256 chip set. TV/COM, which has been developing programmable single-chip digital QPSK and QAM architectures for second-generation networks, will investigate the merits of variable bandwidth and variable order QAM capabilities.

This announcement follows one previously made with Pioneer.

## Jottings

Canadian operators **Halifax Cablevision** and **Access Cable Television** plan to test high-speed computer connectivity over their cable systems. Computers located in up to 10 public sites will be outfitted with Zenith Homeworks gateway cards and modems to provide free public access to Chebucto Free-Net services. The trial also calls for an unspecified number of residences to be outfitted with the Zenith hardware as well . . . In times of turmoil, you need a consultant. **Larry Yokell**, who had been a senior analyst for strategic/competitive assessment at CableLabs, has hung out his shingle and started a new company called **Convergence Industry Associates**. The company will offer full-service consulting services, including primary and secondary research, executive summaries, reports, white papers, briefings, conferences and more. Larry can be reached at (303) 494-6418 . . .

**Augat Inc.**'s communication products division will supply **Toshiba Corp.** with RF amplifiers and related products for use in advanced communications networks in Japan and Asian countries. In addition, the two companies will work together to develop new products for both U.S. and international use . . . **Alcatel Network Systems** has been chosen by **Southern New England Telephone (SNET)** to supply digital crossconnects for I-SNET, the voice/data/video network that will serve the state of Connecticut. The crossconnects have a capacity of 256 DS-3 ports with planned expansion to more than 2,600 ports (2,048 ports can handle about 1.4 million telephone calls simultaneously). I-SNET will cost about \$4.5 billion over the next 15 years to construct. Crossconnects allow traffic to be rerouted with virtually no interruption in the case of a network failure . . .

*Compiled by Roger Brown and Leslie Ellis*

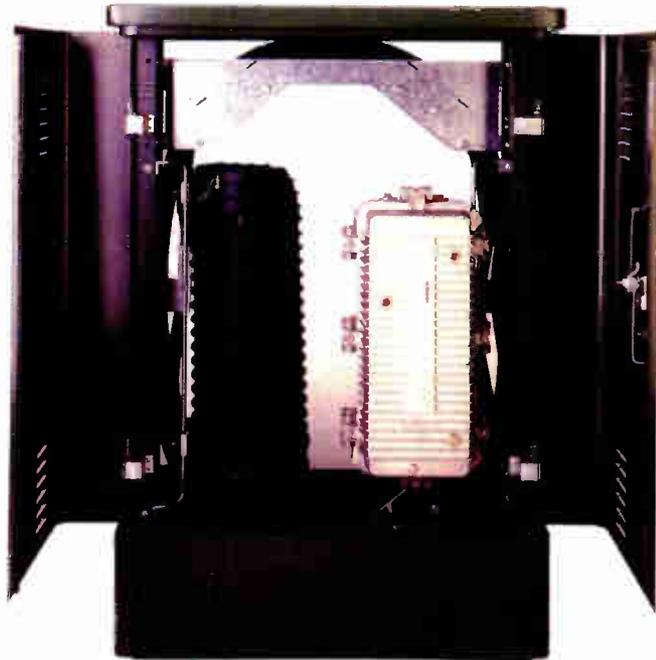
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# Frame: Leading NT's broadband charge



By Leslie Ellis

If Mike Frame, vice president of Northern Telecom's new broadband network services division, had one wish, it would be to jettison the hype out of the information superhighway. It's one of his biggest pet peeves.

"We need to put more realism into the convergence scene," clips Frame, a conservative and quiet Briton-turned-American. "A lot of the media tends to over-extend what the industry can do, so I think it's important that we cut through the hype and add realism to the stories."

Largely, that's what Frame intends to do for Northern Telecom, as the executive in charge of the recently formed broadband group. "What I want to do is to get Northern Telecom clearly into the cable business," Frame emphasizes. "We only entered into cable in January of this year, and I see it as a real challenge to bring in a corporation and gain the respect of the industry."

Frame hopes to do that with the coming introduction of a new line of "full service network" products that promise to deliver telephone, personal communication services and switched video/telephone/data services to cabled homes.

"What we'll bring to the table is our end-to-end full service network line,

for switched video and analog video, telephone service and data services," says Frame, noting that the line will likely include video servers, set-top boxes, ATM switching equipment, voice switching equipment, and operations and maintenance gear.

## Silver NT anniversary

This year marks Frame's silver anniversary with Northern Telecom, which he joined in 1969. He says he joined the North American communications industry because of a high level of respect he had for the approach taken in this country. "I lived in the U.K. at the time, in Chester, which is in northern England," explains Frame. "I came to Northern Telecom because of the respect I had for the U.S. communications industry, from a quality and design standpoint."

Frame had completed his bachelors and doctoral degrees at Heriot Watt University, located in Edinburgh, Scotland, prior to his move to the States. He holds a BSEE and Ph.D. in electrical engineering from the Scottish university, named after James Watt, inventor of the steam engine.

In his early days at Northern Telecom's Ottawa, Canada laboratories, Frame designed copper-, coaxial- and optically-based transmission networks which carried data, voice and video signals. "In those days, it

was all for long-haul applications, and inter-LATA transmission," Frame recalls.

In 1981, Frame moved out of Northern Telecom's labs and into business administration. It wasn't a difficult transition, he says. In his new role, Frame served as marketing director for NT's digital transmission products before moving to Atlanta one year later. He and his family of four, which includes his wife, Jennifer; and three children, Sara (23), Heather (21) and David (14), have been in Atlanta ever since.

Early this year, Frame was selected to oversee the company's broadband business unit, which boasts 250 employees taken from the company's widespread sales, marketing and manufacturing facilities. Prior to the division startup, Frame had served as a regional marketing VP in charge of the company's account with long distance carrier MCI.

The new broadband group, Frame says, will manage research and development and operations to develop a new residential broadband product line. It will use a development plant the company owns in Harlow, England to develop the new gear.

## Biggest challenge

Frame says he experienced his biggest engineering challenge two separate times during his 25-year Northern Telecom stint. Both times it involved the installation and cutover of "huge, long-haul networks" from analog to digital capacity.

"The first was in 1974, when we upgraded the network from Montreal to Toronto, Canada to carry data at 274 Mbps," Frame recalls. "The second was in 1992, when we modified a network to carry data traveling from the West Coast to the East Coast at 2.4 Gbps."

What made the installation particularly vexing, says Frame, was designing and installing the equipment, and ensuring the project was on schedule at all times. "It was all analog prior to the change, in both cases," says Frame. "We were putting in digital when people didn't believe in digital."

Frame says the telecommunications future promises increased speeds of ATM networks "so that when a business or subscriber needs certain information, it will be instantaneously delivered, over a full ATM fabric." Top speeds of that ATM network will be in the gigabit-per-second range, evolving to terabit switching speeds, Frame says: "I think we'll see these kinds of speeds within the next decade."

In his free time, Frame enjoys rock climbing—"because you can forget about work"—and snow skiing. Last winter, in fact, he and his family skied the Colorado Rockies. During the trip, the elder and younger Frame men entered a Nastar ski race together, zipping in and out of the Olympics-style flags at breakneck speeds. The winner?

"My son is starting to ski the bowls faster than I," laments Frame, "but I beat him two out of three on the race. When age gets going, it really does come through." **CED**

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## Shows prove cable ready to battle competitors



By Wendell Bailey,  
VP of Science  
and Technology, NCTA

When I wrote last month's column about the SCTE and Bill Riker, I was just heading off to the NCTA's National Show in New Orleans (a.k.a. the Big Easy; America's Crescent City; home of jazz, cajun food and Creole cooking.)

Heading off to the Show, I didn't really know exactly what we would be facing in terms of attendance. Our estimates were running about 30 percent ahead of last year's total attendance.

Well, the numbers are in. As it turned out, we had nearly 23,000 people in the New Orleans Convention Center for our annual show. We had almost three times as many international visitors as we've ever had before. We had several new program services, more than 30 new hardware companies, new service providers, one of the finest sets of technical papers I can remember in recent years and, all together, a truly spectacular show.

As I write this column, on my way to the Cable-Tec Expo in St. Louis, Mo., I'm still wondering: why did all of these people come to New Orleans during that particular week? What did they hope to find? What, in fact, did they find? And what did they take away from there, in terms of information and thoughts about our future?

### Not a requiem

One thing is abundantly clear: those 23,000 attendees did not come to a funeral. No, they came to see firsthand what our industry was doing and how we're handling the regulatory and legal problems recently foisted upon us.

The most interesting thing about the crowd, however, was that it spent less time on those issues, it seems, and more time on trying to understand where all this new technology would fit in, and what all these new program services were about.

As I walked around the exhibit floor, I couldn't help but be attracted by the conversations I heard between various people from different industries.

They were vigorous conversations, with give and take about technology and its impact. Debates about how to roll out interactive services. Arguments about how to approach competition from DBS, and how to deal with telephone companies and their possible entrance into cable TV.

### Technological displays abound

In addition to all of this talk, I saw more booths with program guides than I've ever seen before, and more examples of high-speed, on-line data services over cable TV. Most fascinating about these displays was

the programming underlining them.

Even though they were essentially demonstrations of what some day can be done, they were programmed in such a way that the viewer had a distinct feeling that this was a service about ready to be rolled out.

### When in France

In thinking about how this year's National Show looked to me, I didn't give any thought to what was going on in other places and venues. I didn't know what I would find the following week, when I would be trotting off to France for a cable operator conference sponsored by the Alliance of Mayors of Great Cities of France. What I did find in France, much to my surprise, was formal and informal conversations about the National Show.

Usually, when I'm asked to give talks and lectures on cable TV in America, I'm asked to focus on regulatory impacts on our business. In France, though, all of these lectures quickly dissolved into questions and discussion about what had been seen on the exhibit floor in New Orleans.

All of the French operators I spoke with proclaimed the National Show "magnifique!" and were eager to hear all about our interactive video experiences, probably because of their ongoing relationship with Minitel. They all claimed that the different services they saw demonstrated in the various vendor's exhibits at NCTA were exactly the kinds of services they hoped would eventually be available in their country as well.

### Whirlwind tech tour spawns new thoughts

After a whirlwind like those two weeks, I'm forced now to stop and offer some sober advice to myself and my attitudes about what our industry is doing and where it's going.

Because, notably, the exhibit floor in New Orleans was not packed just with the friends of the cable industry. It was also filled with many representatives from our existing and potential competitors. There were many people on the exhibit floor who represent the very groups and industries that brought these new and onerous regulations to bear.

Certainly, those people saw our industry as one still in charge of its own destiny and one that can, in fact, successfully meet the competition. Of course, more careful consideration on how to apply our more limited economic resources to those new services and projects prevails.

So another year has passed, as measured by the passing of the National and SCTE shows. We now must all buckle down to the hard reality of "Life Under the New Rules." Will these issues end the growth of the best delivery system ever built by private enterprise?

I think not. The people I saw and spoke to in New Orleans were bubbling over with new ideas and a dedication to the challenge that should see us through. It makes one proud to be in the cable business. **CED**



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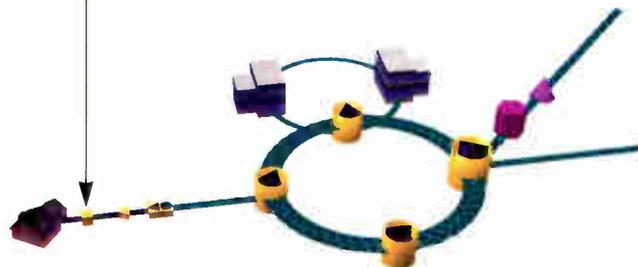
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# Which is better for cable: QAM or VSB?



By Chris Bowick, Group Vice President/ Technology, Jones Intercable

Today, for the second time in as many weeks, I was asked if I had a preference for the use of multi-level quadrature amplitude modulation (QAM) or multi-level vestigial sideband (VSB) as a modulation format for the transmission of digital signals to the home.

QAM proponents argue that the scheme is a well-known, tried and true quantity in use in vast numbers of different transmission systems around the world today. They also imply that QAM, because of its volume usage, should be less expensive to implement, and is somewhat of a "standard".

VSB proponents, on the other hand, argue that multi-level VSB is more robust for a given symbol transmission rate, especially in the presence of noise bursts and ghosts, and requires less channel equalization—also implying less complexity and lower cost in the decoder for a given performance level.

Early discussions (1990/1991) on the subject of digital modulation techniques for the transmission of compressed digital video to the home in the CATV industry typically revolved around the use of 16-QAM. This technique, described in an earlier column<sup>1</sup>, would be theoretically capable of squeezing as many as 4 bits of digital information in a single hertz of bandwidth. Or, stated in the way we usually speak, 16-QAM would allow a theoretical maximum of about 24 Mbps to be transmitted in a single 6 MHz cable channel.

Later discussions and experimentation became more bold, moving to 64-QAM (6 bits per hertz or 36 Mbps in 6 MHz) and most recently, in order to better compete with the 16-VSB proponents, discussions have been targeted around 256-QAM having a theoretical maximum efficiency of 8 bits for every hertz of bandwidth, or 48 Mbps in a 6 MHz channel!

Practically speaking, due to the requirement that actual circuits be built with realizable components, the actual data rates that can be accommodated in a given 6 MHz channel for 16-, 64-, and 256-QAM are about 20 Mbps, 30 Mbps, and 43 Mbps, respectively.

## How they work

In a QAM modulator, the incoming data stream is first commutated or split into two different data paths: the in-phase or I path, and the quadrature or Q path. This results in a data rate in each path that is one-half of the original input data rate to the modulator. In other words, if we were dealing with an initial input data rate of 20 Mbps, then the data is split into two separate paths of 10 Mbps each.

Each of these data streams is further processed

through multi level converters, where a certain number of bits are converted to an analog voltage level called a symbol (2 bits to 4 levels for 16-QAM, 3 bits to 8 levels for 64 QAM, or 4 bits to 16 levels for 256 QAM) and then applied to two separate double-sideband suppressed carrier amplitude modulators operating in phase quadrature. After modulation, the in-phase and quadrature carriers are summed together and filtered for transmission. This is therefore a double-sideband, suppressed-carrier technique.

16-VSB modulation is an outgrowth of the 4-VSB work Zenith has been doing in its high-definition television efforts<sup>2</sup>, and which was selected by the Grand Alliance back in February of this year as the modulation technique of choice for the transmission of HDTV via broadcast facilities. In 16-VSB, the incoming data stream is *not* split into two different paths driving two different quadrature modulators as in the case of QAM, but instead, symbols of 16 discrete levels are applied to a single suppressed carrier, vestigial sideband, amplitude modulator.

A small pilot carrier, used to aid in synchronous detection at the receiver, is inserted at the location of the suppressed carrier—about 310 kHz above the lower channel edge. For a given number of levels per symbol and for a given channel bandwidth, QAM and VSB have the same data carrying capacity: 4-VSB equates to 16-QAM; 8-VSB to 64-QAM; and 16-VSB to 256-QAM.

Proponents of 16-VSB argue that, due to the presence of a pilot carrier, and the use of synchronous detection in the receiver, the receiver is able to maintain carrier synchronization and sync operation even during the presence of noise bursts and ghosts. QAM systems, on the other hand, rely on the use of the modulation of the carrier for carrier and data synchronization. Therefore, with QAM, during noise bursts and ghosting the data detection process will often fail, causing data synchronization to also fail, and requiring the system to re-acquire sync. This typically takes a significant amount of time.

## Which way to go?

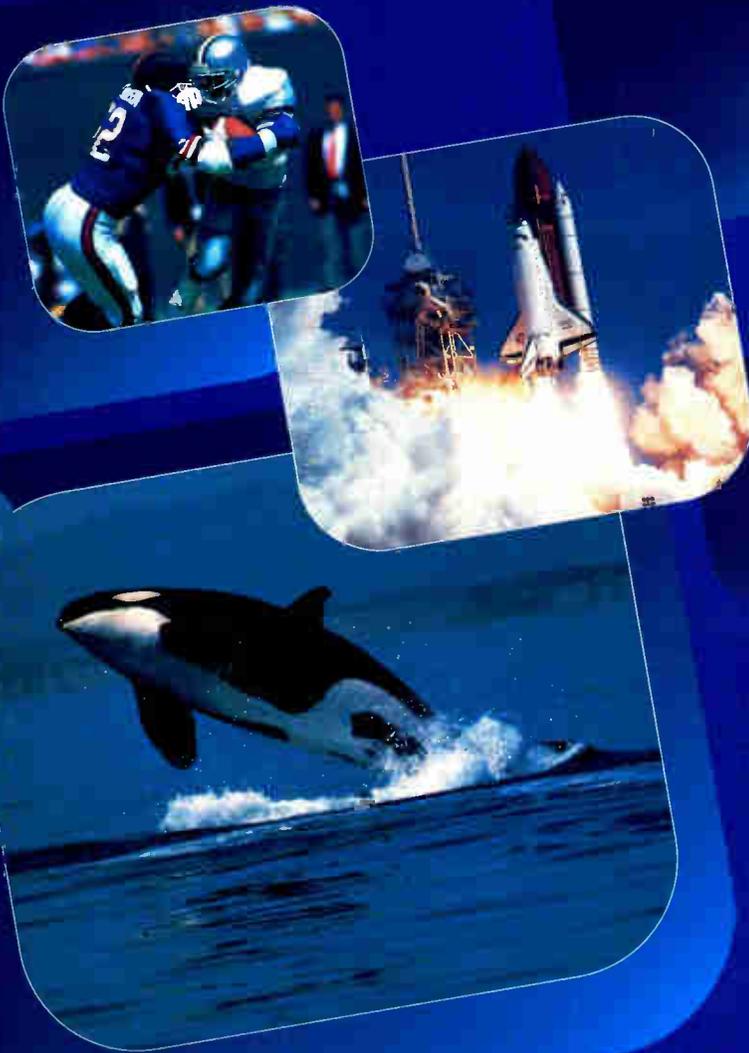
So which system is ideal for the cable industry? I don't claim to know the answer to that one! Back in March of this year, however, CableLabs issued a report, based on a multitude of different cable-related transmission tests, conducted in its own facility, that concluded: "The VSB system showed a slight edge over the QAM system in the low data rate (broadcast) mode and a greater edge in the high data rate (cable) mode."<sup>3</sup>

During these tests, the 16-VSB modem performed better than 256-QAM modem at lower S/N ratios and in the presence of phase noise, CSO and CTB. 256-QAM performed better in the presence of residual FM. I am convinced that the industry must eventually gravitate toward a single optimum solution—one that provides value to our subscribers through the optimization of bits/hertz throughput, enhanced interoperability, and improved quality of service at minimum incremental cost. **CED**

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# Making the perfect connection

## Examining the cable-node options

By Markus Giebel,  
Product Specialist,  
Siecor Corporation

With the United States moving toward a new information infrastructure, different types of traffic will be transmitted over the telecommunication network, including:

- ✓ Voice
- ✓ Video
- ✓ Teleconferencing
- ✓ Data

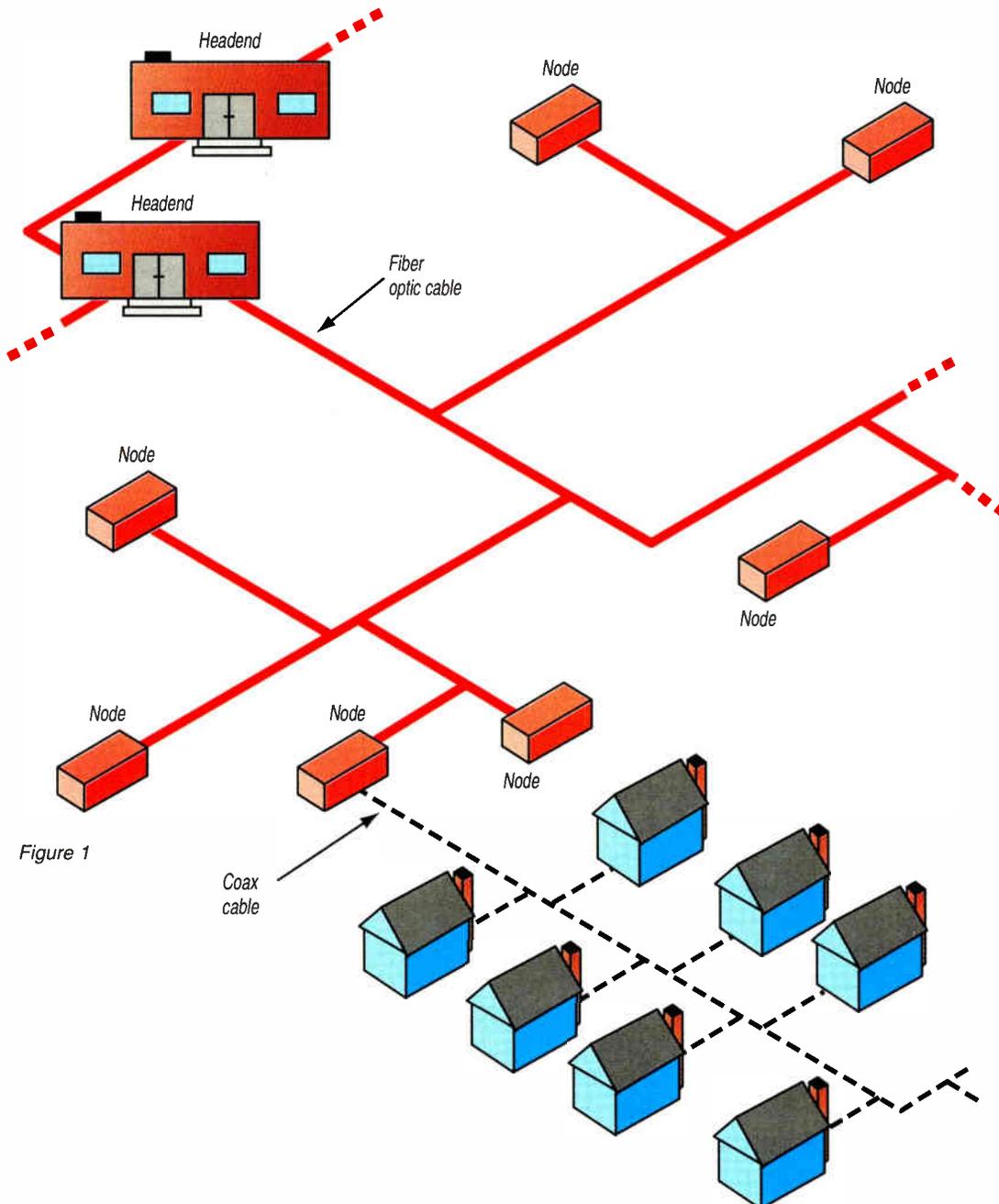


Figure 1

- ✓ Voice
- ✓ Video
- ✓ Teleconferencing

To distribute these signals, most cable television companies are building hybrid fiber-coax (HFC) networks, where fiber is used from the headend to the neighborhood. From there, a coaxial distribution cable delivers the signal to the home. This architecture is commonly referred to as fiber to the feeder (FTF).

The connection between fiber and copper is accomplished in aerial applications with a receiver node. The node converts the optical signal into an electrical signal. Future application nodes will also be capable of converting the digital optical signal into an analog electrical signal, and, additionally, handling and converting the upstream feedback from the subscribers. Approximately 80 percent of these networks are aerial, which shows the increasing importance of nodes in future systems.

Every node needs at least one input port (optical fiber cable) and one output port (coax cable). The connection between the optical fiber cable and the node is still one point of concern. This article focuses on emerging node applications for optical fiber cables and discusses different cable-node connection options.

### The CATV network

Network designers are searching for a network solution capable of supporting the information infrastructure of today and tomorrow. How the network is deployed depends heavily on the existing structure, the area, the population density, and the installation cost. The current trend in CATV network evolution is the FTF architecture, where every node serves between 80 and 500 homes. With this type of system, typically two to four optical fibers are installed to support today's bandwidth needs, and two to four additional optical fibers are stored inside the node for future system upgrades. This network architecture of a hybrid fiber-coax based network is shown in Figure 1.

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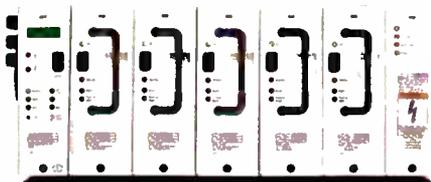
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### Network node connection imperatives

There are many requirements for properly designing the optical cable input port for nodes. In order to provide a 20-plus year lifetime, the following issues should be taken into consideration:

#### 1. Pull-out

Figure 2

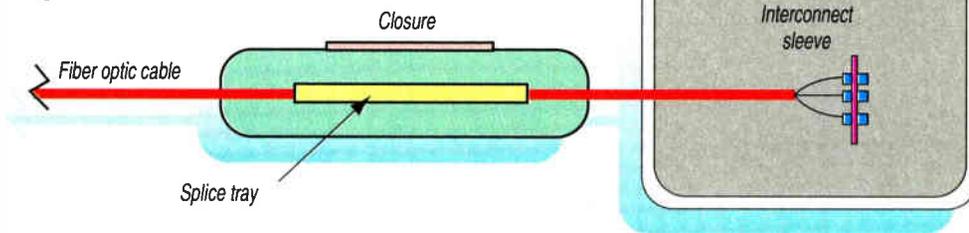


Figure 3

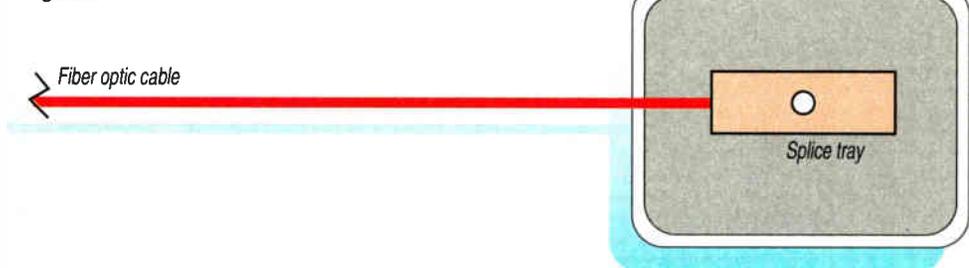


Figure 4

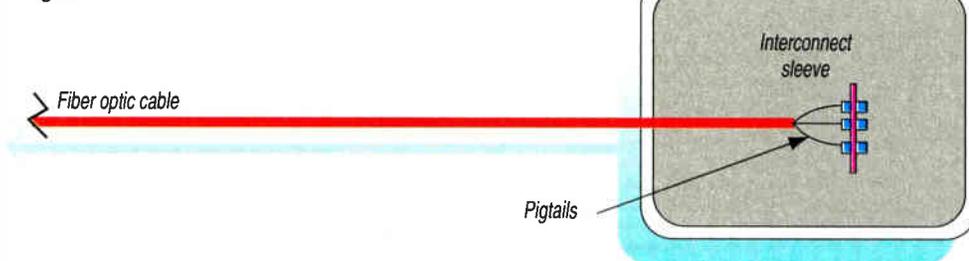
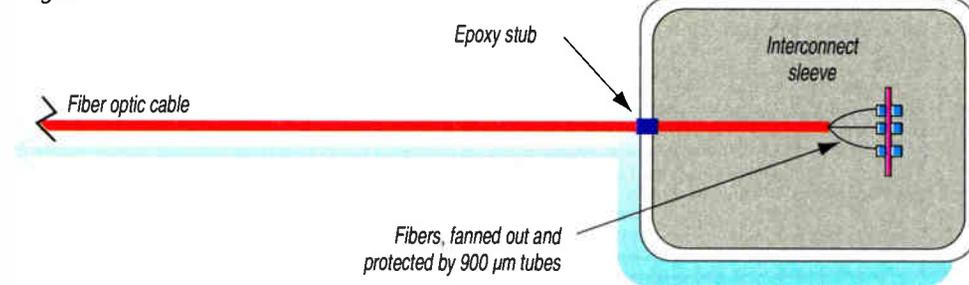


Figure 5



An input port should withstand the same pull-out forces as required for the input-output ports of closures. Current industry standards state 100 pounds pull-out resistance, which takes temperature changes, heavy storms and ice loads of the aerial environment into consideration.

#### 2. Water penetration

The cable assembly should prevent water penetration. Two different water penetration possibilities have to be considered: outside water penetration and inside water penetration. Outside water penetration occurs if the outside cable sheath-node connection is not sealed properly. The inside water penetration occurs with

damaged cable sheath and possible migration of the water inside the cable into the node.

#### 3. Jacket shrinkage

Jacket shrinkage is a well-known effect, where the cable sheath moves relative to the cable core. This movement is a result of different expansion coefficients of the optical fiber cable components. Anti-buckling elements must be properly secured to avoid potential damage to electronics and/or fibers.

#### 4. Fiber protection

Handling bare fibers is always a concern, especially if installations of different components (e.g. coax cable installation) and/or reconfigurations come into the picture. Therefore, fiber protection is necessary in order to ensure long-term mechanical and optical reliability.

#### 5. Optical performance

The high sensitivity of CATV signal transmission to insertion loss and reflection increases the importance of minimizing splice and connection points. Connectors are required to maintain the required flexibility and inter- and cross-connectivity of today's networks. To

support the signal quality, the implementation of high-performance connectors, such as Ultra Physical Contact (UPC) connectors, and the avoidance of additional splice points should be taken into consideration.

### Network-node connection

Many different solutions can be used for integrating

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nodes into the system. One of the following approaches is most commonly used:

**1. Closure-Pigtail Option**

A closure located at the node location terminates the outdoor cable. For the connection between closure and node, pigtails contained in a plastic tube are spliced inside the closure and routed to the node. Interconnect sleeves located in the node housing are used to accomplish the connection to the active equipment (see Figure 2).

**2. Splice Tray Option**

The unstubbed outdoor cable is routed directly inside the node and terminated with the use of a splice

interconnect sleeves inside the node housing (see Figure 4).

**4. Prestubbed Option**

The outdoor cable end is factory prestubbed, fanned out, and factory preconnectorized. The fibers are protected with 900 μm tubes, routed into the node and connected via interconnect sleeves inside the node. No splicing is required (see Figure 5).

**Analysis of connection options**

The first option requires a closure, splicing equipment and additional cable to integrate the node into the network. This solution can be taken into consideration if the node is located directly at a distribution point and a closure is already in place. For distances over 60 feet, Options 2, 3, and 4 are preferred because they eliminate the need for an additional splice closure. The second option routes the cable directly into the node and hardwires the optical fibers to the electronics. This hardwiring option eliminates interconnectivity and flexibility. Furthermore, it makes the disconnection of the optical fiber cable impossible without destroying the connection (coax cable installation and/or future upgrades can require the disconnection of the optical fibers).

Option 3 enters the node similar to Option 2, but instead of hardwiring the fibers to the node, pigtails are spliced to the fibers in order to regain fiber management and upgrade opportunities. The fourth option eliminates the need for closure and splicing, in offering a factory preinstalled package, including cable end termination, fiber protection and connectorization.

Only Option 4 does justice to water penetration (inside and outside water penetration), jacket shrinkage, and optical performance, by offering a factory-stubbed, fanned out, and preconnectorized solution. The cable is terminated with an epoxy stub, eliminating water penetration, and avoiding damage to electronics and/or fibers due to movements of the cable sheath. It further withstands a total pull-out force of more than 150 pounds additional to the strain relief fitting mechanism.

The fibers that are fed out inside the epoxy plug are protected by 900 μm tubes in order to provide a continuous optical path to the node and to eliminate additional splice points. The factory preconnectorization further guarantees the optical connector performance required.

After discussing different network node connection

Table 1: **Cost comparison**

	Option 1	Option 2	Option 3	Option 4
Labor hours used for installation	3.5	2	2	0.25
Material used	Closure, interconnect cable \$100	Splice tray (inside the node) \$0	Pigtails (see connectors) \$0	Factory-installed furcation \$105
# of Connectors	3	0	3	3
# of Splices	3	3	3	0
Total cost [\$]	\$537	\$250	\$340	\$210.50

Table 2: **Advantages and disadvantages of different network-node connections**

	Option 1	Option 2	Option 3	Option 4
Available cable length	≈60 feet	According to good installation practice	According to good installation practice	According to good installation practice
Splicing	Yes	Yes	Yes	No
Reconfiguration/troubleshooting	Yes	No	Yes	Yes
Strain relief	Depending on fitting and installation	Depending on fitting and installation	Depending on fitting and installation	150 pounds plus strain relief from fitting
Cable end sealing	No	No	No	Yes
Cable shrinkage	No	Yes	Yes	No
Future upgrate	Splicing required	Splicing required	Splicing required	No splicing required
Average cost per node connection [\$]	\$537	\$250	\$340	\$210.50

tray. The 250 μm fibers of the outside plant cable are spliced inside the node to 900 μm leads, which are hardwired to the active equipment (see Figure 3).

**3. Pigtail Option**

The unstubbed outdoor cable is spliced to 900 μm pigtails and routed inside the node. The connection between active equipment and pigtails is achieved by

imperatives and cable node connection options, an economical analysis can be used in order to compare the cost effectiveness of the four different options.

### Economical analysis

The following analysis gives an overview of the cost for the node integration to the system, according to the four scenarios described above. The cable connection evaluated is a six-fiber outdoor cable, where only three fibers are connected to the active equipment. The remaining three fibers are for future upgrade only, and are therefore neither spliced nor connectorized during the initial installation.

This cost comparison is broken down into four parts: labor, material, splice, and connector. Labor includes preparation and installation of cable, node and/or closure, and was quoted at \$65 per hour. Material takes into account the additional hardware used to complete the connection network node. For the splice cost determination, an average cost per splice of \$40 was used, not including rental or depreciation of the splice equipment. The connector plus connector installation was priced at \$30. Table 1 shows the cost comparison, based on the assumptions above.

The low-cost options are Options 2 and 4. Only Option 4 guarantees the flexibility of an interconnect system, which is necessary for the new information

infrastructure. Comparing Options 3 and 4, which both offer the required interconnectivity, leads to a price difference of \$129.50, in favor of Option 4.

Looking at the involved cost for future upgrades, Options 1 through 3 require additional splicing in order to integrate the spare fibers into the system. The node has to be disconnected from the messenger and lowered to the ground. Option 4 offers the opportunity to apply field-installable connectors to the already fanned-out fibers. This installation can be done at the aerial mounting point, and is therefore a time-saving and low-cost solution.

### Comparison

The information in Table 2 compares the technical and the economical aspects of all four options discussed above.

Providing a continuous path from the distribution point to the node seems to be the most cost-efficient solution for current and future applications. System reliability and quality increase with decreasing numbers of splice points.

Prevention of water penetration, avoidance of damage due to jacket shrinkage, and fiber protection must be considered. Therefore, the factory-installed prestubbed cable, discussed at Option 4, offers the low cost and the technically preferable solution. **CED**

**Providing a continuous path from the distribution point to the node seems to be the most cost-efficient solution.**

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# Cable struggles to Transaction age needs support build an OSS

By Roger Brown

**T**o date, much of the discussion surrounding the construction of full service networks has focused merely on the components of the network—ATM switches, SONET rings, digital set-tops—but completely ignored the fundamental infrastructure that has yet to be designed and implemented if these networks are ever to realize their full potential.

The key to unlocking the ultimate promise of the full service network—the ability to order what you want when you want it—is the creation of an entire new generation of operational support systems that are flexible, scalable and based on a truly interoperable platform.

These support systems, or OSSs, are completely foreign to most cable system operators, who have historically eschewed systems such as network status monitoring, chiefly because they were too costly and suffered from low reliability. But in the coming era, when networks will be expected to carry voice, data and video with greater than 99.999 percent reliability across traditional franchise borders, such support mechanisms are being deemed absolutely critical to success in a competitive environment.

As the cable network operations paradigm shifts from one based on subscription video broadcast to the masses to one characterized by transactions between users, content providers and the network operator,

cable companies such as Telecommunications Inc., Time Warner Cable, Rogers Cablesystems and Jones Intercable are discovering they have to re-think their approach to OSS.

For one thing, they've discovered they can't look to the telephony industry to provide a workable solution. It turns out that telcos are also faced with a similar challenge, for although they have had OSSs in place for years, these "legacy systems" consist of layers of proprietary software that have been simply stacked upon one another as new network devices and services were brought on line. Today, it is not uncommon for a single regional Bell operating company to have thousands of OSSs and hundreds of thousands of interfaces that had to be custom written to bring new calling features on line.

Telcos and cable companies should both look to the datacom world and the SNMP protocol standard to develop a common network management system, says Randy Hamilton, network management system engineering manager at First Pacific Networks, a supplier of telephony-over-coax systems.

FPN's network management product is based on SNMP, the leading system support protocol in the world. Hamilton says this is key because the standard supports open networks and complete interoperability.

Fortunately, leading MSOs, equipment manufacturers and software developers are beginning to focus on the opportunity the cable industry has to start with an almost-clean sheet of paper and not make the same mistake the telcos have made over the years. If concepts such as movies on demand and Your Choice TV, which will serve up a menu of TV programs any time a viewer wants it, are to work, a common messaging system must be shared by the set-top box, the network provider, the switches, the server and the billing system.

Similarly, if operators want to increase reliability and improve customer service, they need software systems that can monitor and talk to a wide variety of devices from a multiplicity of vendors. In the event of failure, they need to be able to re-route traffic, perform remote diagnostics and contact the nearest service technician with ease.

So far, pieces of this huge puzzle are beginning to be designed and some are even being put into place. But overall, the task isn't coordinated and some fear that unless standards can be agreed upon quickly, cable's competitive edge may be lost.

"I think generally that there's still an ignorance of the issue," says John Anderson, VP of project engineering at Rogers Cablesystems. "I'm sensing that there's a panic setting in on how to operate these new



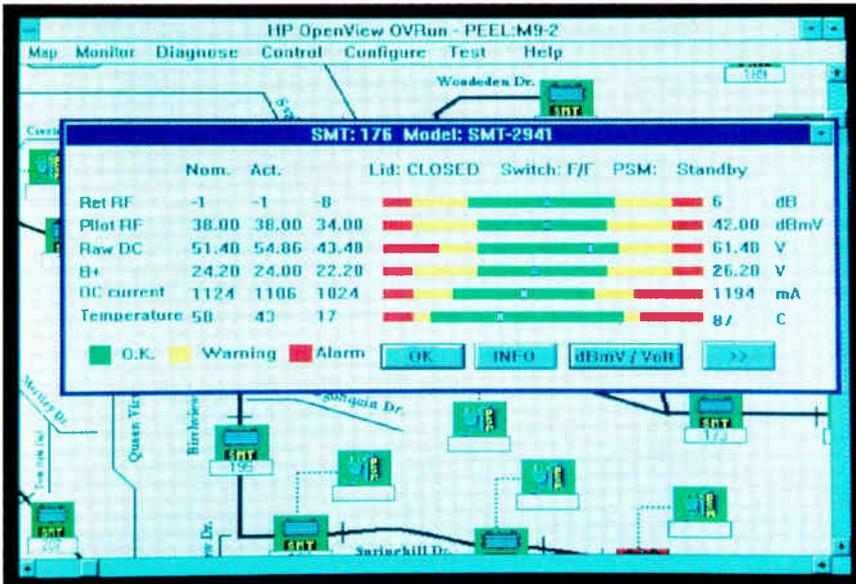
networks, because it's too late to implement management systems after the service is provisioned."

Anderson should know. It's taken him and his staff in Toronto about five years to custom write just the network management OSS—one that will eventually monitor about 10,000 network elements such as fiber nodes, amplifiers, headends and power supplies all

interactivity. Although it's a high priority, Anderson expects it to take between two and three more years to finish the job. To help speed it along, he'd like to see the NCTA, CableLabs or perhaps a consortium of big MSOs take the lead position, recommend some operating standards and push the technology forward.

"To continue (as it is now) with each vendor doing it's own thing without any coordination is ludicrous," he says. "Unless we start setting the standards, the telcos will."

Scott Bachman, VP of operations technologies projects at CableLabs, says the R&D consortium is aware of the need for such systems and is actively engaged in disseminating information about them as well as trying to define them. About a year ago, CableLabs performed a private OSS assessment study in which in-depth interviews were conducted with member companies to determine their needs. Since then, a series of tutorials and seminars have been held to further educate the operators.



**Rogers Cablesystems' network management system has broad capabilities to monitor hardware components at a detailed level.**

across Ontario. While that system now allows users to drill down deeply into the network to monitor its performance (see photo above), it's been a daunting task because of the widely disparate pieces of hardware that exist.

The next step is for Rogers to integrate that support system with other management systems to allow full

### Throwing out the old ways

Jones Intercable is arguably on the cutting edge of developing an OSS that covers customer support, network management and finance/administration. The Denver-based MSO intends to build an infrastructure around a central "data warehouse" in which all the customer records will reside. This relational database will allow other databases to be attached to it, allowing for distributed computing. This is in stark contrast to the cumbersome and complex telco model—in which databases are never shared—that results in the same customer record residing in multitudes of databases.

Jones has the luxury of essentially starting from scratch because it doesn't have an embedded network

## What is OSS?

Operational support systems (OSS) and business support systems (BSS) are two telco industry buzzwords used to refer to the infrastructures that have been put into place to monitor networks, provision new services, provide customer support and bill for services rendered.

According to Michael Pritz, director of business development for OSS at ANTEC, the CCITT has developed a set of standards, broken down as follows:

- ✓ Configuration management – the ability to troubleshoot the network remotely, without having to send service personnel just to find out which network component has failed.
- ✓ Fault management – A close cousin to cable TV's status monitoring, this system allows the user to perform diagnostics remotely.
- ✓ Performance management – in order to anticipate problems before they actually occur, the network is able to collect statistics and develop trend lines related to how the network is performing.
- ✓ Accounting management – the ability to create accurate billing statements for the amount of time the network was used.
- ✓ Security management – this system allows only authorized users to access the network.

Although these standards have been defined, Pritz says they are not well implemented here in the U.S. because most telephone companies have instead adopted a set of protocols developed by Bellcore, the research and development organization for the RBOCs.

In the telephony industry, estimates are that between 15 percent and 20 percent of a telco's operating expenses are related to the purchase, maintenance and development of OSS. That number may actually increase in the short-term because telcos are beginning to transition from their embedded systems to systems based on distributed and object-oriented open computing methods.

Along the way, they're beginning to latch on to some standards, including:

- ✓ SNMP. Simple network management protocol was developed by the Internet Engineering Task Force to simplify multivendor management by defining a method of communication between the network management software application (client) and the SNMP code buried in the device (agent). It defines basic actions, sets of information and a protocol to exchange information. Vocabulary comes from a management information based (MIB) which consists of variables, or defined objects.
- ✓ CMIP. Common management information protocol. Originally designed for OSI networks by the International Standards Organization, CMIP is actually transport independent. It is used to exchange network management information between management stations, but can also transport between an application and a station.
- ✓ CMOT. A modification that was made to CMIP to allow it to run over transmission control protocol/Internet protocol (TCP/IP) local area networks.
- ✓ TBOS. Telemetry byte oriented serial protocol was designed to transmit network status information, alarms and control points between network elements and the operating system software.



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**“We can’t afford not to invest in these systems if we want to compete.”**

management system and is looking at alternatives to CableData, its present MIS/billing supplier, says Greg Carlisle, VP of consulting services at Jones Interactive Inc. In fact, more than a year ago, the company put out an RFP under non-disclosure for a customer service management system. Although one was selected for a pilot test, in the end, however, Jones executives were disappointed to discover there was no system that met all their needs. Consequently, the company is looking to partner with someone to perhaps build its own.

The issue of whether to use centralized or distributed databases is a potential source of disagreement between operators, according to Curt Bilby, VP and COO of Arrowsmith Technologies, which presently offers a workforce management and fleet tracking system. Either way, interfaces will have to be written to integrate today’s technology into tomorrow’s network.

Arrowsmith’s existing Fleetcon system has already

sure all the network elements will fit together.

### The software integrator

While there appears to be a lot happening within certain aspects of management systems, there’s a shortage of vision when it comes to integrating multiple OSSs into a single, common set of instructions. That’s where Probita, a small Boulder, Colo.-based software house, hopes to make its mark.

The company gained its familiarity with the cable industry through TCI, for whom it developed transaction processing software when the giant MSO implemented addressability throughout all its systems. Probita is now proposing a new software architecture, called PROSE, that it says will ensure interoperability between different technologies and enterprises.

The first step in implementing the architecture is an operations gateway, or translator, to provide a common interface between networks, technologies and OSSs. This gateway is expected to be available by the end of this year, while a complete demo of the PROSE system architecture, including data structures and an initial set of agents and elements, is due out this autumn, says Bob Lund, technical director at Probita.

In the meantime, EDS hopes to take advantage of its computer prowess by helping telcos and cable companies provision new services quickly, without sinking a fortune into all-new hardware.

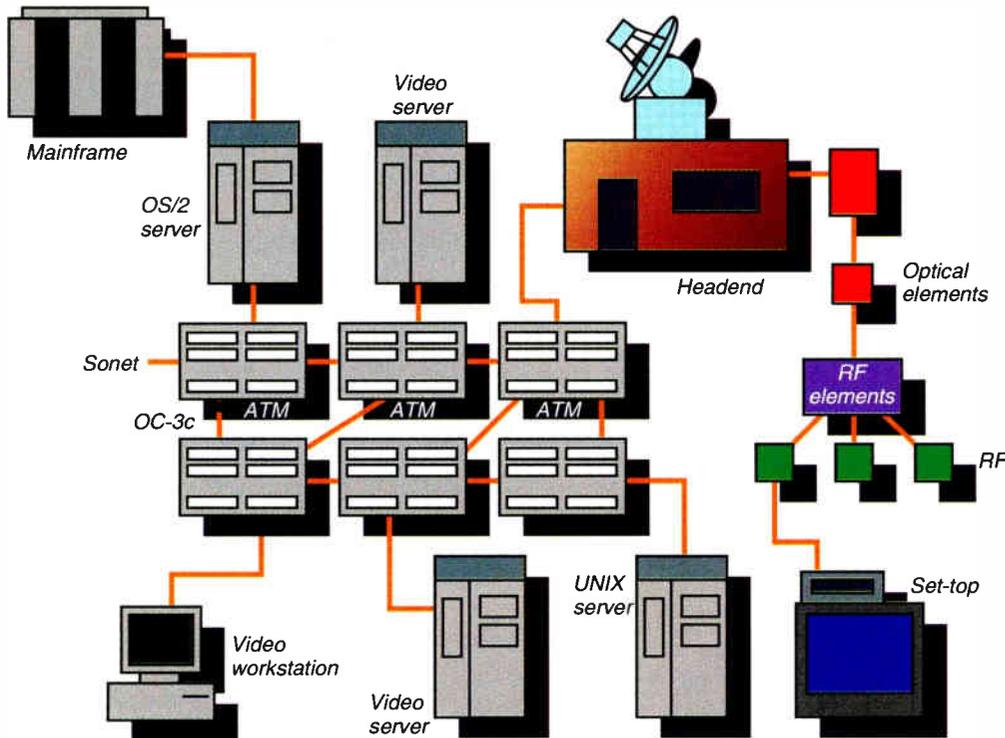
Through a suite of capabilities the company is calling “Harmonic Connections,” EDS plans to develop a system hub built around ATM and SONET standards that will integrate disparate systems yet allow portions of the embedded systems to be leveraged. This system will consist of six ATM nodes (see Figure 1) that will initially offer video on demand and multipoint video-conferencing in order to show the power the system has, says Jeff Dentler, VP of strategic alliances at EDS.

“We intend to show how to take current OSSs and generate new services in days and weeks instead of months and years,” Dentler says.

The system will feature dynamic service provisioning, real-time views of network resource utilization, network surveillance and dynamic service restoration.

Regardless of how it all shakes out, even the most optimistic forecast for the development of OSS is three to five years, because of the issues that have to be overcome and standards that must be settled. And, of course, these systems cost money, a scarce commodity now that the cable industry has been saddled with a 17 percent rate rollback. “But we can’t afford not to invest in these systems if we hope to compete in the future,” concludes Bowick. **CEO**

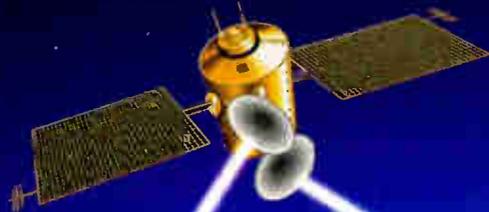
Figure 1: EDS six-node ATM network



been designed to be an “information hub” consisting of object-oriented software that ties together all back-office functions, including billing, inventory control, construction management, etc. “An executive information system is what we ultimately want to supply to the cable industry,” Bilby adds.

To fill in its missing network OSS, Jones sent out an RFI for network management systems recently. Twenty-three responses were received and since then the company has winnowed the list to eight finalists, says Chris Bowick, group VP of technology for Jones Intercable. In the interim, Jones engineers are making sure that the equipment vendors they purchase equipment from are aware of their overall strategy to make

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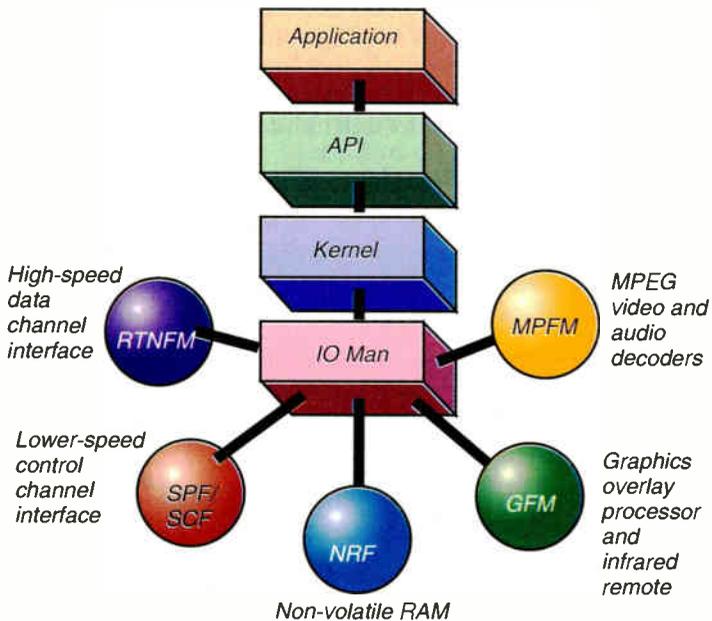
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## ◆ DIGITAL STANDARDS

**Microware's input/output configuration**



Microware, which produces operating software akin to what MS-DOS is to PCs, except that its products target the set-top box. Already, the company, founded by computer junkie and ex-college professor Kenneth Kaplan, has inked deals with set-top manufacturers including Philips, IBM, Eurodec, Goldstar, 12M, Zenith Electronics, Samsung, ICTV, Compression Labs, Kyocera, Divicom and Adaptive Microware. On the video server side, Microware is working with DEC, N-Cube and IBM.

Microware's DAVID (for digital audio/video interactive decoder) software works by providing real-time, multitasking housekeeping for all of the data and applications streaming in and out of future set-tops, says Kaplan.

"Basically, DAVID consists of an operating system and set of protocols that allow interoperable connections between various set-top boxes and servers, over various types of networks," including telco, cable and wireless, says Kaplan, Microware's president.

The real-time and multitasking aspects of the software are important, says Kaplan, because digital set-tops will have to manage so much disparate information. "The set-top will be managing broadband communication channels and accepting user input from the remote control, all the while it is running an application program and decoding audio and video, and running a graphics display—all at the same time," explains Kaplan.

Microware's primary interest is to provide software for TV set-tops and headend decoding devices, says Kaplan. Secondly, it hopes to "facilitate the development of large-scale video services" which provide data and command streams to subscribers' homes. To that end, Microware is developing a set of protocols and a layer of communications software to link the video servers with the set-top, independent of the server's own operating system and related system software.

Kaplan says he sees mixed levels of interest in digital set-top standards, largely depending on the specific agendas of the companies involved. "Manufacturers (of set-tops) are either very for it or grudgingly for it," says Kaplan. "Content providers are typically all for it, because they don't want to have to supply 15 different types of programs."

On the cable operating side, the outlook is equally muddled, says Ciciora. Referencing a National Show general session where a panelist suggested cable operators strongarm vendors into developing interoperability standards, Ciciora counters: "I saw that as a rather astounding statement, to which I do not agree. To say that operators should strongarm vendors into standards development is naive. Cable operators, for the most part, don't even know yet what they want."

**CED**

Organization	Organizing Group	Scope	Deadline
C3AG (Cable/Consumer Electronics/Compatibility Advisory Group)	EIA/NCTA USTA/SBCA?	Develop set-back decoder interface standard; cable ready receiver specs; 3rd party module interface	August 94
MPEG	Digital Storage Media Command & Control (DSM-CC)	Develop protocols to support various MPEG bit-stream applications in network environments	Draft Nov. 94 Committee draft Jul. 95
DAVIC	Digital Audio Video Council	International specs for open interfaces and protocols for interoperable digital A/V applications and services.	4Q94 or 1Q95
IMA (Interactive MultiMedia Assoc.)	Inter-Industry Set-top Summit (policy) Set-top Focus Group (technical)	Facilitate interoperability between set-tops and servers; develop set-top interface specs	Jan. 95
VESA (Video Electronics Standards Assoc.)	Special Interest Group: Open Set-top Standards	Define features and interconnections required for open digital interactive set-top box	1Q95
COS (Corporate Open Standards)	Special Interest Group: Set-top Box	Open interactive standards for digital set-tops	?
ISA (Interactive Services Assoc.)	Special Interest Group: Interactive TV	Telecom based Interactive Services: Audio/Video/Data	?
EIA	ATV Receiver Interface Subcommittee R-4.1	Interface and interoperability standards	?

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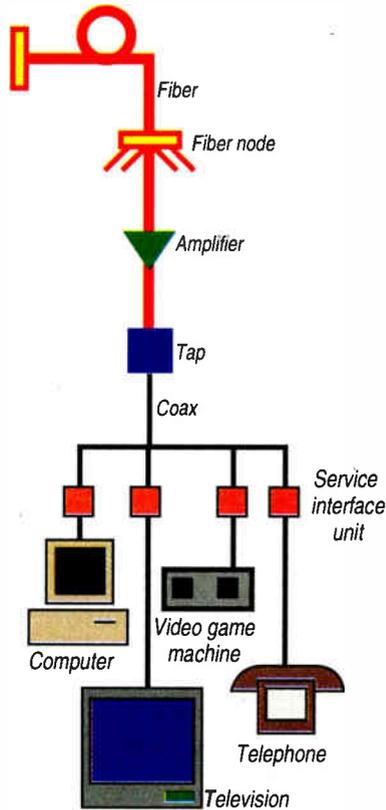
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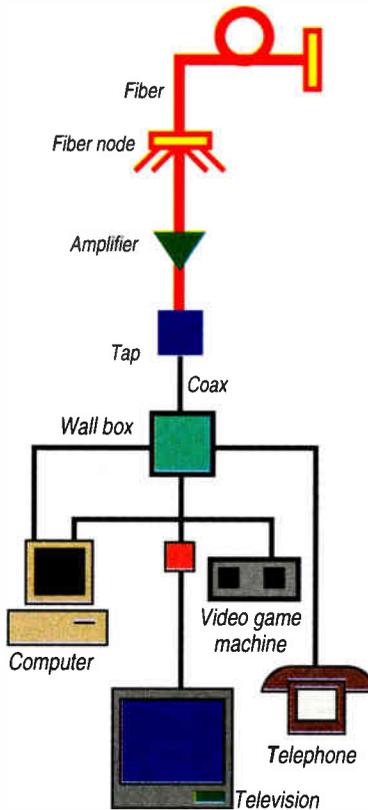
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Figure 1

1. Dedicated Service Termination



2. Multi-Service Termination (wall box)



*In the early phases of advanced service roll-out, a DST architecture may be sufficient, but as service penetration increases, incremental deployment of wall boxes and the transition to an MST architecture becomes most cost-effective, as the wall box centralizes common functions.*

# Laying the foundation for advanced services

## How to add customers & revenues

By Dilpreet Jammu, Strategic Infrastructure Development, and Jim McEachern, Senior Manager, Access Evolution, Bell Northern Research

With all the hype about the information superhighway—including the prospect of a 500-channel network and infinite video on demand (VOD)—cable operators are pondering investment strategies and deployment schedules for advanced services. With recent rate re-regulation, predicting future subscriber

needs while keeping an eye on the bottom line has made the decision anything but simple.

Some of the most vexing questions are: Which advanced services are the most likely to pay off now and in the long term? What will be the relative network impact of VOD, telephony and data? How will the work-at-home market affect the network? Should operators invest in multi-service termination (MST) or dedicated service termination (DST)? Is “dark” fiber (dormant fiber installed for future use) cost-effective? How much

bandwidth should operators invest in today: 500 MHz? 750 MHz?

To find the answers, we analyzed an existing cable network. Our goals were twofold: to upgrade the system in order to provide a platform for new revenue; and to decrease operation and maintenance costs. Against the backdrop of several emerging industry trends, we analyzed the effect on network cost of two different network architectures, level of fiber penetration, and provision of Digicast (e.g. Staggercast), video on demand, telephony and data.

### Industry trends

As cable operators prepare to deploy advanced services over their coaxial networks, five key trends have emerged: volume fiber deployment, increased connectivity through headend consolidation, capacity expansion to 200 to 500 channels, near-term open competition for both video and telephony services, and an increase in transactional and interactive services.

The CATV industry already is deploying fiber in volume for existing video entertainment services. Typical systems have dedicated fiber to about 500 homes and 750 MHz of spectrum (about 120 channels). In many cases, those systems are upgrades of much older systems with as little as 300 MHz of bandwidth and no fiber.

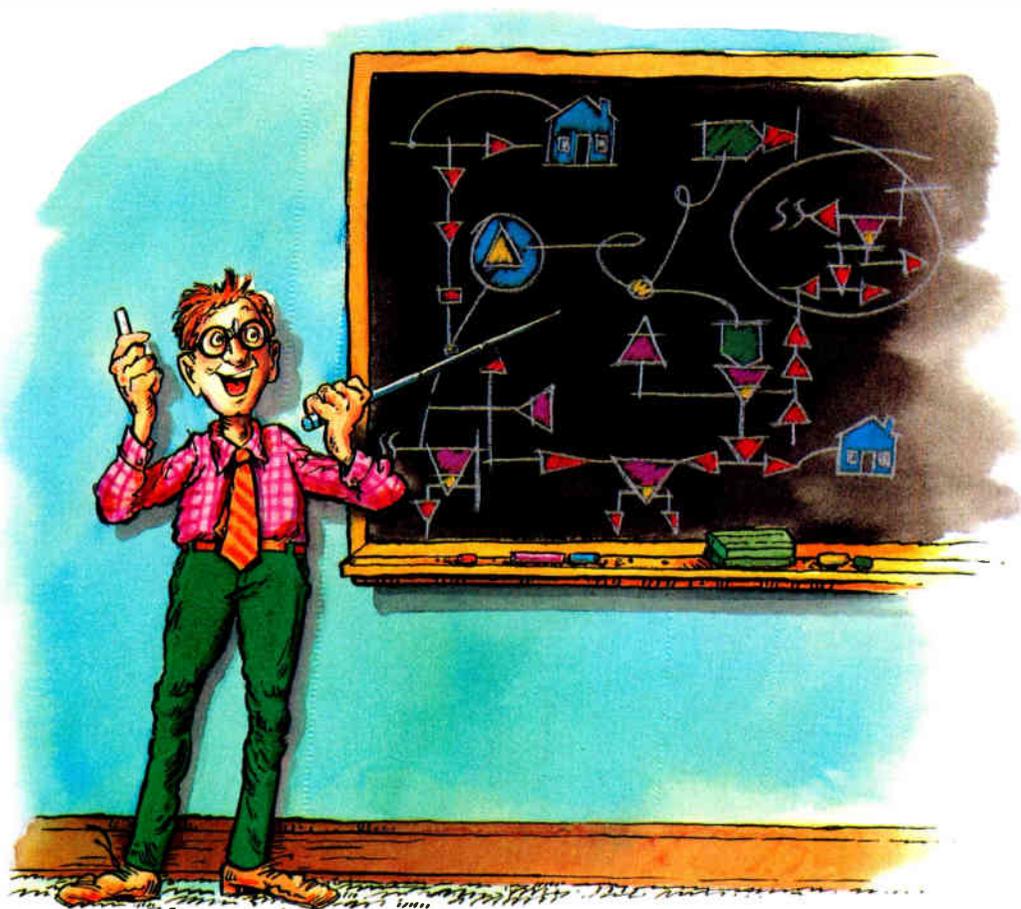
Historically, each CATV headend has been an independent entity. Over the past decade, with the introduction of fiber and digital video transport, cable operators have begun to establish fiber links between “master” headends and remotes. Since new services are consolidated on the master headend, rather than being duplicated throughout the network, reliability is increased and costs are reduced.

For the past two decades, capacity has been consumed as soon as it has become available at attractive rates. Most CATV systems have little unused channel capacity, and there is a long list of channels waiting to be carried when capacity becomes available. That trend will continue. By the year 2000, typical CATV systems will have a capacity of 200 to 500 channels.

Within a few years, we expect there will be full and open competition for both video and telephony services. The products to support that competition, by providing telephony over coax, are expected to be commercially available in 1995.

An increase in transactional and interactive services will change the character of the traditional, broadcast-oriented CATV network. While the key parameter for broadcast ser-

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## ◆ ADVANCED SERVICES

tralizes common functions such as bandwidth assignment, and common hardware, such as telephone line cards, thus simplifying network management and service evolution.

Where service penetration for interactive services is low, DST architecture has a cost advantage over MST, because it limits investment to devices subscribing to the service. As penetration increases, MST architecture potentially can save between 10 percent and 25 percent over DST because functionality—in the form of data cards, line cards, equipment housing, and public network access software—is not duplicated at each device. Upstream bandwidth management—in particular, isolation of upstream noise—becomes simpler and less expensive with MST architecture.

To identify the impact of advanced services, we selected one transactional service (Digicast) and three interactive services (video on demand, telephony and data). We assumed the primary Digicast service would be movies, with a monthly demand of 20 titles, available from a central source already digitized and compressed at 3 Mbps with 20-minute start times. They were placed above 450 MHz using a representative digital over analog

scheme similar to QAM and VSB. Only subscribers requesting Digicast service were provided with set-top boxes. We found that adding Digicast to the basic 750 MHz network approximately doubled the total network cost.

To go beyond Digicast services and provide interactive services such as video on demand, telephony and data, requires an investment of three to three and a half times basic Digicast over a 750 MHz network with DST architecture. Some of the incremental cost is due to duplicate functionality on each DST device, as noted above; some is due to reduced bandwidth sharing, as VOD subscribers can tie up a channel for extended periods of time.

VOD service requires a dedicated, high-bandwidth channel, upstream capability for control signaling and a large selection of content. We assumed a library of 2,000 titles would provide sufficient critical mass to justify VOD introduction. As the set-top box already has been deployed for Digicast services, we assumed that the same digital scheme would be used for VOD delivery. The major incremental costs for this service were the file server and the dedicated subscriber channel. To ensure adequate service delivery

and minimize costs, we provisioned 50 digital channels per 500 homes, to allow 40 percent of digital subscribers to simultaneously receive non-blocking service.

Telephony-based services, though low in bandwidth, require 64 Kbps upstream bandwidth plus a switched infrastructure and interfaces to the public telephony network. As with the file server, we spread the switch core and software costs over a large pool of subscribers. The cable network already has significant bandwidth; hence the incremental cost of delivering telephony services are the switch, switch interfaces, and the coaxial telephone equipment on the subscriber premises.

In analyzing the incremental cost of providing data services, we assumed that no more than 10 percent of homes would simultaneously require data connectivity, and that a 2 Mbps bit rate would satisfy the average user well into 1997.

When we looked at the incremental installed first cost for interactive services, we found that implementing data on a coaxial network may be less costly than either VOD (80 percent less) or telephony (30 percent less).

## Conclusion

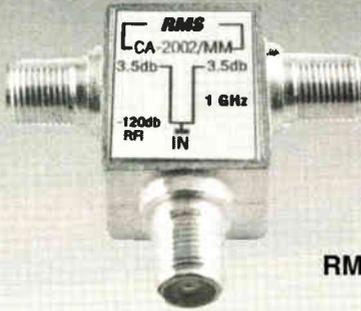
The decision of which advanced services to consider will depend on the regulatory and competitive climate, but the economics suggest that Digicast and data services may provide the highest initial and near-term revenue potential. Telephony and VOD will require additional network infrastructure investments, and additional revenues to finance the upgrade.

In analyzing a typical North American network, we found that a 750 MHz system will be a sufficient platform for most applications. To address the issue of segmentation, we found that a fiber-rich architecture with a fiber node serving 500 homes plus sufficient dark fiber to extend to 100 homes is more cost effective than deploying fiber nodes to 100 homes. Such a network will allow rapid deployment of high-potential Digicast and data services.

In the early phases of advanced service rollout, a DST architecture should be sufficient, but as service penetration increases, incremental deployment of wallboxes and the transition to an MST architecture becomes most cost-effective.

While there is no "magic formula" for deploying advanced services, we believe our case study has identified the key elements, allowing cable operators to plan with confidence investment strategies and deployment schedules that will take them to the 21st century. **CED**

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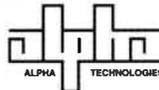
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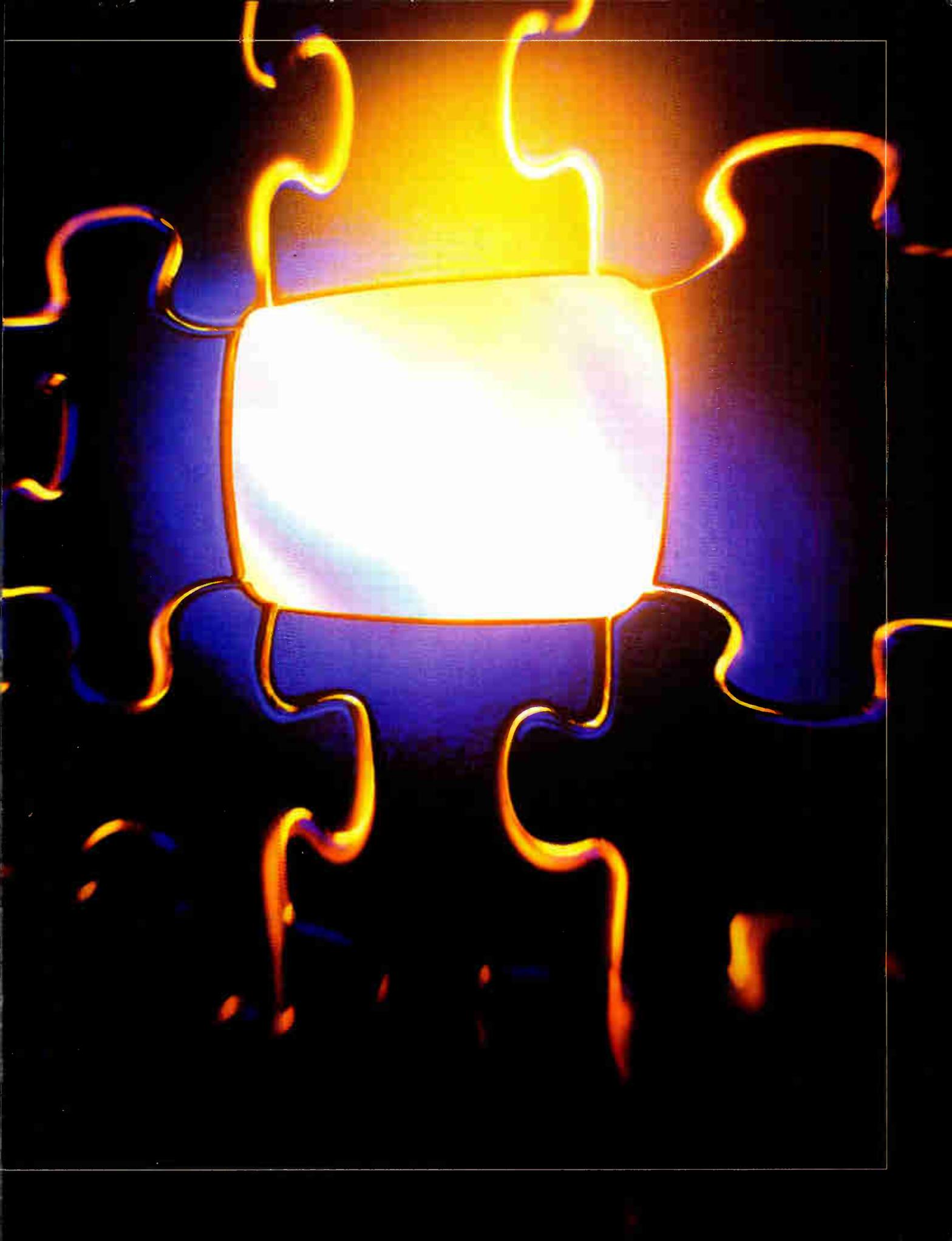
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# Future set-tops Sides chosen during Cable '94 show **begin to take shape**



## Major agreements announced during the 1994 NCTA Show

- *General Instrument licenses Microsoft operating software for future set-tops*
- *Zenith, Philips and CLI form set-top consortium, license DAVID operating system from Microware*
- *Hewlett-Packard licenses DigiCipher II technology from General Instrument for set-tops*
- *Comcast and TCI commit to purchase H-P digital set-tops*
- *Scientific-Atlanta, IBM and Apple form task force to develop multimedia operating system for future set-tops*
- *Rogers Cablesystems licenses Microsoft's media server software for interactivity in Canada*

Still smarting from actions taken by the Federal Communications Commission they consider punitive, cable operators nevertheless flocked to New Orleans in May to see the latest technology and potential new programmers gathered for the largest National Cable Show on record. The crowd of about 25,000 exhibitors, cable operators and telephone company representatives were treated to an upbeat environment that seemed incongruous with the recent rate rollbacks approved by the FCC.

Although some may wonder how an industry that has been slapped with a 17 percent reduction in revenue over the past year could possibly afford to upgrade plant and build advanced networks, vendors reported high attendance and interest in new products—especially those that enable cable networks to offer new, unregulated services.

But perhaps the real story of this show were the deals that were struck. This “choosing up sides” for the impending battle to build full service networks made significant progress on several fronts: between vendors and between vendors and operators.

For example, on the set-top front, Zenith Electronics, General Instrument and Scientific-Atlanta all had significant announcements about operating systems for future generations of product.

GI announced it has licensed Microsoft Corp.'s first-generation operating system software for set-top terminals, the initial step in what the companies described as a broadened relationship. Other co-developments include GI plans to incorporate Microsoft's Tiger Windows NT Advanced Server NT continuous media server software technology into its products, and, in the longer term, GI and Microsoft will work together on broadband distributed network architecture solutions based on ATM (asynchronous transfer mode) transport.

GI also inked an agreement with Puma Technology to develop wireless access software for the LinX module to its next-generation set-tops. LinX, based on Intel's X86 microprocessor and Microsoft's operating system, is being developed as a gateway device for multimedia applications and providers. Puma will develop a wireless “data transfer engine” to interface LinX to mobile computing products, including personal digital assistants, computer peripherals and other devices. The software will support wireless network access and navigation simultaneous with TV viewing, data transfer between mobile computers and LinX networks, and the use of mobile computers as wireless input/output devices. Puma will



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offer the software at retail for the computer industry; GI will bundle the software into all its LinX multimedia platforms.

Meanwhile, Zenith, Philips Consumer Electronics and Compression Labs solidified an agreement between those three companies that will result in the development and manufacture of the "Media Access" brand of set-tops by all three companies. These digital units, which will also deliver NTSC signals, will feature MPEG-2 compliant compression and 16-VSB transport. Additionally, the units will be driven by Microware Systems Corp.'s "DAVID" operating system.

Microware officials describe DAVID as a common operating system environment for interactive TV decoders, that can run on 68XXX, X86 and PowerPC microprocessors. It supports both network and local interactive applications as well as graphics and user interfaces.

Manufacturers including Philips, Zenith, CLI, IBM and ICTV are currently building DAVID-based decoder products that will be used in trials and network deployments this year, Microware officials said.

Finally, S-A, IBM and Apple announced that the three firms will form a technical and business team aimed at creating an open architecture operating system for digital multimedia set-tops. The goal is to build scalable and interoperable interactive television interfaces based on existing technologies from all three companies, including the ScriptX operating language developed by Kaleida, the IBM/Apple joint venture company.

Also in the set-top arena, Hewlett-Packard cemented its place as a manufacturer to be reckoned with by garnering two more purchase agreements from large MSOs. Comcast Corp., the nation's fourth largest MSO, has agreed to purchase an unspecified amount of "smart" interactive, digital set-tops from Hewlett-Packard as they become available. "We chose HP because of their leadership and knowledge in digital communications as well as their proven ability to deliver," said Thomas Baxter, president of Comcast Cable Communications.

In a separate announcement, TCI has significantly increased its order with H-P for digital set-tops, from the 100,000 units the MSO committed to purchase during last year's Western Cable Show, to 500,000 units. The analog-compatible set-tops will be installed in existing TCI systems.

H-P also said it has obtained a license from General Instrument Corp. to incorporate DigiCipher II into the set-tops it's building for the industry. The H-P set-tops also will employ an analog descrambling technology

designed by Antec subsidiary ESP; a 64-QAM (quadrature amplitude modulation) tuning technology from Broadcom, and Dolby Labs' multichannel audio system, Dolby AC-3.

Finally, Contec will have primary in-warranty repair responsibility for GI set-top terminals, Contec officials announced. The agreement stems from Contec's successful completion of a pilot program for in-warranty repair launched last year, said Contec officials. GI will now shift a larger segment of its repair activities from its Matamoros, Mexico repair facility to Contec's U.S.-based facilities.

### Rogers prepares to go interactive

The operators, while many were in New Orleans to kick the tires on new technology, also brought along their checkbooks. For example, Rogers Cablesystems announced it will bring interactive services, including entertainment, communications and information services, to its Canadian subscribers through a licensing agreement with Microsoft for the "Tiger" continuous-media server software.

In the agreement, Rogers will license the software to provide its Canadian customers with a fully interactive broadband network by deploying the system in cable headends and in-home receivers.

"This is an important development for Canada," said Colin D. Watson, president and chief executive officer of Rogers Cablesystems Limited. "This relationship with Microsoft helps ensure the Canadian cable industry will have early access to the world's most advanced technology for broadband services to the home."

Rogers will also participate in early tests of the Tiger software, company officials said, to gain a first-hand understanding of the technology. Applications on the Rogers network will likely include education, directory services, home shopping and government applications, in addition to entertainment.

In other contract news, Suburban Cablevision has chosen American Lightwave Systems to supply digital fiber optic hardware for a backbone network the MSO is building for its New Jersey properties. The backbone will replace one headend with two digital hubs. The ALS digital system is a transmission system that transports uncompressed video at 2.4 gigabits per second.

Also, Time Warner Cable has selected Philips Broadband Networks to supply more than 1,800 miles of 750 MHz RF distribution equipment for the system upgrade planned for Charlotte, N.C. The \$4.7 million contract calls for Philips to supply trunk amps and line extenders for the two-way interactive network,

which was scheduled to begin construction this month. General Instrument was chosen to supply its Cableoptics equipment to the upgrade, which will result in the system being partitioned into nodes serving about 500 homes each.

And Media General will buy ANTEC's Gateway Optical Receiver, a bi-directional, fully redundant-capable receiver platform designed to accommodate interactive voice, video and data transmission capabilities.

Mike Shafer, product manager for ANTEC's broadband transmission products, said Media General will use the gateway in the first phase of its plan to deploy network redundancy and bi-directional interactivity.

Finally, Channelmatic and AT&T Taiwan Telecommunications will distribute Channelmatic's automation equipment to cable TV operators in Taiwan, under a joint venture agreement. AT&T Taiwan Telecommunications Co. Ltd. is a joint venture company between AT&T and other Taiwanese partners which manufactures, markets, sells and services telecommunications products in Taiwan.

In a separate announcement, Channelmatic will develop digital audio/video automation products using Silicon Graphics's Challenge media servers. Product offerings including MPEG-based digital audio/video playback systems in scalable sizes from a few channels to "hundreds of channels" will be available toward the end of the year, Channelmatic officials said.

Initial applications in the Channelmatic/Silicon Graphics announcement include advertising insertion, movie playback and video on demand, and will include both existing and proprietary hardware and software. Integration of other components, such as MPEG decoder boards supplied by Scientific-Atlanta, will also embody Channelmatic's expanding product family.

Riding high on an unprecedented level of business success, several cable equipment suppliers announced significant manufacturing plant expansions. C-COR Electronics has broken ground on a new, 80,000-square-foot plant that will be located adjacent to the company's present location in State College, Pa. GI and S-A both also announced significant plant expansions during the show that will result in a doubling of capacity for those companies.

Sensing that the time is now right to form a new national distributor, Cable TV Supply has formed a limited partnership with global trading conglomerate Itochu International to create a full-line distribution company that will supply equipment and material to cable television

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**Riser-Bond's 1205T time domain reflectometer**

modular voice interface unit to its cable telephone system, company officials said. The unit, dubbed the VIU-1B, can be located inside the home or business and includes a four-hour battery backup option. It is microprocessor-based and serves as the cable telephone system's intelligent link between a subscriber's telephone and the coaxial cable drop. A multiple line version of the internal voice interface unit will be announced next year, FPN officials said, as will off-premise and network-powered versions.

Other news related to telecom came from Hewlett-Packard, which is developing an intelligent peripheral platform for telecommunications service providers. The platform was designed to facilitate voice interaction deployment, announcement playing, speech recognition, text-to-speech recognition and fax store and forward.

The HP intelligent peripheral platform, based on the company's Unix-based system computers, supports multiple open application programming interfaces (APIs), including SS-7, network management, and a voice API. The system is made up of two components: a voice-processing front-end and an application server.

The front-end manages the interface to the network and performs the voice processing. Scalable, the voice processor ranges from 24 ports up to "thousands of ports," said HP officials.

It can contain T-1/E-1, voice recording and playback, dual tone multifrequency (DTMF)

recognition and regeneration, speaker-independent speech recognition, text-to-speech and fax store-and-forward modules.

Also at the show, Philips Broadband introduced its Broadband Communications Gateway, a system which transmits telephone and data services to individual subscribers over a hybrid fiber/coax network. The system interfaces to the telephone company's central office switch and adapts the communications for transmission to the end user.

On the datacom side of the world, Zenith showed its line of high-speed modems, as did Intel via the GI booth. And there was good news for subscribers who own PCs and live within the service area of certain Media General, Cox Cable, Viacom and Comcast cable systems. They will be able to hook their PCs to the cable network and access new interactive Prodigy Services Co. products at speeds 50 to 1,000 times faster than their existing 9600 baud telephone modem connections.

The cable-based services feature almost simultaneous delivery of photographic and text information, said Scott Kurnit, executive vice president of consumer products, marketing and development for Prodigy. Other enhancements include integrated sound which delivers voice, music and sound effects within half a second of a keyboard request.

At an educational session, Kurnit lamented the slow data transmission speeds associated with the telephone industry's copper twisted pair last mile. "The bottleneck is the local telco," Kurnit said. "It's not an exit off the

information superhighway. It's more like a dirt path."

**Power supplies**

Alpha Technologies debuted a new broadband network power node, the BNPN, which powers telecommunications applications via a fully enclosed and multi-redundant unit. The BNPN provides uninterrupted AC, DC or combined AC/DC output with battery backup for short power outages or disturbances. An environmentally controlled battery compartment ensures maximum battery life and performance, Alpha officials said.

The company also unveiled its new status monitoring system, which collects power supply diagnostic information through a handheld, infrared retrieval unit. With the unit, technicians can verify correct power supply operation and anticipate potential problems by checking multiple test points on the power supply. The information collection part of the system displays test information via an LED. Fully electronic recording replaces manual logging forms.

Also new from Alpha is a 60VAC/48VDC power multiplexor, designed to accommodate



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both cable and telephony powering needs. Dubbed the Power MUX, the power supply facilitates remote powering of 48 VDC telephony equipment from cable networks and also conditions 60 VAC power from a cable trunk line to provide a 48 VDC, 4 amp output. For reliability, the multiplexor includes redundant AC input to ensure the integrity of the DC power furnished to the telephony equipment. Also, the multiplexor provides AC input and DC output status information, which can be cabled into a remote status monitoring system.

### Test equipment

New from Sencore is its new VITS inserter designed for cable operators to complete FCC-mandated cable television headend video testing. With the new Sencore inserter, operators can insert two test signals for testing proof-of-performance measurements on active channels, without service interruption to customers. Specifically, the unit enables composite and multiburst signal tests. Any of 12 test signals can be selected for VITS or full field operation, including differential gain and phase tests, percent modulation, S/N and hum.

Riser-Bond Instruments unveiled a new

compact, dual line time domain reflectometer designed specifically for cable TV. The Model 1205T features an "Autosearch" mode at start-up that places a waveform from the beginning of the cable up to the first fault. The unit also features waveform data storage and comparison software that provides both on- and off-screen storage as well as a RS-232 serial output that allows waveforms to be downloaded to a PC.

### Fiber optics

C-COR Electronics has announced it will design and manufacture its own line of optoelectronic components at its State College, Pa. headquarters, the company announced in New Orleans. Until recently, C-COR had an agreement with American Lightwave Systems to distribute the latter company's line of fiber components into the industry. The new line of gear, dubbed LinkNet, will feature laser diodes manufactured by Ortel Corp.

Speaking of Ortel, the company introduced two new DFB laser subassemblies designed to transmit combined AM and digitally compressed signals on the same laser. The AM signals are to be transmitted up to 550 MHz and digital signals are transmitted between 550 MHz and 750 MHz.

IPITEK announced an enhancement to its IMTRAN digital fiber optic transmission system, in that users can now add up to 20 high-speed RS-449 data channels per fiber. The system already includes a variety of modules including video, audio, RS-232, T-1/E-1 and composite IF, which can be mixed and matched within a 3 RU IMTRAN frame. With the enhancement, each RS-449 module can multiplex up to two channels, with room for up to 10 modules per frame. Distances cover more than 40 miles over singlemode fiber, and up to 2 km over multimode fiber, IPITEK officials say.

The IMTRAN system was designed to solve difficult network problems to create a fiber digital video ring network, which is capable of dropping and inserting signals at any site. Applications for the system include broadcast video, studio distribution, live video origination, distance learning, secure communications, and cable television headend or microwave replacement.

Alcoa Fujikura introduced a 68-fiber OPT-GW cable, particularly applicable for high density traffic networks such as the alternate access loops around metropolitan areas, company officials said. What makes it suitable for metropolitan loops is its high-frequency, wide bandwidth fiber optic waveguides, suitable for voice, data and image communication—

including high definition television signals.

Photon Systems Corp. has developed a new single channel digital transmission system, designed to deliver high-quality video and audio signals over singlemode optical fiber. Applications suited for the point-to-point or point-to-multipoint transmission include linking a studio to a headend, a sporting event to a broadcast center, a headend to a hub or a control room to a transmitter system.

The system transmits one baseband video and two audio signals up to 50 km, using digital filtering techniques to exceed RS-250C short-haul video performance specifications and delivers CD-quality sound, Photon Systems officials said. The system comes in rack mounted and portable units.

New from Augat is its ET (Easy Term) series fiber optic connector, designed with pre-loaded epoxy to reduce material costs. The dry epoxy used in the series ST, FC and SC multimode connectors has a longer shelf life and higher yield than liquefied epoxy, Augat officials said.

### Headend equipment

Scientific-Atlanta introduced a new 750 MHz version of its Model 6350 top-of-the-line television modulator here. Options include an integrated BTSC stereo audio encoder, video switch with automatic gain control to provide back-up and emergency broadcast requirements, dual IF loops for pulse-sync and sine wave suppression scrambling systems and IF automatic gain control. The unit can be upgraded to 1 GHz in the future, according to S-A officials.

Jerry Conn Associates took the wraps off two new products manufactured by Intelvideo, both of which reduce signal impairments. The Model CF digital co-channel filter reduces co-channel interference, random noise and other video errors. The Model HQ reduces impairments caused by impulse noise, dropouts, FM threshold noise, white noise and "other unwanted, random interference," JCA officials said.

New from Capital Networks Ltd., a Canadian automated information service provider, is its DiGiMATION digital video recorder, designed for playback, station automation and advertising insertion applications. The recorder uses JPEG compression to assist in production, master control, satellite playback automation and ad insertion.

And, Dolch Computer Systems unveiled its portable MPEG playback and compression "PAC" (portable add-in computer), designed to compress a full-length movie onto the hard drive of a portable computer. The system enables users to compress audio and video



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media in real-time, and simultaneously perform a multicast distribution and presentation of the stored media over T-1 telephone lines.

The system can be integrated with Dolch's integrated touch screens to provide video-on-demand services, information kiosks and training applications, said Dolch officials. Dolch's color PCs support 1.7 million colors of full motion MPEG video, Pentium and 486 processing technology and includes five open expansion slots.

**Distribution gear**

General Instrument introduced its Broadband Telecommunications Amplifier. The 750 MHz-capable amp features a 1 GHz passive design and can be upgraded with a fiber-optic receiver by changing the lid. HIGH New from Electroline Equipment is a drop amplifier, the DropAmp, designed to eliminate problems associated with in-home microreflections, which could disrupt future digital video signals.

The amplifier offers 35 dB of isolation between any of its four outputs, and features 1 GHz of bandwidth.

The new subscriber amplifier addresses the problem of microreflections and other signal discontinuities caused inside a consumer's home by multiple outlet, multiple connector, multiple television and VCR environments. For example, said Electroline officials, when cable subscribers "surf" on numerous sets, unwanted energy can travel back from the convertor, TV tuner or VCR toward the tap. In-home splitters with inadequate isolation can cause the reflected signal to impair signal reception on other televisions inside the home which also use digital decoders.

**Other news**

Also at the show, The Electronic Industries Association's Consumer Electronic Group touted its Extended Data Services (EDS) feature for televisions, which will enable cable programmers and broadcasters to transmit program and weather-related information in line 21 of the vertical blanking interval. The technology is based on the same technology as CaptionVision, the government-mandated captioning circuitry available in all new television sets with 13-inch or larger screens.

Specifically, EDS can provide information including program title, program description, show length, time remaining, weather alerts, time of day, network name and channel affiliation (call letters).

During the National Show, the local Public Broadcasting Service affiliate transmitted EDS data along with its regular television program-

ming to demonstrate how cable operators and broadcasters can use the service. The data appeared on an EDS-equipped television set in the EIA's booth.

Jones Interactive has digitized its popular "Jones Cable Television and Information Infrastructure Dictionary," and placed it on a CD-ROM cartridge. The electronic book marks the launch of a "whole new business," said Glenn Jones, CEO of Jones International Ltd., parent company of Jones Interactive. "We are creating a new visual literacy, and interactive multimedia projects represent the genesis of this goal."

The book comes in floppy disk and CD-ROM versions and features 2,900 terms encompassing cable television, satellites, computers, telephony, multimedia and information delivery services. Among the terms are 850 "hot links," which guide the user to seek out related entries. Linked terms are highlighted to allow movement among definitions.

Arrowsmith Technologies introduced its Fleetcon 2.0 at the National Show. A workforce management system designed for cable companies, it combines computer aided dispatch (CAD) technology with a geographical interface helping cable companies increase efficiency of their operations.

Features include UNIX work stations, outage detection capabilities, status monitoring, auto routing, hand-held signature capture, and icons providing user-friendly interaction between dispatch personnel and field technicians.

LSI Logic Corp. has developed a motion estimation processor (MEP) chip exclusively for General Instrument Corp. Motion estimation is the most complex and computationally intensive part of video compression, according to LSI officials. The MEP was developed using LSI's 0.6-micron Embedded Array technology which enabled all the functions of motion estimation to be integrated on a single chip. GI will use the chip for encoding DigiCipher II and MPEG-2 digital video. LSI described the MEP as equivalent in power to 560 Intel Pentium microprocessors on a single chip.

ACTV Inc. unveiled a new interactive point to multipoint distance learning technology, as Tele-Communications Inc. opened its J.C. Sparkman Center for Education Technology in Denver. Through its program development agreement with Turner Educational Services Inc., ACTV enabled students at W. Bruce Evans Junior High School in Washington, D.C., to receive an interactive version of CNN Newsroom.

The technology, developed by Gregory

Harper, allows programmers to enhance analog or digitally compressed distance learning systems with interactive elements personalized for individual students. Programmers can prepackage interactive lessons or the system can allow schools to integrate interactive segments into live programs. The technology also can provide individualized responses to each student's input.

And finally, Telecorp Systems has released the latest version of its System 9000 predictive dialer software. Release 2.1 adds features and functions to the dialer, which was designed for cable systems that make large volumes of outbound telephone calls. With the new software package, users can now perform automatic callbacks to potential customers who want the CSR to call back later. Additionally, new digital signal processing technology provides 95 percent accuracy in detecting answering machines vs. live voices, and fax, modem and other tones. Also, the system features call pacing, which more accurately predicts agent availability to prevent wait time between calls by using a statistical algorithm to determine dialing speed. The new system can now also accept a direct T-1 interface. **CED**



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## Woody named Member of Year; ANTEC given Chairman's Award



*Wendell Woody of Sprint/North Supply was chosen to receive the prestigious SCTE Member of the Year award for his contributions on the Society's behalf.*

The SCTE honored a few of its own during the Expo, bestowing the prestigious member of the year honor upon Wendell Woody and recognizing ANTEC for the company's contributions to the Society during the annual awards luncheon.

Woody, who has been heavily involved with the SCTE at a national level for several years, was chosen because his considerable contributions had gone officially unnoticed, according to SCTE officials. Among his past accomplishments: founding a chapter; serving as regional and at-large director; and stints as a Society officer, including a two-year reign as president during which he reorganized the subcommittee structure and fueled international growth efforts. Woody is presently an at-large director.

SCTE Chairman Tom Elliot, who was re-elected for another term during the Board meeting prior to the Engineering Conference, presented the Chairman's Award to ANTEC



*Diana Riley of Jerry Conn Associates formally inducted Bill Grant, Ron Cotten and Alex Best into the Society's Hall of Fame during the annual awards luncheon.*

chief John Egan to recognize the company's leadership and support via technical presentations at chapter meetings. ANTEC has more than 100 national members on its staff.

"I've known these guys for many, many years," said Elliot of ANTEC. "It's one of the craziest group of people I've been around. Virtually everyone there has fun. John (Egan) creates an environment where it's fun to work."

Also during the luncheon, three members were inducted into the SCTE Hall of Fame, including Alex Best, senior VP of engineering at Cox Cable; Ron Cotten, CEO of Engineering Technologies Group; and William Grant, the not-so-retired industry veteran. The three join Cliff Paul, Len Ecker, Dave Willis, Jim Stilwell, Rex Porter, James Grabenstein and Steve Bell in the Hall, which honors those who have made extraordinary contributions to the Society over many years.

Best, who joined the cable industry in 1966 and the SCTE in 1975, worked at Scientific-Atlanta for 20 years before moving on to Cox. He has long been active in the Society, producing videotapes, chairing the subcommittee on BCT/E exams and also serving on the Board of the Southern Cable Television Association.

Cotten, who began his cable career in 1964, is one of the SCTE's founding members and was the SCTE's first president. He has held jobs with Cablecom General and Daniels & Associates in addition to owning his own system and installation services company. Grant, who was honored as Member of the Year during the 1994 Expo, was employed at Jerrold before he became involved in constructing several cable systems. He's been a member of SCTE since 1972 and is author of "Cable Television," a textbook that explains cable TV technology.

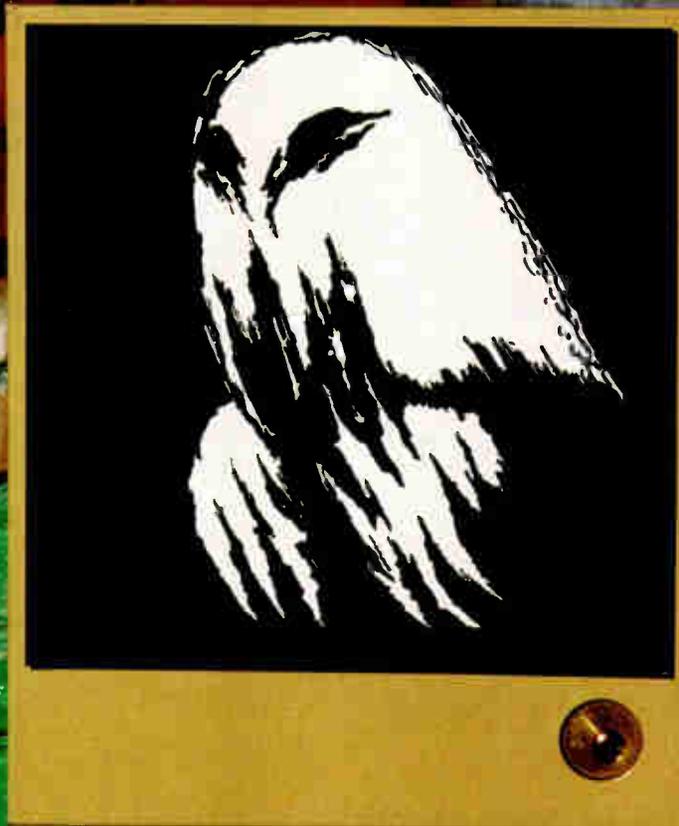
### Additional awards

Other award recipients during luncheon include:

- ✓ Sandy McKnight of Capitol Cablevision in Jackson, Miss., Mel Welch of Genesis Cable and Paul Harris of Ventura County Cablevision were given field operation awards. McKnight was given first-place honors for his device which automatically shuts off headend modulators during FCC technical tests.
- ✓ Personal Achievement Awards were given to: Dick Beard, Continental Cablevision; Robert Behrens and Mark Smith, Multimedia Cablevision; Keith Burkley, Time Warner Cable; Kenneth Covey, Jones Intercable; Patrick Kelley, ANTEC; Jack Sachs, Sachs Communications; and Alan Tschirner, American Cablevision.

In addition, the following people were elevated to senior member status: Al Dawkins; George Grills; Gaylord Hart; Anthonie Herrman; David Hollowell; Larry Langevin; Ronald Larock; Randy Midkiff; Dan Nofs; and Matt Stanek. Finally, the Floribama meeting group was elevated to chapter status, becoming the 74th SCTE chapter.

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## ◆ SCTE CABLE-TEC EXPO COVERAGE

As mentioned previously, Tom Elliot of Tele-Communications Inc. was elected to a second one-year term as the Society's chairman of the board during a meeting held prior to the Expo. "I'm proud of the growth the Society's experienced," he said. "This is an exciting time, but a difficult time with competition and convergence on our doorstep. For us in the technical community, this is a very challenging time as we determine what we want to be when we grow up."

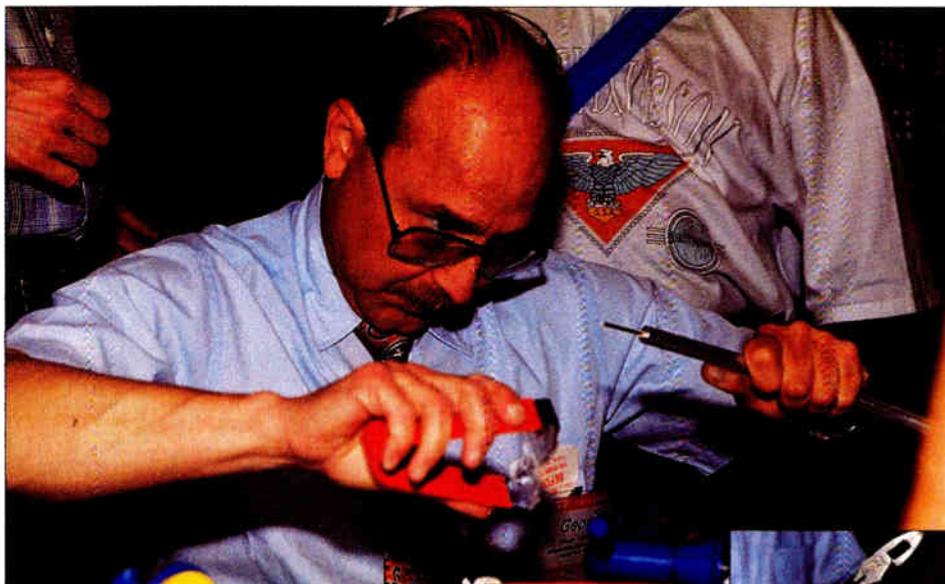
Other officers include: Michael Smith, Adelphia Cable, Eastern vice chair; Pam Nobles, Jones Intercable, Western vice chair; John Vartanian, Home Box Office, secretary; Robert Schaeffer, Star Cablevision Group, treasurer; and Wendell Bailey of NCTA was named additional executive committee member.

After the Engineering Conference, four teams of techs squared off against each other during the annual Cable-Tec Games during Wednesday night's reception, testing their ability to splice cable, operate signal level meters and other test equipment as well as answer questions during Cable Jeopardy. Teams from the Great Plains, Wheat State, Heart of America and Penn-Ohio chapters participated.

When it was over, the Heart of America chapter took top honors while the following individuals brought home the gold: Dale Kirk of TCI Cable of the Midlands in Bellvue, Neb. won in the splicing category while Marty Derry of the same system was best in test equipment operation; Al Wilke of American Cablevision in Kansas City won the SLM competition; and George Caramico of Adelphia Communications in Bethel Park, Pa. was high scorer in Cable Jeopardy. Caramico also took top overall individual honors. **CED**



**Vicki Marts of Multimedia Cablevision in Wichita reads a test meter during the Games competition.**



**George Caramico of Adelphia Communications in Bethel Park, Pa. inspects a piece of aluminum cable (above) as he participates in the Cable-Tec Games last month during the Expo in St. Louis. Caramico's attention to detail and superb manual dexterity (as shown in the inset photo at right) apparently paid off: he was named the overall individual award winner.**



*Continued from page 67*

### **Lectro Products**

New from Lectro Products is a localized powering cabinet, developed for use where multiple installations of the company's ZTT family of power supplies are used. The enclosure is weather-resistant and pre-wired, and comes with a fan-assisted flow-through ventilation system, for constant air circulation. Each of six shelves can support up to 280 pounds of equipment, said Lectro officials.

### **Mind Extension Institute**

New from Mind Extension Institute (MEI) are three video training courses, titled "The Technical Troubleshooting Challenge," "Customer Service Through Troubleshooting," and "DBS: The Inside Story." The latter is a two-part program comprised of MEI's June and July "Rethinking Cable for the 21st Century" video training series. It covers DBS equipment, programming, services and pricing.

### **NCTI**

The National Cable Television Institute has published a Spanish/English illustrated dictionary of cable TV and broadband terms, the company announced. The first section presents English terms with Spanish translations and definitions; the second section reverses that process.

In addition, NCTI has developed a new course, called "Fiber optic technician," that replaces its old course on fiber technology.

### **North American Cable Equipment**

North American Cable Equipment has added two in-line amplifiers, the LA-915LED and LA-2050LED, to its satellite and wireless television product line. The amps include an indicator light to warn technicians when voltage is low or nonexistent.

The LA-2050LED offers a 25 dBmV output with a 3.5 dB maximum noise figure; the LA-915LED offers a 28 dBmV maximum output. Both include standard F-connectors and are powered with direct current, so as to power LNBs and downconvertors, company officials said.

### **Northern Telecom**

New from Northern Telecom is its "FiberManager" access provisioning unit, described by NT as a "flexibility point" for drop splicing, branch splicing, reel end splicing, cable administration and rearrangement and loop-back, cable end splicing. Fiber bend radius is controlled to a minimum of 1.5 inches, NT officials submit. Cables can be added "at any time," up to one through cable of 216 fibers and up to six drop or branch cables with 12 to 96 fibers.

### **Qintar**

New from Qintar is an indoor distribution amplifier, designed for multiple dwelling units and part of the company's Cable Spec equipment line. The dual-hybrid amplifier is designed to operate at bandwidths up to 550

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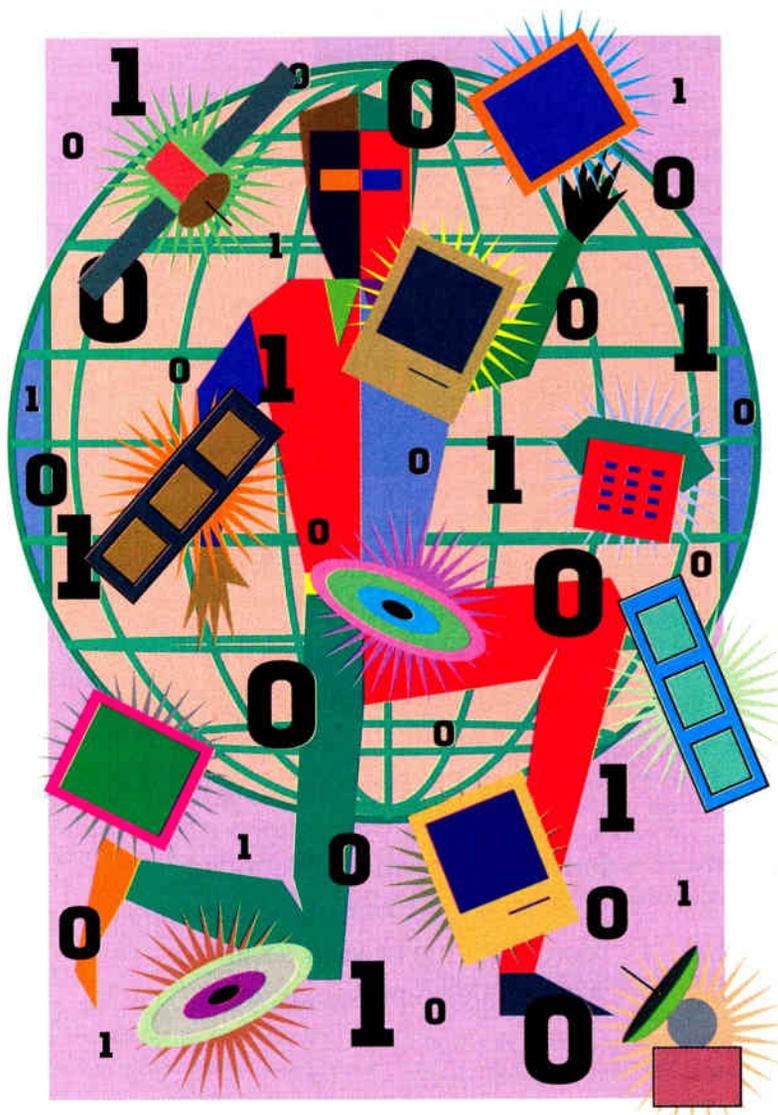
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# PC linkage key to multimedia future

Digital World shows new tools



By Fred Dawson

**A**n explosion in powerful new tools supporting low-cost development of advanced multimedia productions promises to revolutionize the strategic approach to network expansion in the cable and telephone industries.

This message came through loud and clear at the Digital World conference and exhibition in Los Angeles last month, where product demonstrations and speaker presentations left little doubt that network connectivity

to the PC will vastly alter the relationships between service providers and network operators.

"Computer technology is moving so fast that each generation of equipment is obsoleted every two years," said Jim Clark, founder and former chairman of Silicon Graphics Inc., in a speech opening the conference. "The television can't keep up."

Given the combination of computer technology in the creative environment, expanding bandwidth and low-cost PCs, "interactive media will move into this environment with increasing rapidity," Clark said, voicing sentiments that represented a significant change in his own thinking over the past year.

Where Clark had championed interactive TV as head of SGI and had left the company to take an entrepreneurial role in new services designed for computerized set-tops such as SGI is developing for Time Warner and NTT of Japan, now, he explained, he has quickly come to see that the evolution of the Internet and computer technology are pointing to a new paradigm, where exploitation of expanding bandwidth in networks would vastly alter the media environment from what it is today.

The upshot, he noted, is that he has formed a new company, Mosaic Communications Inc., joining with a growing cluster of start-up firms to tap the power of data communications by offering new tools to support development of multimedia services over the Internet. "The focus we're taking here concerns how people can put the network to use commercially for the consumer market," he stressed.

Clark's observations were supported at every turn in the halls and conference rooms at the Los Angeles Convention Center, culminating in a ringing endorsement of the importance of the PC connection to the cable industry in a closing speech by Richard Green, president of Cable Television Laboratories.

"We're seeing a need for this (computer) interconnection at the high commercial end, where banks, medical institutions, colleges, research centers and a host of other entities need a high bandwidth data link," he said. "And we're seeing it at the small office and residential levels as well, for everything from telecommuting to broadband access to on-line services and the Internet."

Green added: "We don't have to speculate about how readily people will use the PC versus the TV to capture the benefits of digital communications. We only have to respond to what the market wants."

What the market wants, already undergoing significant change as evidenced in the surging sales of CD-ROM players and titles, will soon be influenced by a new generation of multimedia titles founded on advances in development tools and driven by ever larger levels of capital infusion.

## Support tools

On the tool support side of the equation, the news at Digital World was that technology has reached a plateau where compelling verisimilitude and high-speed interactivity in three dimensions is eliminating



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**The impact of virtual reality was apparent in many new navigator systems on display.**

the clunkiness that characterizes much of first-generation product in multimedia. For example, Apple Computer Corp. introduced a new software system dubbed "QuickTime VR," which allows developers to turn single photographs into seamlessly connected vistas offering 360 degree viewing of realistic scenes.

As the multimedia developer shifts to different views of a particular setting, the software, operating in real time, adjusts the perspective so that all pieces of the picture fall into the relationships with each other that one would see from that angle in real life. The user can zoom in on objects in the scene and "move around" them for a complete look close up as elements of the background shift accordingly.

Similarly, sound in a scene can be arranged to change as the viewer scans the environment. In one Apple demo, a beach environment includes a bush where, on close viewing, one can hear birds chirping and a cafe at one end of the beach. Upon turning in that direction, the user picks up conversation and music; by zooming in for closer inspection, one hears these sounds at higher volume.

The developer using the Quick Time VR software does all the programming on a Macintosh computer without any special hardware attachments required, said Eric Zarakov of Apple New Technology. "You can combine real-world pictures and sound in games, travel tours, kiosk applications, you name it," he noted.

The first commercial title employing the new Apple

system is a "handbook" for exploring the Starship Enterprise from the StarTrek series. Developed by Simon and Schuster Interactive, a unit of Viacom Inc., the CD allows the viewer to "walk through" the spaceship, exploring all the nooks and crannies in a continuous stream of changing scenes, stopping at various points to "look around" much as a person does by turning around in a room. The developers used close to 15,000 photos from sets and models to create the CD.

**Virtual reality**

Digital World was awash in demonstrations of such next-generation product, some of which accomplished similar virtual reality effects using more expensive production technology than was shown by Apple. What the Apple demo indicated was that, soon, these very expensive, high-tech effects will be available to developers of every stripe, vastly expanding the base of producers who will be creating advanced multimedia product.

The impact of virtual reality technology was apparent in many new "navigator" systems on display, including one from Knowledge Adventure World that is meant to work with on-line systems over standard telephone lines. In this system, demonstrated by KA World president Dave Gobel, the user accesses various information categories through "rooms" and other "spaces" which can be customized to suit particular tastes. The system eliminates the text-based pull-down

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menus of standard on-line systems.

KA World is a spinoff of Knowledge Adventure Inc., a San Francisco-based multimedia production house which announced it has received major backing from motion picture director Steven Spielberg. The announcement pointed up another phenomenon which promises to have an important impact on the trend toward PC-based media, which is the ever increasing amount of capital being spent on multimedia titles.

Where multimedia titles have traditionally been produced at costs tabulated in the tens or, at most, hundreds of thousands of dollars, a number of projects, including one by Spielberg in cooperation with George Lucas, are tapping funding in the millions of dollars. Spielberg's new CD-ROM game, titled "The Dig," is reputed to be operating on a budget of over \$5 million.

The parade of celebrities moving to the multimedia platform has expanded rapidly over the past year, reflecting the fact that more powerful tools and computer processing power have created an environment for artists that is becoming hard to ignore. Among pioneers in the field on hand at Digital World were Thomas Dolby, Todd Rundgren and Peter Gabriel, all of whom have multimedia titles featuring their music and many things besides.

Gabriel, whose "Xplora 1" CD title was one of three prize winners at the Interactive Media Festival held in conjunction with Digital World, said it had become clear to him that the creative experience of working in the new medium was too compelling to be ignored by other artists. "You can do what people have been trying to do with music videos and much more without the time constraints and other limitations," he said.

In the "Xplora" CD, users can move in and out of musical performances to access material related to the content and can mix various elements to create their own "music videos," including new arrangements of the music. "I think that the way people will interact with interactive technology is going to change the way that we live and the way that we think," Gabriel commented.

## The Internet

Extravagant as that might sound, the range of "authoring" tools on display at Digital World in conjunction with the expanding base of multimedia-equipped PCs suggests that on-line connectivity could open a means of building markets for media product that is altogether different from today's centralized distribution system. The point was vividly demonstrated in the closing session by John Gage, director of the science office at Sun Microsystems Computer Corp., who accessed the Internet and took the audience to various points of connection around the world as part of his talk.

Employing Mosaic, the Internet search software developed for free distribution to the public by National Center for Supercomputing Applications at the University of Illinois, Gage conducted a free-associ-

tion tour over "the Net" to such points as a database of films located in Australia and a file of high school student autobiographies and observations found in Hillsdale, Minn.

The Hillsdale file contained reports on various events and phenomena, such as the impending comet collision with the planet Jupiter, where a student had pulled color photos from a NASA file to illustrate his report. This sent Gage on a brief search of the NASA file for more such photos, which quickly materialized in full color over the local telephone line as the audience watched.

The point, Gage said, was that the expanding reach of the Internet, now counting some 30 million users with over two million servers accessible via Mosaic, has created a threshold for spontaneous creativity and expression that can transform culture. "Enormous change is happening as a result of a single idea," he noted.

## Accelerate hardware penetration

For Sun and other manufacturers, he added, the challenge is to accelerate penetration of hardware as the cost of silicon "moves toward zero." By setting up storage systems at newspaper offices and other content-generating centers around the country free of charge, Sun is promoting digitization and expansion of content, which, in turn, encourages more people to acquire the hardware necessary to be service providers and as well as users.

Sounding a similar theme, Carl Malamud, president of Internet Multicasting Service, described three types of "radio" programs his firm is "broadcasting" over the Internet from Washington, DC, using multicast sound technology that allows packetized speech to be transmitted to PCs equipped with sound translators. Such programming, avoiding problems of spectrum scarcity, points to a day when video as well as sound broadcasts will be possible using very low-cost equipment at points of origin, he said.

"Right now the issue is bandwidth and interconnection," Malamud added, echoing remarks by many other speakers. "As the cable companies put in LANs, it's important that they think about interconnection."

Whether Jim Clark is right in asserting that the transition to widescale broadband access to the Internet will outpace digital connectivity to the television set remains to be seen. But it was clear from all that occurred at Digital World that the tools, services and networking navigation systems essential to revolutionizing the way services are created and distributed are in place.

CableLabs' Green was asked by a member of the audience when it would be possible for everyone to have a broadband pipeline for upstream delivery of multimedia information. "That's hard to estimate," he said, "but I would expect we'll see a 1.5 megabit/second pathway out of the home by 1998 or '99."

For the thousand or so multimedia developers on hand that day can't come too soon. **CED**

**The way people  
will interact  
with interactive  
technology is  
going to change  
the way we  
live.**

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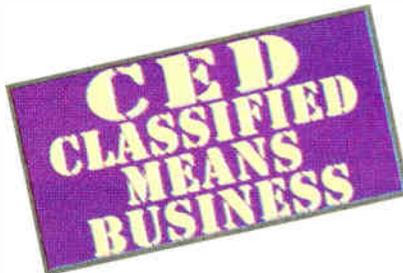
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# The information super-highway



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

The information superhighway. Is it the Holy Grail at the summit of a frenetically accelerating technological spiral? Will it finally achieve long promised social and cultural goals, enriching our lives and enhancing the quality of life itself? Will it solve our desperate educational shortcomings? Who pays for it?

No one should be deceived by the hype suggesting that the information superhighway is a magic silver bullet. By itself, it is not an information provider. It does not engage in research, undertake scholarly studies, make movies, write books, or create art works. It is not a teacher, nor a social worker. It does not even entertain. The information superhighway is nothing more nor less than an elaborate and sophisticated electronic pipeline.

Nevertheless, it could be well suited to provide an extraordinarily useful communication linkage between an almost unlimited store of information, already existing and still to be generated, and users who have the interest, motivation and means to make use of it. Simply building the network will stimulate the development of information databases. Potential commercial, government, and military users already await impatiently. But, achievement of social, cultural and educational goals is not at all assured.

## Distance learning

The Mind Extension University (ME/U), created from the dreams and wisdom of Glenn Jones (Jones Intercable), is a superb example of both the potential and the limitations of distance learning based on enhanced communication networks. ME/U's primary focus and greatest success has been in the realm of degree granting higher education, along with individual personal and professional development.

Such students have to be motivated in order to overcome the twin hurdles of tuition and time for study. ME/U has assembled an impressive set of information providers for this program, including state universities, the Library of Congress, American Federation of Teachers, National Alliance of Business, Apple Computer and many others.

An important but more difficult goal of ME/U is to provide "direct student instruction and staff development for secondary schools." Interactive instructional programming is provided by several educational organizations such as the TI-IN ("tie-in") Network, a not-for-profit spin-off from the federal Star School program, the foundation supported Achievement Television in California, and the Massachusetts Corporation for Educational TV. The focus of the K-12 (kindergarten to twelfth grade) program is on foreign language, staff development, and student enrich-

ment.

The crisis in education is deeply imbedded in our national culture. Developing motivation and discipline, especially (but not only) at the secondary level, may be beyond the reach of distance learning without major reshaping of attitudes both at home and in the workplace. The information superhighway cannot help much to teach integrity, respect, dependability, civility, discipline, patience or honesty. When parents forsake this responsibility, we are in deep trouble.

Even with the help of the information superhighway, the success of distance learning will most likely be limited to reasonably motivated students whose attitudes are already quite well adjusted. "You may bring a horse to the river, but he will drink when and what he pleaseth" (George Herbert, 1651).

## Who pays?

The scramble for position on the information superhighway makes it quite clear that entertainment will be the major source both of programming and revenue. Does this forebode a surfeit of raunchy television and video games? David Gelernter, an associate professor at Yale, warns that "the information highway presents us with our greatest opportunity in years to rededicate ourselves to the principle of Mediocrity in Television."

The prospects of economic viability for interactive and transactional services on the information highway are much brighter when predicated on obtaining revenue from information providers and advertisers than from subscribers directly. Home shopping, for instance, pays commissions to the cable operator on completed transactions in return for a slot on the highway. Similar arrangements are likely for home banking, ticket sales, and access to gateways. In the end, of course, the consumer pays for the services rendered by the information provider, but only indirectly for the use of the network.

## Direct from artist to home

Alan Deutschmann (Fortune, 2/17/94) paints a glowing picture of movies, concerts, recorded music, literary works, and even textbooks delivered directly from the artists to the consumer's home. No longer would Hollywood producers, Tower Records and bookstores control access to artistic productions. Creative artists could cut their own deals with electronic warehouses to store their works and release them digitally on demand to individual consumers through giant servers.

The profitability of such entrepreneurial development is not hard to project. Education and enhancing the quality of life present a much more daunting challenge, with profitability that can only be called elusive.

Developing the pipeline is the easy part. Whether it enriches or contaminates our cultural heritage is a critical social challenge in which technology is quite neutral. **CEd**

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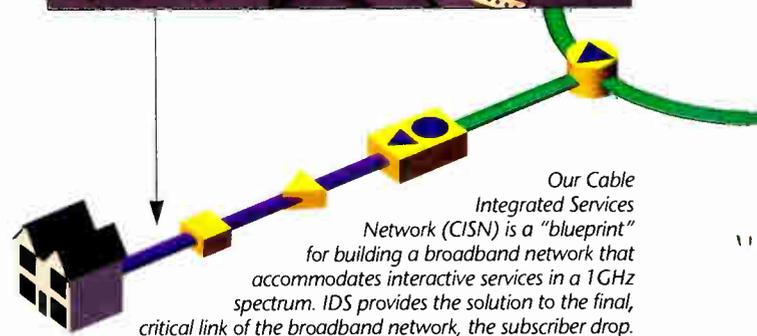


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