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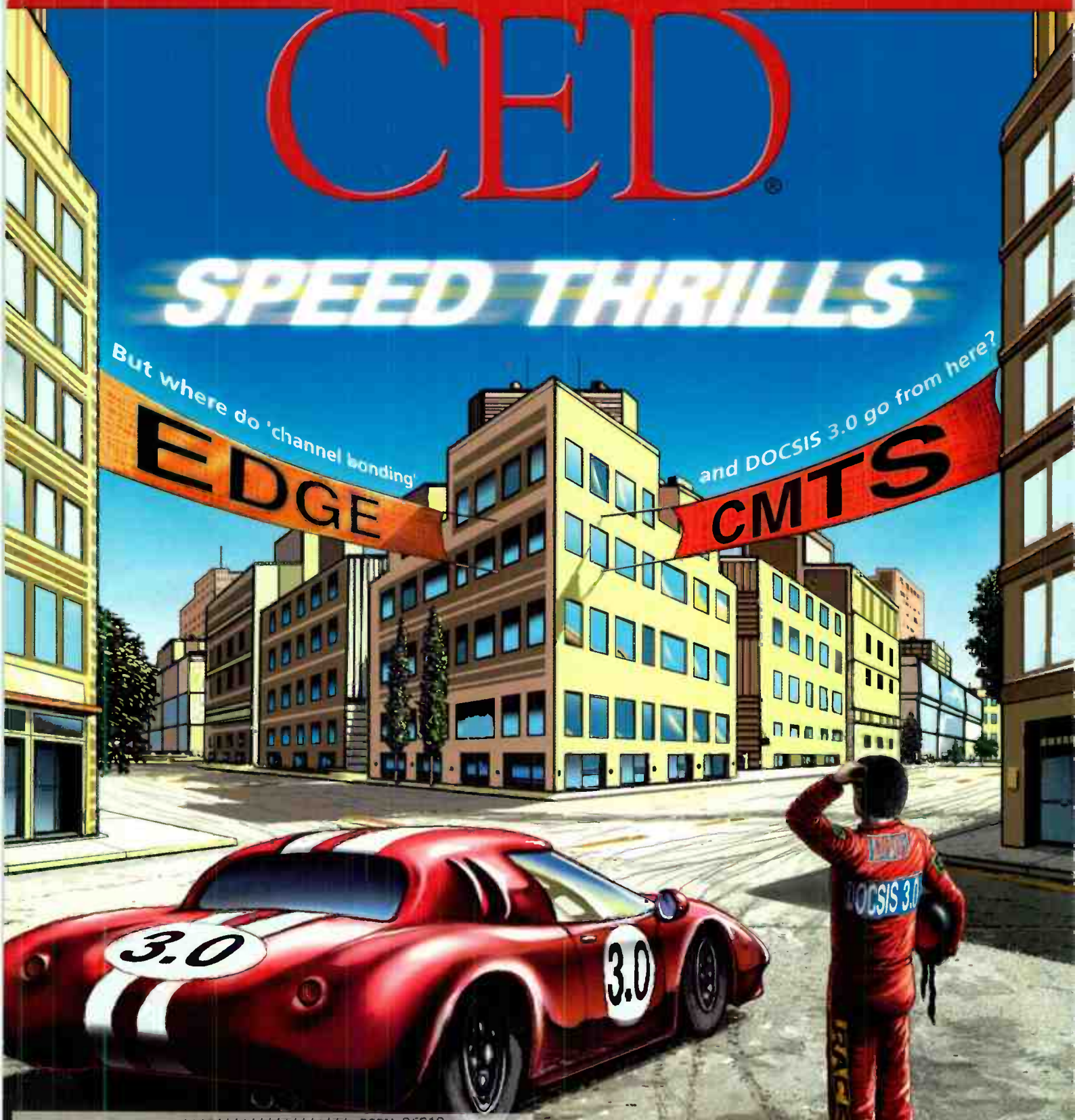
CED

SPEED THRILLS

But where do 'channel bonding' and DOCSIS 3.0 go from here?

EDGE

CMTS



- The Yin and Yang of OCAP
- Powerline broadband seeks electrifying results
- Inside: VOD deployment wallchart

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The best of both worlds

Since late 2003, the $50 digital brick and cable's eventual migration to an all-digital environment has been all the rage. Starting with Charter's digital simulcast deployment in Long Beach, many other operators will soon follow suit in many markets this year. It's already the leading candidate for *the* cable tech story of 2005.

The benefits are easy to pick out: it gives cable a migration path to an all-digital platform, which, in turn, enables operators to reclaim valuable bandwidth for HDTV and other new services. Plus, it takes a long-used DBS marketing point (its all-digital picture) off the table.

Despite all of this all-digital talk (and action), it's not like the cable industry is getting ready to kick analog to the curb like an old, moldy, beer-stained recliner that even a fraternity house wouldn't welcome. The industry should–and likely will–hold on to it like a coveted vinyl copy of "Led Zeppelin IV"–not because of its sentimental value, but because it is something many consumers still find useful and are comfortable with. And telling a consumer that a digital box gives them access to free video-on-demand content and a spiffy interactive program guide still might fall on deaf ears regardless of the value proposition.

It's not like the cable industry is getting ready to kick analog to the curb

JEFF BAUMGARTNER, EDITOR

The "lifeline" label typically is attached to voice services. But it's definitely time to start thinking about that term in the video context, as well–a trimmed down, analog video lifeline product available to all cable outlets. The cable industry is fond of saying video-on-demand is a key differentiator against DBS. Analog video is another. It's something that DBS won't do and can't do.

But, years from now, when cable begins to reclaim that analog spectrum for digital services, the tricky part will be to figure out what channels will make up that lifeline. Is it only the broadcast channels and must-carries? 15 channels? 30 channels? More? That debate is just getting started, but some of the industry's top engineering talent took a crack at it in our annual CTO roundtable (check out this month's *InDepth* section for more).

But consumers can provide some interesting answers, as well. "DSL Reports," a blog of broadband news and gossip, is a good place to start. though many who read it and respond to it are more tech-savvy than the average consumer. Their recent opinions on the value of an all-digital video cable product varied greatly.

One reader, a Cox subscriber, said he would order digital cable if channels like TLC and Discovery were offered in the digital domain. "I'll pass on watching those in nasty analog. Until then, I'll stick with my dish."

But another reader said analog was the "only reason I haven't gone satellite," noting that he's perfectly happy with expanded basic.

So, how can cable achieve the right balance and make everyone happy? That may be an impossible task. But, if there's enough bandwidth to go around, cable could find itself in the unique position of being able to offer the best of both worlds.

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features

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UPFRONT

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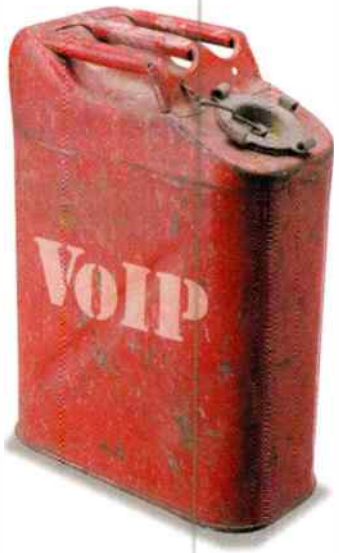

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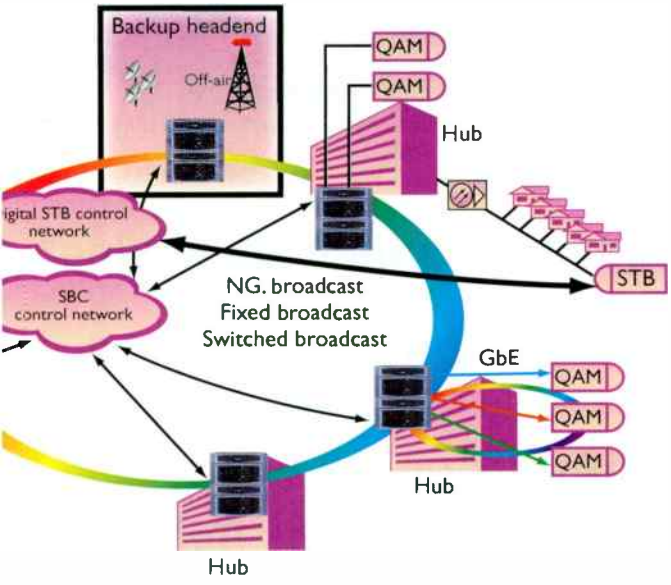

ALWAYS ON

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C-COR Access and Transport

C-COR Access and Transport Group: Clearing a Profitable Path to IP Services

Transitioning to an all IP-based world of services, and producing the impressive revenues and cost savings these services are expected to generate, is not only gaining momentum, but also revolutionizing the way we communicate.

VOD, VoIP, the advancement of packet-based technology and a wealth of on demand services are driving IP deeper into the fertile commercial and consumer markets.

VOD, for example, is currently available to 20 million homes, and by 2009, that number will nearly double to 39.2 million homes, with $6.1 billion in revenue by 2014, reports Kagan Research. VoIP is projected to be in 17.5 million households by year-end 2008, according to the Yankee Group. In addition, In-Stat Research reports

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that 30 percent of the firms it surveyed are interested in, or planning to adopt IP telephony solutions in 2005.

With the stakes rising, the safe, efficient migration of IP technology to complex, sophisticated networks is now a daily mantra for cable operators, telcos and a burgeoning list of IP service providers. It's also the mandate of the new C-COR, cable's partner of more than 50 years and a company stepping up to the responsibility of ensuring a seamless transition to IP-based networks. "As the world moves to on demand-driven IP networks, transitioning to an IP-centric architecture, safely and easily, becomes crucial. Our mission is to lead network operators through that transition," says Ken Wright, CTO of C-COR.

A key to that transition is C-COR's Access and Transport Group, one of three business units comprising the company's core set of products and services—Solutions Group, Network Services and Access and Transport.

"We're supplying the components to build the network infrastructures that will offer profitable on demand services. We saw this transition to IP coming several years ago, and we're ready for it," says John Caezza, president of C-COR Access and Transport.

Three Synergistic Business Units with One Mission

It was that vision that prompted the company to create the three synergistic business units, each providing crucial services and products that will allow the company to fulfill its mission of simplifying technology, facilitating its implementation and enabling operators to confidently manage change wherever and however they serve increasingly demanding subscribers.

"Customers like our three-group strategy with hardware, software and service offerings that can work as standalone solutions or with each other as integrated, cross-functional solutions to meet the specific and often unique needs of each network operator. Working together, our business units can offer operators something at every stage of the network lifecycle," Wright says.

Two recent acquisitions have positioned C-COR as a leader in the on-going migration to IP-driven networks: Lantern Communications, an innovator in Metropolitan Area Network (MAN) packet-based transport solutions with its Multi-Service Packet Switch (MPS) system; and Optinel Systems, with its flagship PLEXiS™ platform, which combines Gigabit Ethernet transport modules with DWDM and CWDM hardware for a true server-to-hub transport solution.

"These two additions give us very advanced digital transport capabilities and allow us to provision and manage networks more precisely than any other company," Caezza notes.

The addition of MPS enables the scalable deployment of carrier-class, QoS assured Ethernet services across MANs, and is considered a key component to C-COR's digital video transport product line as the company moves forward.

MPS

C-COR's Multi-Service Packet Switch (MPS) system.

As Resilient Packet Ring (RPR) technology assumes a greater role in the migration of packet-based technologies from Local Area Networks to MANs, the inclusion of Lantern's expertise in RPR technology is taking C-COR's transport solutions to the next level. And when combined with its MPS system, which incorporates a patented Flow Based Fairness Algorithms (FBFA), advanced bandwidth management and QoS techniques over an all packet edge infrastructure, the company has assembled a new generation digital video transport product line.

PLEXiS, a layer one platform, allows 44 wavelengths of up to 10 Gigabits per wavelength and provides an economical, scalable form of transporting video streams. It combines Gigabit Ethernet transport modules with DWDM and CWDM hardware and enables the network operator to build high-capacity fiber-optic networks capable of simultaneously transmitting video, voice and data traffic in native formats on one optical wavelength over long distances.

PLEXiS is also expected to have a great impact on the commercial market, where it will allow C-COR to offer CWDM and a sophisticated platform using both MPS and the PLEXiS platforms in support of aggressively developing business service opportunities.

PLEXiS

C-COR's PLEXiS™ allows up to 10 gigabits per wavelength

C-COR's workhorse DV6000™ digital transport system, the most widely used digital video networking system around the world with a $500 million footprint, continues as the company's foundation transport product. It is capable of digitally transporting over optical cables a wide variety of standard and high definition video, audio and data signals to a service provider's local headend or point-of-presence, including studio-quality video, broadcaster interconnection, cable television backbones and more.

With the addition of PLEXiS and MPS to the transport portfolio, the bar has been raised to allow the company to quickly move from an RF to IP-centric, on demand world that will drive profitable services such as VOD, HDTV, broadcast video, high-speed Internet and cable telephony.

C-COR's access capabilities, when mixed with the transport components, offer a powerful combination of access and transport products designed for legacy HFC systems and their eventual transition to IP demand-oriented networks.

C-COR's access portfolio has been instrumental in creating the company's near-legendary reputation as an invaluable partner to the cable industry. Its Converged Headend Platform along with its Opti Max nodes and Flex Max amplifiers are the company's long-standing industry leaders, and continue to hold that lead.

Partnering with Cable

The company's Opti Max series of optical nodes are also helping operators launch HSD and other advanced services deeper into HFC networks, while its Flex Max line of flexible amplifiers complement the Opti Max line of optical nodes by offering a wide variety of aerial and cabinet-mount configurations.

And, with fiber being pushed closer to the premise, C-COR's FTTmaX Fiber-to-the-X Systems, using PON (Passive Optical Network), provides an end-to-end fiber solution for high-capacity bandwidth and a simpler, more efficient, and less expensive network access for transporting video, voice and data to the home or business.

C-COR's vision extends beyond its current access and transport products, however. It is closely following MPLS (Multiprotocol Label Switching) and RPR developments, wavelength configurable networks, and timeable optics-based transport. These are clear indications of the company's mission of not only helping operators transition to IP-driven networks in real time, but also in future-proofing tomorrow's networks today.

C-COR's Access and Transport Group, in tandem with its Solutions Group and Network Services Group, comprises today's C-COR. The company's strategy continues to leverage its dedicated global workforce with 50-plus years of cable-centric expertise to help network operators deliver interoperable solutions for lowering risk, improving profit margins, and confidently managing change as they transition to the on demand IP world.

The move to open, digital, IP-oriented networks and the on demand experience it is expected to bring to hundreds of millions of customers worldwide is well underway. C-COR is ready with the trusted advice, products and services that will be needed to smoothly and efficiently complete the move.

Today's C-COR is ready to meet the demands of an on demand world.

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LATEST NEWS AND INSIGHT

Digital simulcast entering the next phase

The idea behind cable's migration to an all-digital platform took center stage in late 2003...and hasn't come off it since. A panel of experts from both cable operators and vendors gathered last month to discuss the next steps of the transition and the barriers that still need to be overcome. During the panel, moderated by *CED*, it became clear that most major MSOs are making big plans for the transition with digital simulcast, a technique that replicates most (if not all) of an operator's analog channels in the digital domain.

Charter Communications, the first U.S. MSO to deploy simulcast, expects to move quickly in other markets, noted Pragash Pillai, the operator's VP of advanced engineering and development. Charter, he added, expects to build a central encoding station that feeds the other simulcast sites.

Charter, which is operating a simulcast system in Long Beach, Calif., has yet to disclose where it will next make the transition. Recent reports have indicated that Madison, Wis. could be Charter's next target for simulcast.

Adelphia also plans to be aggressive with simulcast in 2005, with expectations to have an all-digital product in every "major" market," said Basil Badaweyeh, the MSO's manager of advanced video engineering and development.

Cox Communications, meanwhile, will get its digital simulcast plans rolling in 2005. "I don't think we'll get finished, but we are certainly starting this year," said John Hildebrand, Cox's vice president of multimedia technologies.

Vendors, of course, hope to take a leading role with operators as they embark on their digital simulcast activities. Motorola, for example, already has an all-digital box, the DCT-700. Although that model is much less expensive than boxes that handle both digital and analog signaling, "we are miles away from the $50 set-top," said Kevin Wirick, vice president of marketing for Motorola's digital media system division, noting that more progress needs to be made in getting more functionality condensed on the box semiconductors.

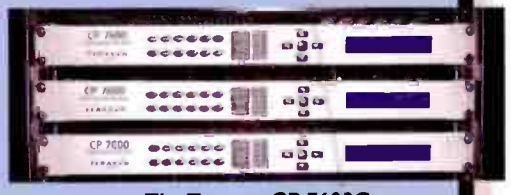
While the $50 bare-bones all-digital box is just one product that will help operators with their simulcast plans, more advanced boxes will play a key role, as well.

"As we look [at] cost reductions of digital-only set-tops, DVR is where we are going to have the biggest cost savings," Hildebrand said, explaining that today's cable DVRs have two expensive analog decoders and other associated circuitry.

On the network side, companies like Motorola and RGB Networks are presently looking into specific challenges, including the scaling of control systems and conditional access systems. RGB, a relative newcomer in the vendor arena, hopes its technology will simplify operations as MSOs make the all-digital transition. RGB hopes to do that with a product that enables operators to execute all-digital operations all the way to the edge of the network, explained Adam Tom, RGB's president and CEO.

Note: The entire video-taped discussion is available on the Web at: www.cablechannel.com/alldigital/.

Terayon bows digital transition gear



The Terayon CP 7600G

Terayon Communication Systems Inc. has introduced a new video decoding platform designed to help MSOs more rapidly migrate from analog to digital.

The CP 7600G, a digital-to-analog multichannel integrated edge decoder, enables operators to move to the digital domain without leaving existing analog customers in the lurch, according to Mark Jeffery, director of product marketing at Terayon's digital video solutions division.

Before the CP 7600G, operators would typically have to run parallel networks and essentially duplicate equipment during the analog-to-digital transition. With the new platform, an operator can shed all of its analog components at the edge and distribute everything in digital while still supporting the existing analog base.

"You can pick and choose parts of your network to move over to IP as you see fit," Jeffery explained. With the CP 7600G, for example, "an operator doesn't need two insertion platforms and billing platforms...if ads move to digital at the hub site," he added.

The CP 7600G supports GigE outputs. Terayon also offers a version of the decoder based on ASI.

Terayon has yet to announce deployments for the CP 7600G.

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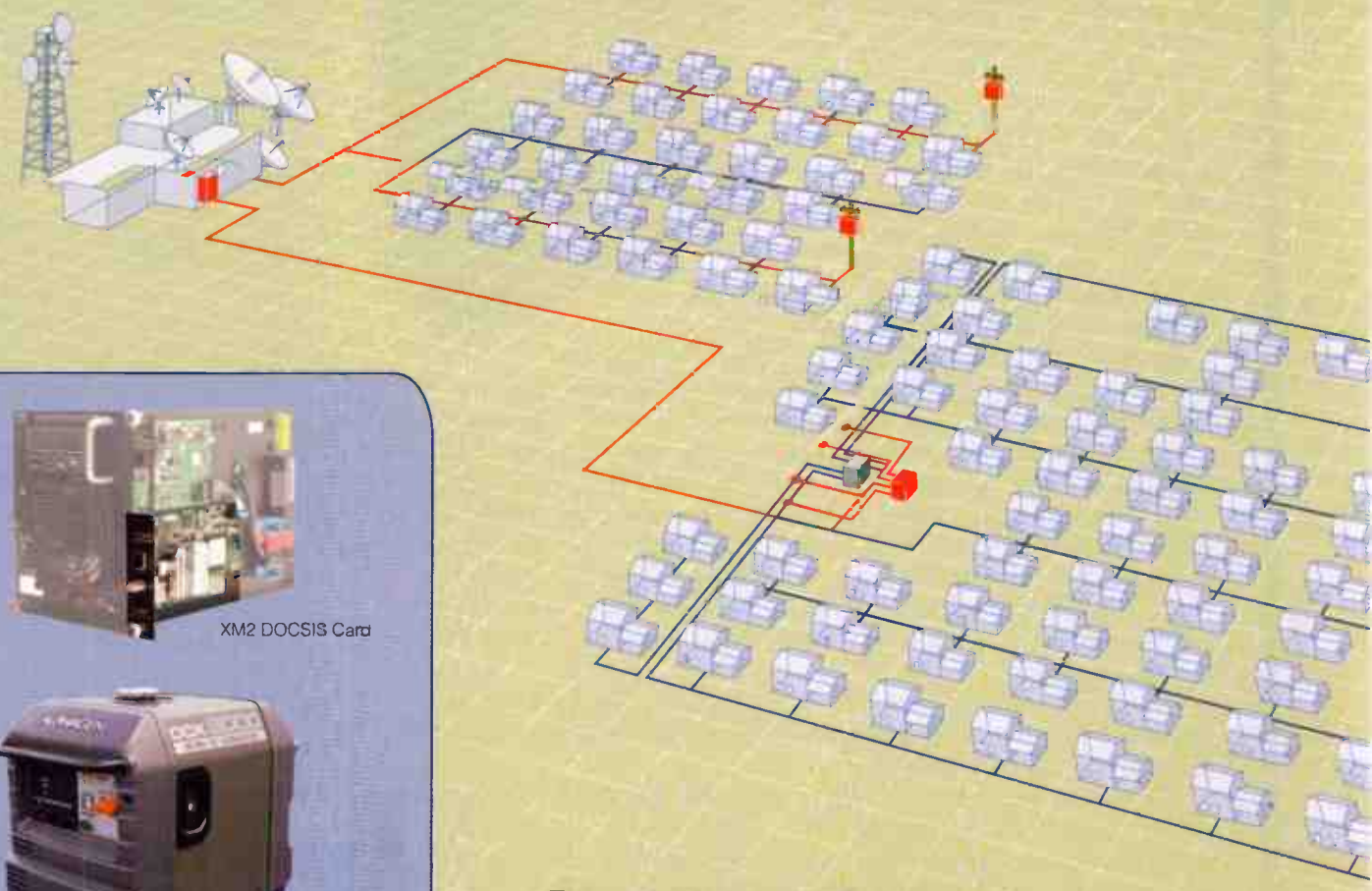

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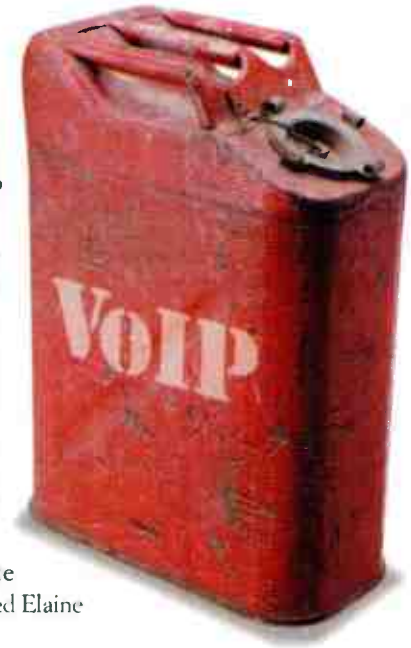
Hybrid tech fuels Cox's VoIP plans



Cox Communications is using a "hybrid" switch from Nortel Networks to migrate its existing circuit-switched telephony markets to a platform based on IP technology.

Nortel's hybrid switch, perhaps best described as the "Prius" of the VoIP world, is an IP softswitch that also leverages the service operator's existing circuit-switched infrastructure.

Using a Nortel CS 2000 softswitch outfitted with a special core processor and software load and the addition of a gateway controller, operators can run IP and traditional circuit-switched voice services in the market, with the goal of eventually moving everything over to IP.

"Cox or any other company...can fully migrate or evolve to the IP side of the switch," explained Elaine Smiles, Nortel's director of cable marketing.

Initially, Cox will tap the media gateway function of Nortel's hybrid switch. Later on, if Cox decides to launch remote sites off that hybrid switch, it could employ media gateways from Nuera Communications–one of Nortel's technology partners.

Cox and Nortel provided additional detail about the plan and approach in a recent whitepaper (www.cox.com/about/newsroom/files/CircuitswitchToVoIPwhitepaper_.pdf).

In addition to taking advantage of IP technology, using the hybrid approach in existing circuit-switched markets will also enable Cox to use its existing infrastructure of rate centers, SS7 links, and to use the same switch to supply E911 and CALEA support.

Cox will stop installing traditional NIUs in existing voice circuit-switched voice markets once a hybrid switch is installed, noted Jay Rolls, Cox's vice president of telephony and data engineering.

Cox is already in the process of deploying the Nortel hybrid in some markets. Under the agreement with Nortel, Cox is committed to upgrading at least 10 Nortel DMS switches with hybrid softswitch capabilities.

Cox currently uses circuit-switched technology in markets such as Orange County and San Diego, Calif.; Phoenix and Tucson, Ariz.; Omaha, Neb.; Hartford, Conn.; Rhode Island; Hampton Roads and Fairfax County, Va.; New Orleans, La.; Oklahoma City, Okla.; and Wichita, Kan. Cox has deployed softswitches to support residential and commercial voice customers in Roanoke, Va.; Tulsa, Okla.; Baton Rouge, La.; Lafayette/Southwest Louisiana; and five cities in West Texas.

Cox, which has about 1.2 million telephony subs, expects more than 50 percent of its new voice lines to be IP by the end of 2005.

Ops opting for multi-room Moxi

BendBroadband and Sunflower Broadband have become the first cable operators to commercially deploy Digeo's multi-room digital video recorder (DVR) platform.

The platform is based on the primary Moxi Media Center and the "Moxi Mate," a companion box that uses existing home coax to talk with (and pull content from) the main device. The combo enables users to share recorded programs, music and photos on two TVs in the same household.

Sunflower of Lawrence, Kan., and BendBroadband of Bend, Ore., launched Moxi's single-TV DVR product last year. The primary device in the multi-room set-up features a 160-gigabyte hard drive, a built-in DVD/CD player, an interactive program guide, and a ticker that provides updates on news, weather and sports.

Digeo also has deployments with Adelphia Communications, Comcast Cable and corporate cousin Charter Communications, but those operators have yet to announce deployments of Digeo's multi-room platform.

Digeo's multi-room set-up.

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upfront

LATEST NEWS AND INSIGHT

FCC hits telco for VoIP blocking

The Federal Communications Commission has slapped the hand of a North Carolina-based telco for engaging in VoIP blocking, a practice that can prevent customers of Vonage and other broadband-enabled voice services from accessing service.

The FCC reached a $15,000 consent decree with Madison River Communications LLC, under which the telco has agreed to refrain from blocking VoIP traffic and ensure that such blocking will not recur. The $15,000 paid by Madison will go directly to the U.S. Treasury.

Madison River, founded in 1996, provides services in the Gulf Coast, the Mid-Atlantic, and Midwestern regions of the U.S. It's been widely reported that Madison River was blocking Vonage traffic.

But Vonage's blocking complaints haven't stopped with Madison. Last month, the VoIP pioneer was reportedly investigating whether another broadband service provider–a cable company, this time–was blocking the Vonage service. At press time, Vonage had not yet named the operator, said to be based in the Midwest United States. A Vonage official was quoted as saying the alleged blocking could have impacted "from the tens to the hundreds to the thousands" of customers.

VoIP blocking has loomed as a concern for VoIP services that piggyback on high-speed connections provided over cable, DSL and other broadband networks.

Just prior to Vonage's investigation in the Midwest, outgoing FCC Chairman Michael Powell said the action taken on Madison aimed to squelch further blocking practices.

"We saw a problem, and we acted swiftly to ensure that Internet voice service remains a viable option for consumers," said Powell. "The industry must adhere to certain consumer protection norms if the Internet is to remain an open platform for innovation."

Hargray gets the message

Hargray Communications, an independent telco based in Hilton Head, S.C., has deployed a TV-based caller ID application from Integra5 Communications.

Hargray is offering Integra5's "UniTV Visual Telephony" platform to its digital cable and telephony customers. Comporium Communications is the only other service provider to announce a deployment with Integra5.

Integra5's network-based application, which does not require new customer-side equipment, automatically displays the name and telephone number of the person calling on the television screen about a second before the phone rings. Integra5's platform is also capable of displaying call history and modifying how long the TV caller ID message appears on-screen.

Integra5 has also added some new enhancements to the 2.0 version of the UniTV platform, including integration of cellular telephony support, enhanced call history logs that note if calls were answered or missed, a call management system for PCs, and a personalized caller ID application that enables users to include a picture, special name or background with specific phone numbers.

Integra5 is just one of a number of companies working on or deploying TV-based messaging applications. At the 2004 National Show, Sprint Corp., for example, showed off an OCAP-based unified messaging application running on a Scientific-Atlanta set-top.

CableMatrix, Xinnia pair on PCMM

CableMatrix and Xinnia Technology have cobbled together an integrated platform based on PacketCable Multimedia (PCMM), an emerging CableLabs spec that enables cable operators to inject QoS into a swath of IP-based applications.

The integration pairs the CableMatrix policy server with Xinnia's application manager–two major components of the PCMM architecture.

upfront

LATEST NEWS AND INSIGHT

Conditional access key to Comcast-Motorola deal

There may be a $1 billion price tag affixed to an expanded set-top agreement between Comcast Cable and Motorola Inc., but the more significant piece of the deal gives Comcast unprecedented access to Motorola's precious conditional access (CA) technology.

The set-top and network infrastructure agreement solidifies Motorola's position as Comcast's primary set-top supplier, but more, far-reaching implications are found in two CA joint ventures.

In the first venture, the companies will collaborate on a "next-generation" conditional access system based on Motorola's MediaCipher platform. The second, to be managed by Comcast, will enable the MSO to license MediaCipher to other U.S. cable operators and third-parties that could include other set-top makers, television suppliers and various consumer electronics companies.

Comcast and Motorola did not say much about what that next-generation CA might look like, but it's widely known that Comcast, as well as other operators, are interested in decoupling the CA from the cable infrastructure and employing downloadable, software-based conditional access systems.

Developing a software-based CA "is certainly a piece of [the agreement]," said Dan Moloney, president of Motorola's Connected Home Solutions Division. "What we have done...is enabled the core MediaCipher [technology] to be at the foundation of the downloadable security we develop with Comcast."

On the telco side of the house, Motorola is already developing a software-based CA platform for IPTV set-tops via a partnership with Widevine Technologies.

Historically, Motorola had been stingy with licenses for MediaCipher, which any digital set-top must support in order to operate on a cable system based on the Motorola CA. But Motorola has lightened its position somewhat in recent months as the list of MediaCipher licensees has grown to include Advanced Digital Broadcast Inc., Pace Micro Technology, and Pioneer Electronics, among others.

A joint venture, however, will likely expedite additional MediaCipher license agreements, and give Comcast the power to determine who gets to license the technology.

Moloney pointed out, however, that Motorola will maintain all rights to MediaCipher. "It didn't take us out of the business, but gave us a foothold for next-generation conditional access [technology] in the U.S," he explained.

The licensing J.V. will also enable other set-top makers to compete in the set-top market. Not that Motorola is very worried about that.

"We are very prepared to compete in an open environment," Moloney said, pointing out that Motorola has been able to build and maintain market share in the DOCSIS cable modem sector.

Mark Hess, Comcast's SVP of digital television, said systems based on PowerKEY (Scientific-Atlanta's CA) will remain intact. "We'll see how we evolve the S-A relationship; we'd like to get them involved," Hess said. Presently, 90 percent of Comcast's footprint is based on MediaCipher, the balance on PowerKEY.

The agreement with Motorola also marks the latest move by Comcast that gives the MSO a better hand in controlling its technological development. Among the more recent developments, Comcast has formed the GuideWorks venture with Gemstar-TV Guide International, has teamed with Cox Communications on a pending purchase of iTV software specialist Liberate Technologies, and has partnered with Time Warner Cable on an OCAP licensing entity called OCAP Development LLC.

Arroyo gains funding, loses CEO

While video server startup Arroyo Video Solutions Inc. appears to have its financial house in order, the company was last seen searching for a new CEO.

Kelly

Arroyo, which is making waves in cable circles as a top contender in the next-gen video server category, raised $12 million in a B-round of expansion financing led by Matrix Partners and existing investors such as Time Warner Investments and Comcast Interactive Capital. The round extended Arroyo's funding total beyond $25 million.

But that news was dampened somewhat with the stepping down of CEO Kim Kelly, a former Insight Communications exec who put Arroyo on the map last summer, and provided the startup with a strong line into the cable industry.

An Arroyo spokeswoman said Kelly's constant commute from New York to California contributed to her decision to step down, but that the company is pleased she will remain an active member of the Arroyo board of directors.

Arroyo said it has begun a search for a new CEO. In the meantime, company co-founder and CTO Paul Sherer will serve as Arroyo's interim CEO.

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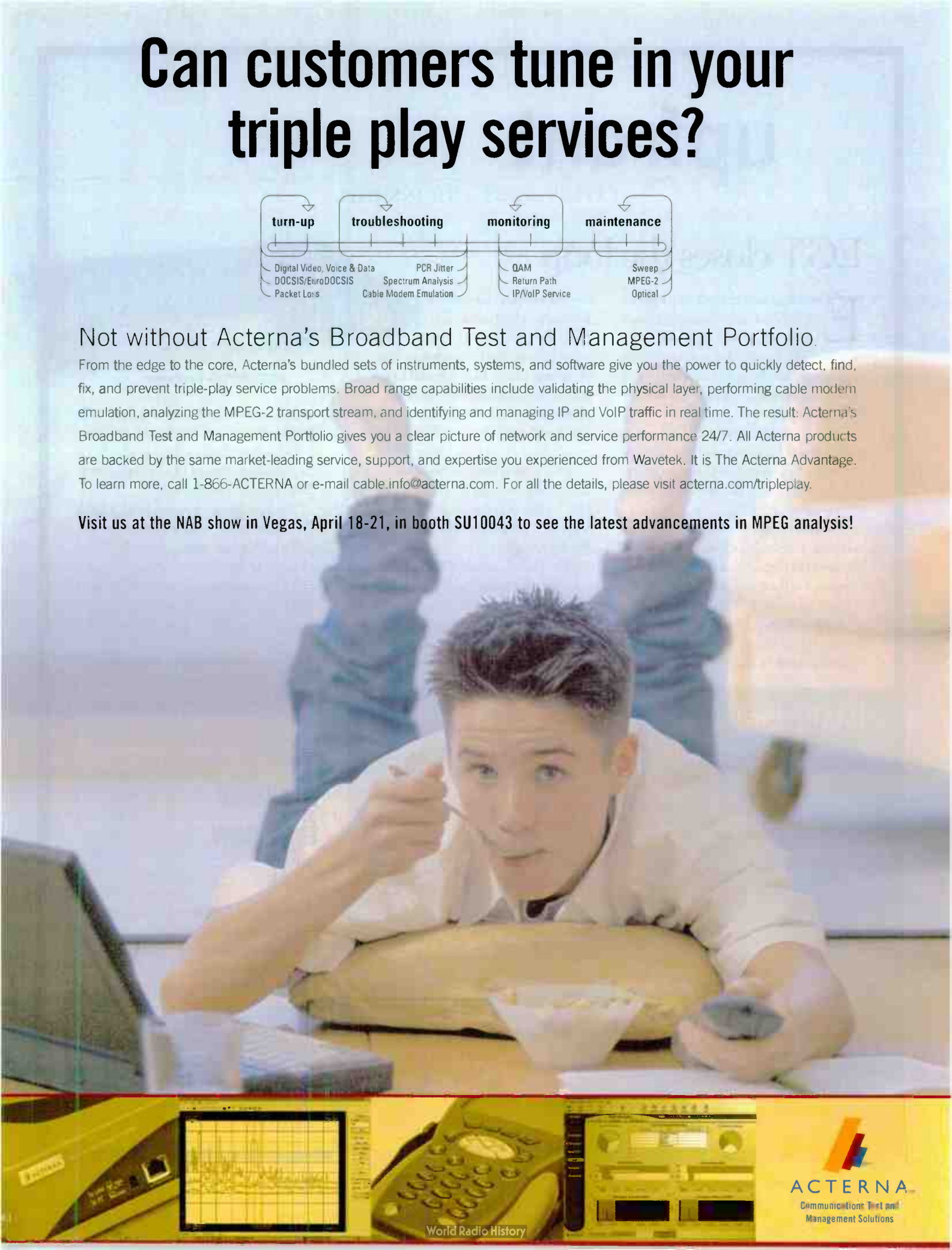

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LATEST NEWS AND INSIGHT

EGT closes the loop

Encoding startup EGT Inc. believes its software-upgradeable approach to encoding will help operators save precious bandwidth as they embark on digital simulcast deployments and launch bandwidth-eating services like high-definition television.

EGT, a startup based in Atlanta, uses a DSP-based encoding platform. Instead of hardwiring everything, the software-friendly platform is designed to provide an easy upgrade path.

The latest upgrade involves closed-loop encoding, a method that gives operators a 20 percent to 25 percent bandwidth gain when compared to the company's original line of constant bit rate (CBR) MPEG-2 encoders.

Unlike traditional open-loop encoders, the closed loop variety, which EGT markets under the name "Chorus," can determine if the box needs additional bits to encode video from a complex, fast-moving sports event or fewer bits for a newscast with simple talking heads. EGT's closed-loop technology "mathematically senses the complexity of the scene based on proprietary algorithms," said Chris Gordon, the company's director of product management.

EGT's closed-loop implementation also allows one encoder to serve as the "bit boss," a function that is usually handled by separate multiplexers that cost upwards of $20,000 apiece.

The latest upgrade follows "Aria," an open-loop software improvement that uses variable bit rate (VBR) technology designed to increase capacity by 10 percent to 15 percent on existing encoders.

Operators that want to upgrade EGT's initial CBR encoder can opt for Aria or the closed-loop product. The open-loop option provides about half the gain (and sells for about half the cost) of EGT's closed loop, VBR upgrade, Gordon said.

EGT's MPEG-2 encoder

The company emerged from stealth mode more than 15 months ago when it introduced its first product, an MPEG-2 encoder. It has since won deployments with 35 customers worldwide, including a sizable one with Canadian cabler Cogeco, which is using EGT's gear in 20 cities.

IMAKE targets VOD content

IMAKE Software & Services Inc. has expanded its software portfolio with a platform that encodes content for video-on-demand (VOD).

The platform, dubbed OpenVision Content Creator, is aimed at content suppliers that must encode and prepare video prior to distributing it to a service provider. IMAKE's new platform is designed for cable operators that use CableLabs-compliant metadata as well as a new breed of IP-based television video providers.

IMAKE, which has already integrated Content Creator with encoders from the likes of Harmonic Inc. and Vela, also markets a line of VOD pitchers, catchers and asset manager products under the OpenVision umbrella. IMAKE also offers a session resource management platform that ensures QoS allocation by communicating with the servers on a given system.

IMAKE, which competes with Tandberg Television and TVN Entertainment Corp., counts Comcast Cable as one of its largest customers.

"We provide an entire VOD backoffice solution," said Steve Sweeney, IMAKE's vice president of marketing and business development. "Now we are getting more involved in [VOD] content."

Arcwave taps new CEO

Arcwave, a maker of wireless DOCSIS extension gear, has hired Bill Sickler to president and CEO.

Sickler, who has held the CEO position with companies such as Caspian Networks, Arzoon, Reactive Network Solutions and Gadzoox Networks, succeeds the departed Steve Goldberg, who became CEO in 2003 following the merger of Advanced Radio Cells Inc. and CoWave Networks.

Campbell, Calif.-based Arcwave markets a wireless plant extension platform called ARCXtend, which enables cable operators to offer data services to commercial customers out of the reach of their HFC networks. Its current platform operates in the unlicensed 5 GHz spectrum.

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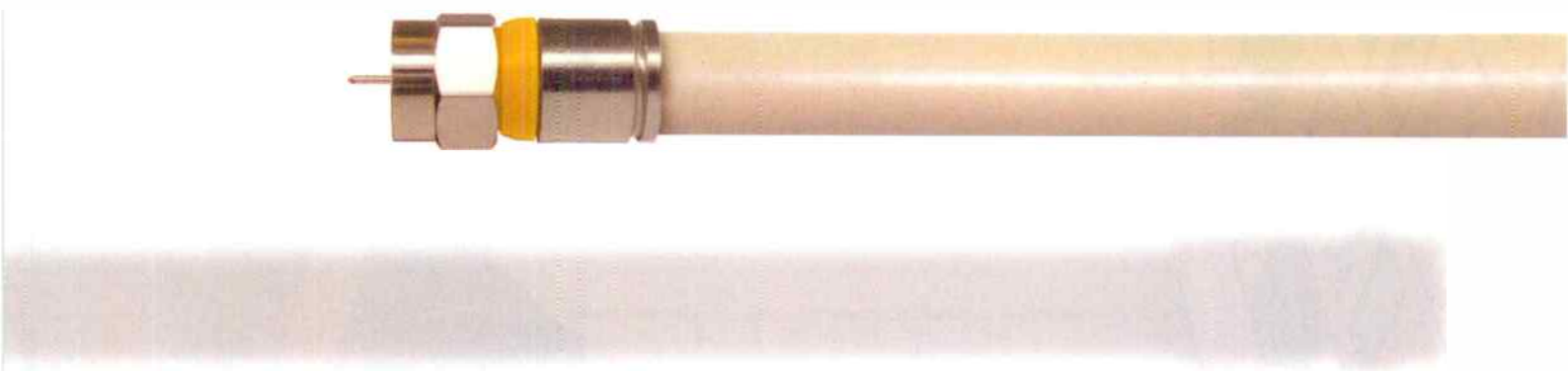

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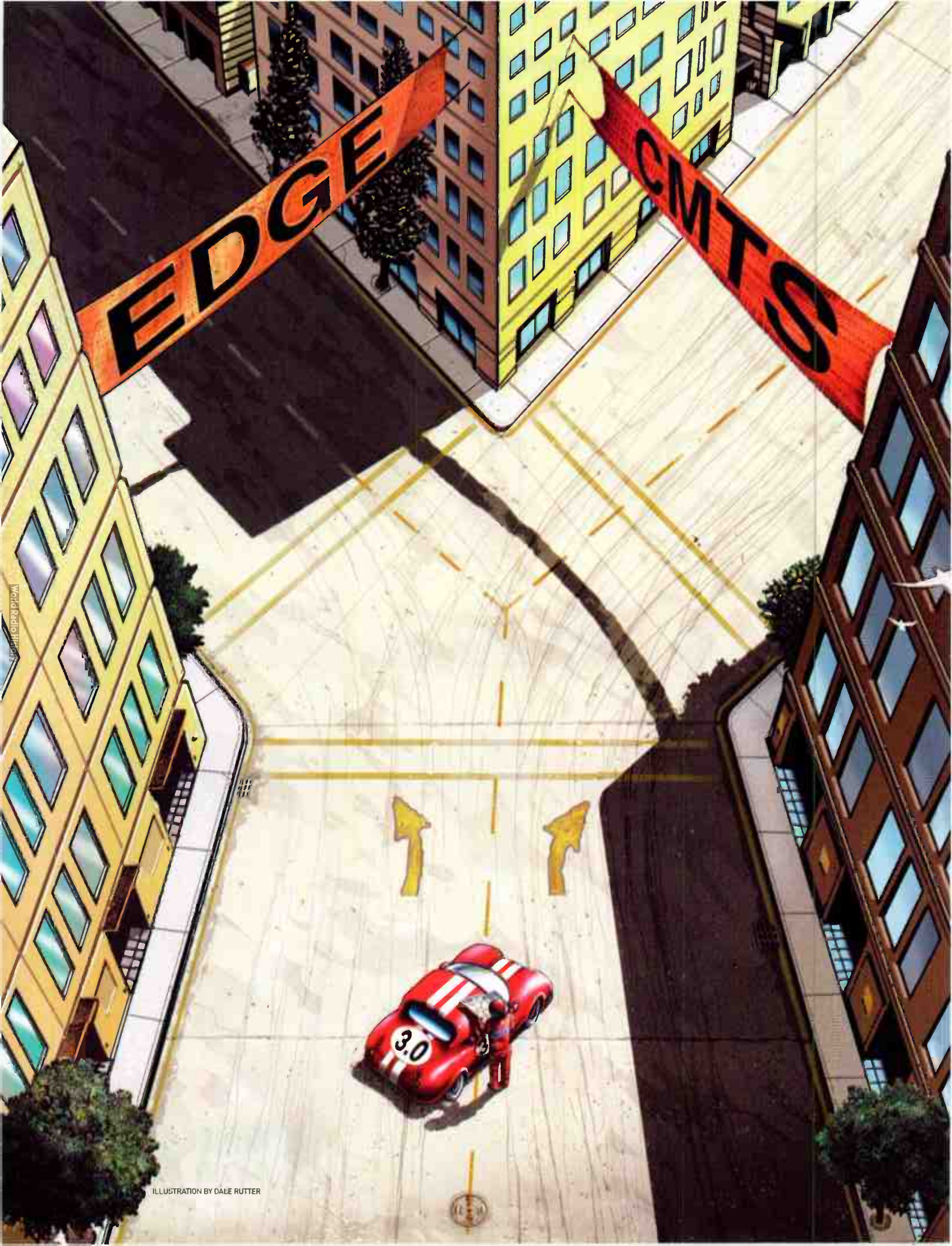

ILLUSTRATION BY DALE RUTTER

DRIVING DOCSIS 3.0

By Karen Brown, Senior Editor

Channel bonding will help MSOs compete with fast, fiber-fed services on raw speed, but some key decisions must be made before cable can step on the gas

Driven by telco competitors' recent revival of fiber-to-the-home-based services, cable operators are looking to a new technology option that could turn their single-lane cable modem services into multi-lane, super data highways.

All it will take is a little time to bond.

Technology vendors say that the scheme–referred to as either channel bonding or wideband–has been kicking around for a few years, but only recently have cable operators put it on the new technology priority list. It is now one of the key pins for the evolving DOCSIS 3.0 spec CableLabs Inc. is developing.

But channel bonding is not itself unified–there are several strategies CableLabs is now considering, and they differ on where the bonding occurs and at what level–and that, in turn, varies the impact on what new devices are needed to make it all come together.

While methods vary, channel bonding essentially spreads data over multiple channels rather than the single channels used today. Armed with a future DOCSIS 3.0 modem, customers could receive 50 Megabits per second–or even 100 Mbps or higher services–via coax, and keep cable in competition with its telco, fiber-based foes.

"Pretty much every large MSO that we talk to has a market somewhere, where there is a Verizon or SBC already starting to offer a trial of fiber-to-the-home," notes John Mattson, Cisco's director of marketing for cable products.

"One thing that we've all sort of learned over the past few years is that speed is the killer app. All of a sudden, you don't want to be in the backseat when it comes to driving the speed on the thing."

That's true for Comcast Corp., which is looking at channel bonding as a way to significantly ramp up its residential data service, says David Fellows, Comcast's executive vice president and chief technology officer.

"We are always thinking about how we will respond to our customers' needs for increased bandwidth–from two Megs to three Megabits, from three Megabits to four Megabits–and we have several more upgrades in the pipeline," he notes.

One day that data rate may well rise to 100 Mbps. And while video is not part of the picture now, it needs to be taken into consideration as part of the slow evolution of cable systems to all-IP platforms.

"There is an objective that our digital set-top boxes not only tune to DOCSIS streams, but they also tune to bonded streams," Fellows says. "So we are doing everything with an eye toward the day when more...video is IP going all the way into the home–to the set-top or digital media center. But what am I actually deploying? High-speed data. What do I have in my mind when I am pushing (DOCSIS) 3.0? High-speed data."

Data is indeed the initial focus for channel bonding as part of the developing DOCSIS 3.0 specification, and it has attracted several proposals from silicon and CMTS vendors.

That includes Cisco Systems, which has offered up a scheme that uses the

MPEG layer to initially weld together as many as 24 channels drawn from anywhere in a 300 MHz range of spectrum.

Cisco's channel bonding technology starts with framer chips, a new breed of silicon added to cable modems and the CMTS units. In the downstream direction, the framer chip in the CMTS breaks up the content and fires it down the bonded channels, choosing which path packets should take based on the available capacity of each channel. On the receiving end, a framer chip in the modem reassembles the stream.

Cisco demonstrated just such a system at January's SCTE Conference on Emerging Technologies, delivering about 200 Mbps to a prototype modem. In the initial phase, the modem supports downstream channel bonding, but the eventual goal is to do so in both directions, widening the service possibilities.

"So in the same way you would want to expand the downstream capabilities, you would ultimately want to do it with upstream," Mattson says. "There are a lot of applications that are starting to require more and more bandwidth."


Mattson


Quigley

While the technology for now can bond as many as 24 channels, it could rapidly grow to cover a much wider range of channels, Mattson says.

The number of channels bonded also could grow to cover much of a cable operator's plant. Cisco's initial scheme already calls for two CMTS blades armed with two channel-bonding framer chips each able to bond 24 channels for a total of 96 channels possible.

"We've already figured out how to go to 48 channels, so it becomes four times 48, and then we've figured out how to double the number of slots, so that's four times 96," Mattson adds. "So you are pretty much getting there, and that's just in the early days."

Core or edge?

Broadcom Corp., meanwhile, also has submitted a proposal for channel bonding, but, unlike Cisco, it places the control elements in devices located at the edge, not at the CMTS.

Broadcom's scheme bonds channels in groups of four, which can then be combined into multiple quartets along the spectrum.

"We bond in groups of four, but we are not limited to four," notes Tom Quigley, Broadcom's senior director. The quartets are bound together in a hierarchical scheme.

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"The main reason we do that is to maintain tight timing. We want to make sure that the delay variance between the different QAM channels is very tightly controlled," says Quigley.

Timing control is also a reason Broadcom's strategy put the channel bonding controls at the edge–the closer the channel bonding brains are to the user, the better able it is to keep the data flow consistent in the short distance between it and the user.

"If you make timing decisions back at the core now you have a somewhat arbitrary IP network between the core and the edge," Quigley says. "We were saying, 'Well, gee, all that dumb pipe does is make all of your timing guesses more inaccurate'."

Keeping a tight rein on the delay means the end device doesn't require as big of a buffer to hold packets if one packet is delayed in the stream. Despite that argument, it appears CableLabs is favoring the CMTS-based approach for channel bonding, Quigley acknowledges, "so I think fundamentally, that's the way it is going to happen."

It appears CableLabs is favoring the CMTS-based approach for channel bonding, 'so I think fundamentally, that's the way it is going to happen.' –Broadcom's Tom Quigley

How the move toward placing channel bonding in the core routers will affect Broadcom's technology will depend on what CableLabs finally issues in the specification, Quigley says. But moving to a CMTS-based scheme will require Broadcom to rejigger its silicon design, and that may slow down development somewhat.

"It's going to delay product availability in the industry," Quigley says. "Some of our chips we can adapt, but the new core approach requires us to build completely new chips for other parts of the network that we weren't anticipating. So we have more work to do, and it is going to take us longer."

With the decision going back to the core, Broadcom also is shifting its original notion to bond at the MPEG layer, instead looking toward schemes that offer channel bonding at the DOCSIS layer, Quigley says.

"Now that I am at the core, the value of doing it at the MPEG layer is less–I can't

do video because I'm not out at the edge to see video. I can't really keep my timing tight, because I've got this ubiquitous kind of network between me and the edge, so I can't really control my timing that great anyway," he notes. "So then to me the compelling argument becomes, let's use something that has less of an impact to the overall system, which may be an IP Layer 2 approach."

MPEG or DOCSIS glue?

That is exactly what Motorola Inc. has submitted to CableLabs as part of its channel bonding proposal.

"The reason we went with the packet based proposal was we think it makes some simplifications in some of the components, particularly in the downstream," says Gerry White, senior director of advanced technology at Motorola's Connected Home Solutions division. "We think it makes the downstream edge QAM a lot simpler because it doesn't have to have a mix of MPEG and packet."

The Motorola scheme draws from a PPP multilink protocol commonly used in the dialup world to boost throughputs.

"You take a DOCSIS packet and you put a little shim header in front of it based on this multilink and you ship it backwards and forwards," White explains. "And what the multilink proposal does is it gives you sequence numbers so that you can recombine packets in the right order and things like that."

Once that is done, the packets are distributed across the bonded channels. Motorola's scheme will allow any number of channels to be bonded–from two to 200, White adds.

"The limits on how many you bond we think are really the physical limits–how cost-effectively can you build a tuner and things like that," he notes. It also would bond in both directions, so "it's essentially a very symmetric-looking protocol," he adds.

The equipment factor

For all of its benefits, channel bonding does come at a cost–specifically new cable modems and CMTS gear. At the CMTS, one of the key parts of the Cisco scheme is to funnel the bonded channel traffic to an external QAM device, much like the modular CMTS unit designs CableLabs also is considering as part of DOCSIS 3.0.

"One of the drivers for that was to leverage the price curve and the cost curve of video QAMs or edge QAMs compared to DOCSIS QAMs, and because of DOCSIS you've got upstream

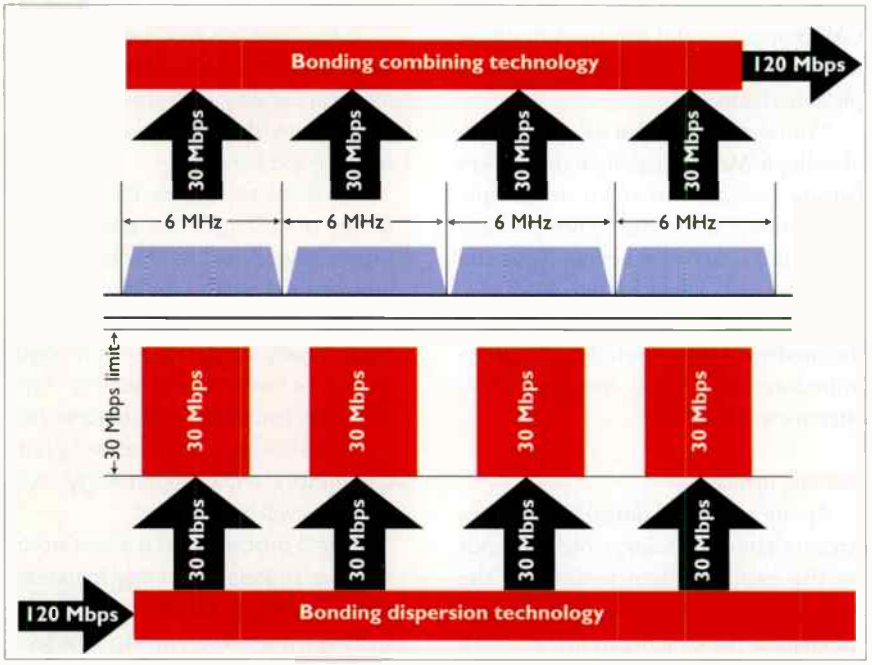


Figure 1: A 120 Mbps stream enters the system. The channel bonding system disperses the 120 Mbps evenly across the four channels. The bits are transferred across the cable system. The channels are received by a channel bonding-capable receiver that simultaneously receives the four channels. Then, the receiver recombines the bits back into their original stream. Source: Broadcom Corp.

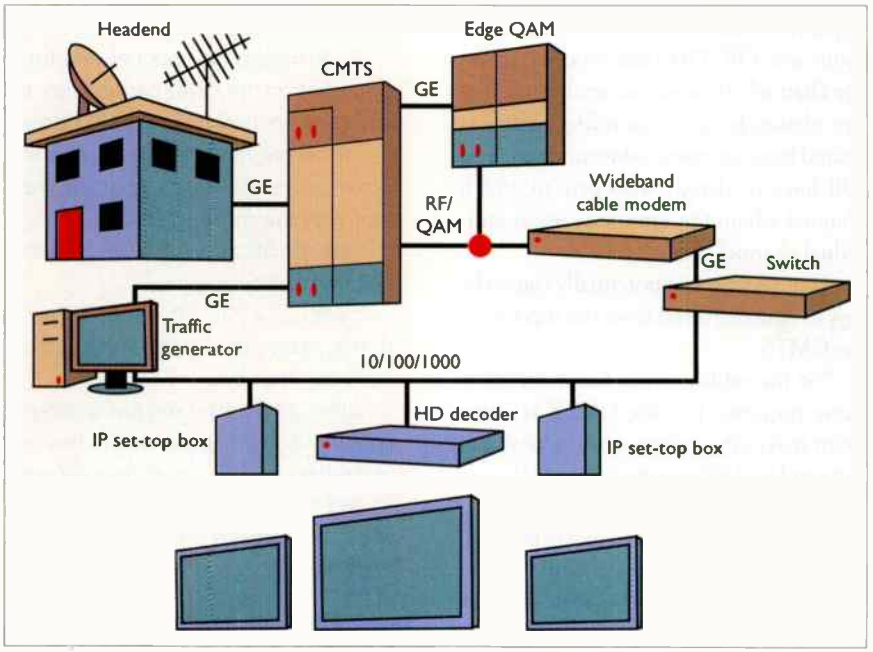


Figure 2: IP video wideband demo diagram. Source: Cisco Systems Inc.

and downstream tightly coupled together," Mattson says, adding that external QAMs "are much, much cheaper on a per-QAM basis than buying a new line card on a CMTS."

Motorola's proposal also would require CMTS upgrades and new modem silicon to power a tuner that could accept multiple data channels.

"You would need what is the equivalent of multiple MAC functions in the modem because you have to synch to multiple streams now," White says. "Then you need to add this collector function. Now, you might end up building that into the silicon, or you could run it in a CPU behind it in the modem. That's kind of to be determined–to see what is the most cost-effective way to do it."

Heading upstream

Another potential difficulty lies in upstream channel bonding, which depends on the cable modem to initiate the process. Problem is, it is still beholding to the channel bonding brains in the CMTS to decide how to dole out data across the bonded channels.

For example, if a future modem is able to oversee four bonded channels, "it actually makes a request of the CMTS to send on each of those channels," White explains. "The CMTS scheduling has to figure out 'OK, I'll let this modem talk on the channel,' because, remember, each of the channels in the bonding group is shared between many cable modems. You still have to decide who gets to which channel when, the same way as an individual channel today."

That process can potentially cause delays in data delivered from the modem to the CMTS.

"So the cable modem has made all of these requests, but the CMTS at some point makes the response to say 'now you can send it'," White says.

That channel bonding in the reverse path may not develop as quickly is of key concern for Charter Communications. The MSO is looking at the technology first as an option–instead of optical links–in delivering services first to commercial cus-

Channel bonding linked to DOCSIS 3.0 development

How channel bonding joins future cable networks largely depends on how CableLabs assembles the DOCSIS 3.0 specification.

CableLabs has been working on the next version of DOCSIS for more than a year, says CableLabs Chief Technology Officer Ralph Brown. It is now going through details of the specification and proposals from vendors "so we have a fair amount of work on our plate, both between this and our modular CMTS effort," he explains.

CableLabs has gone through a couple of rounds of proposals and reviews for the draft DOCSIS 3.0 specification, and channel bonding is a key feature, Brown says. Because channel bonding impacts hardware, it will be more likely among the first features incorporated.

"You want to address all of the hardware issues up front, and channel bonding is clearly one because that's getting to the issue of how channels are put together, or how many channels," Brown says. "The tuner in the cable modem has to be broad enough to tune those, and all of those kind of issues."

While the specifications work is not complete, there are some general indications for the core technology, including a rough minimum for how many channels will be bonded.

"We'll probably set a lower bound on the number of channels–probably, say, four channels is a likely minimum," Brown notes. "But the upper bound we are not going to place a limit on, so as technology matures and as things evolve, if members want to look for however many channels bonded together–24 even–that's a possibility. We don't want to cap ourselves."

Whatever the number of channels bonded, DOCSIS 3.0 will be backwards compatible to all past DOCSIS versions, Brown says. That in part is influencing the move toward bonded channels as opposed to configuring super channels wider than 6 MHz.

Older modems will still work in a DOCSIS 3.0 scheme with bonded channels, and DOCSIS 3.0 modems will be compatible with older DOCSIS CMTS units.

As to where the channels are located, there are some issues, Brown says. It depends on the tuner capabilities, because wideband tuners won't be as agile and may not cover the whole frequency range.

"So there may be some practical restrictions that we will encounter," Brown says. "But right now, the frequency range is intended to be consistent with the existing stack."

The specification also will address channel bonding in the downstream and upstream, Brown says.

"With DOCSIS 2.0, we enabled the ability to have symmetric services, so to the extent that is still achievable in DOCSIS 3.0, we want to make sure we do that," he says.

Although CableLabs has a target for releasing the modular edge QAM draft specification for review in the next few months, it still has a prioritization process to go through with members regarding DOCSIS 3.0's development timeline.

"It's really going to be a matter of what all they want to put in there," Brown says. "My guess is they are going to want us to go faster [rather] than slower, so we'll probably pare that back. We're expecting to move fairly quickly on this." –KB

tomers, with applications for residential service developing further out in the future.

As such, it needs channel bonding technology in the forward and reverse path, the latter of which has not been as strong of a focus in the rest of the industry, says Mike Emmendorfer, Charter's vice president of advanced engineering.

"Charter is deploying PON (passive optical network) technology, but our challenge is we don't have fiber close to customers. So what we'd like to do from a channel bonding perspective is probably a little different," Emmendorfer says. "It's undefined at this point, but we are developing requirements–we'd like to include, let's just say, somewhere in the area of six channels on the reverse [path]. More than two channels on the reverse, certainly, and perhaps up to six on the reverse."

Bonding out

Ultimately, the fate of channel bonding is tied to the DOCSIS 3.0 specification. CableLabs is expected to make several key technical decisions soon that will provide a clearer direction, but until then, the competitors will have to wait.

"We definitely want to be compliant with whatever DOCSIS 3.0 is," Cisco's Mattson says. "We are optimistic that there won't be anything in our implementation that will be outside of the bounds of DOCSIS, and our intent is whatever we do will become integrated into the standards."

Comcast is looking for three things in the emerging DOCSIS 3.0 specification: modular CMTS units, channel bonding, and the addition of IPv6 to greatly expand the number of IP addresses available, Fellows says. Backwards compatibility is also vital for the MSO.

"If I've got four channels bonded together and I've got a legacy modem, I'd like that modem to be able to tune to one-fourth of the bundle and act just like it does today," Fellows notes. "And yet new modems can tune not only to that fourth of the bundle, but also the other three-fourths, and have access to the higher load of bits."

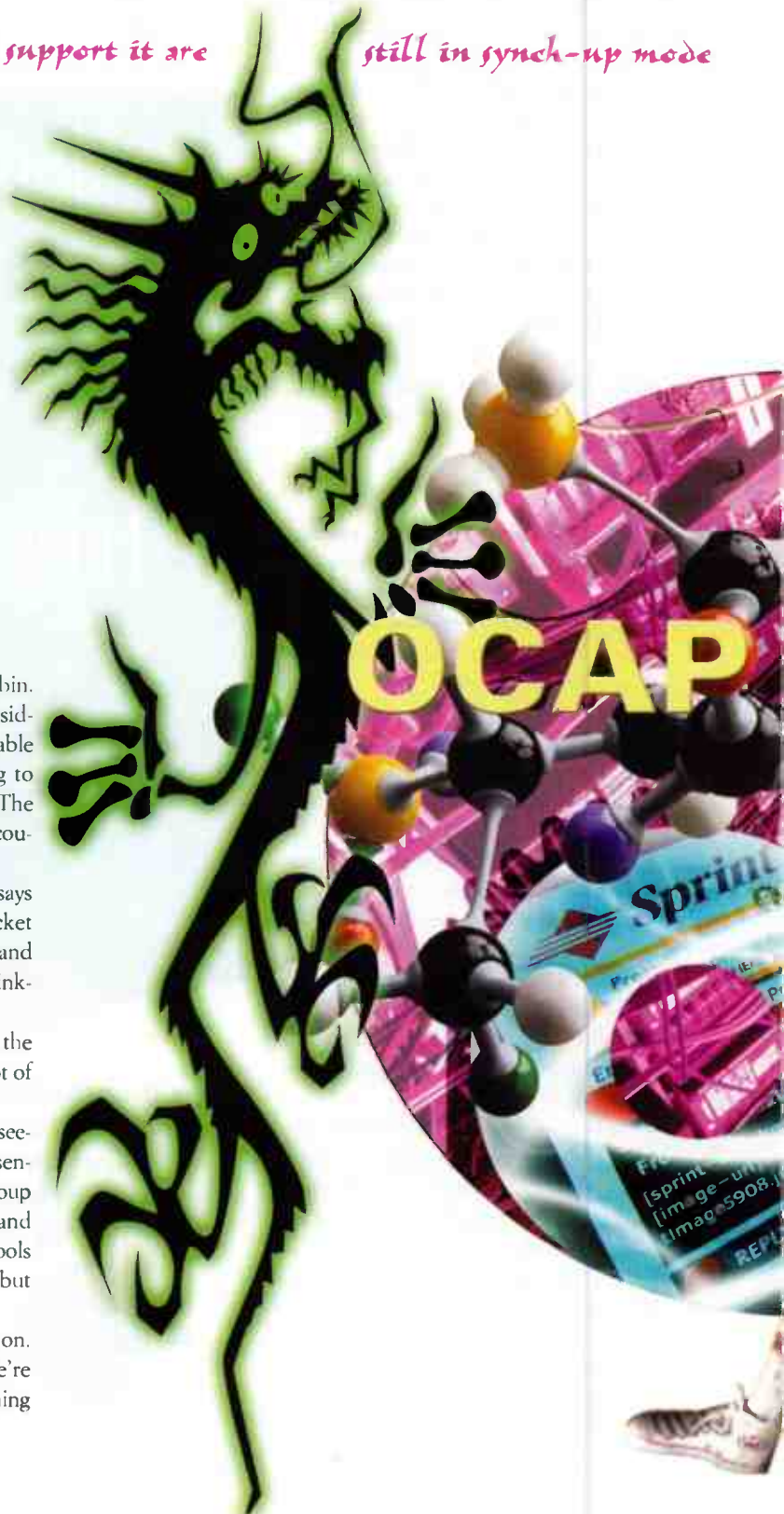
Charter, meanwhile, is also pressing for related features in next-generation CMTS units able to do channel bonding–such as multiple connection options, plus MPLS VPN capabilities and the ability to create sub-interfaces that could channel management, provisioning or specific services.

That's a tall order. So far, Charter's CMTS vendors have responded with partial capabilities–and in some cases, have said the whole package is doable, Emmendorfer says.

"Basically, what it comes down to is this third-generation platform hopefully will be a platform we can leverage for the future," he says. ■

Interactive

OCAP and the applications that will support it are still in synch-up mode



Penn & Teller. Starsky & Hutch. Batman & Robin. Like any dynamic duo, one member is not considered whole without the other. OCAP (OpenCable Application Platform) middleware isn't going to make you laugh (much), solve crimes, or put The Joker behind bars at Arkham Asylum, but it will need to be coupled with a strong set of applications in order to flourish.

"Apps will drive the success of OCAP, not the platform," says Scott Newnam, president and CEO of iTV vet GoldPocket Interactive. "In general, I believe OCAP will be adopted and successful. But it will take time. I'm not being fooled into thinking that this will be an overnight thing," he adds.

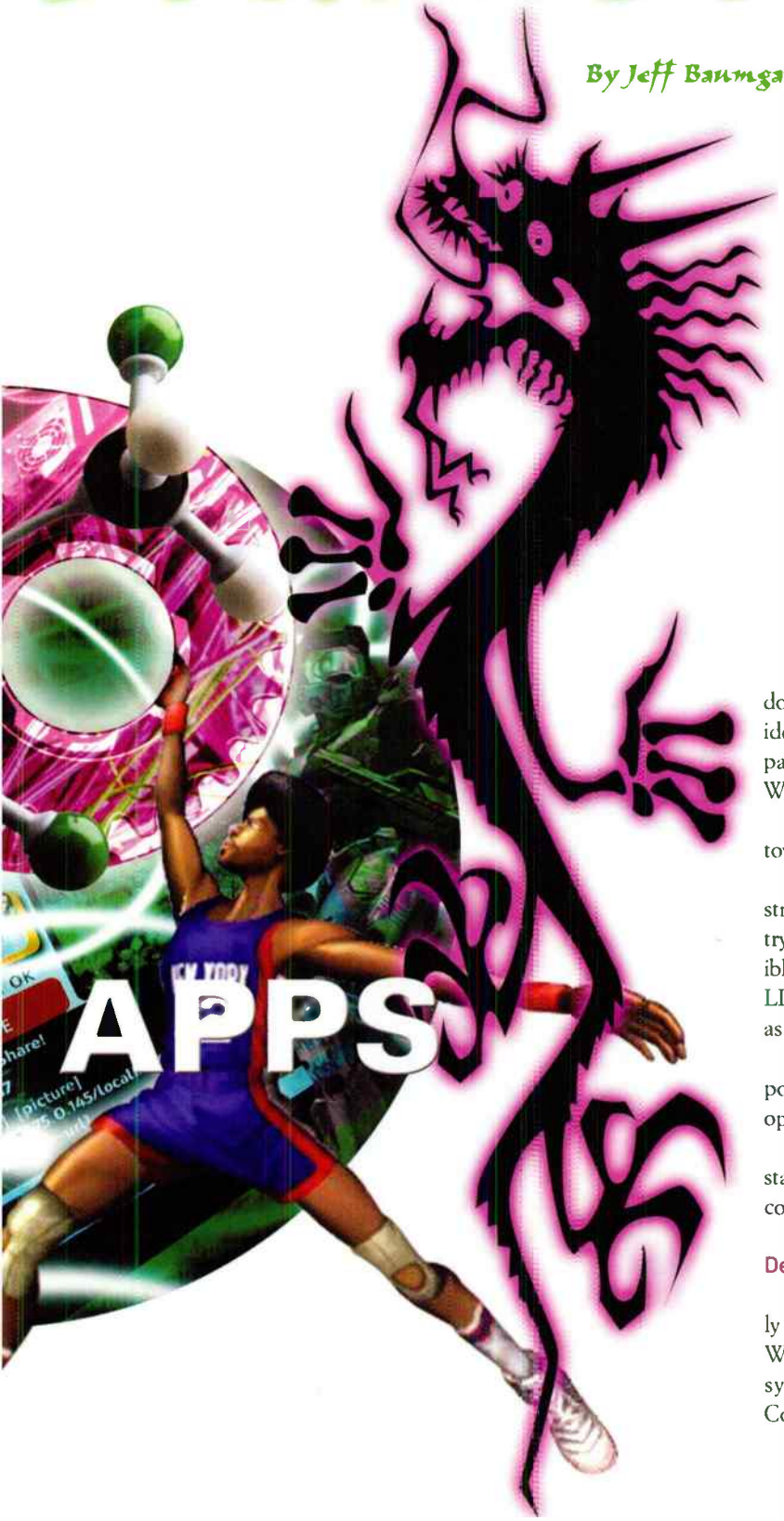
Newnam views the potential growth of OCAP in much the same way as the personal computer. "Once you could do a lot of applications, everyone wanted PCs," he says.

When it comes to OCAP and OCAP applications, "we are seeing a chicken-and-egg syndrome," acknowledges Jeff Bonin, senior product manager at Vidiom Systems Corp., one of a small group of OCAP stack developers. "A number of content providers and set-top manufacturers are looking at [OCAP] development tools to kick the tires at this point. They know OCAP is coming, but they're not ready to do all-out development."

But that doesn't mean there isn't plenty of work going on. "We've seen a lot of activity [during] the last two months. We're turning down work right now because they want to get everything

Harmony?

By Jeff Baumgartner, Editor



done before The National Show," notes Michael Malcy, vice president of business development and marketing at Vidiom, a company that serves as the software brains behind the Comcast-Time Warner Cable OCAP Development LLC joint venture.

For applications developers, the trick will be to put resources toward the emerging platform–but not too many resources.

"For iTV companies, OCAP has to be an important part of the strategy. OCAP is an important initiative that the [cable] industry is pursuing. Anyone would be crazy to be willingly incompatible," says Gary Lauder, the managing director for Lauder Partners LLC, an investment firm with stakes in iTV-related companies such as Integra5, AgileTV and ICTV Inc.

"The big challenge is timing," Lauder says, adding that it's important for iTV app developers to stay on top of OCAP developments, "but not to dedicate every resource to it."

That means they should give special attention to millions of installed cable set-tops that don't have the processing power to accommodate a full OCAP stack.

Developers offer a mixed bag

Most major MSOs have big plans for OCAP, but how quickly and how widely they will roll it out varies by operator. Time Warner Cable, for example, plans to put OCAP in at least three systems this year and across the board in 2006. Cox Communications, on the other hand, is starting this year with

OnRamp, a stepping-stone platform for legacy boxes that works toward the full OCAP stack.

Mark Hess, Comcast Cable's senior vice president of digital television, stresses that the OCAP stack is just one piece of a larger puzzle. An operator must also consider the overall server structure and the two-way messaging connection. "There's a lot more to it than a bit of code in the set-top," he notes.

"There's more than putting the stack on the box and porting Java to it," adds Steve Reynolds, the chief technology officer of OpenTV's North American cable division. "There's management of content at the server side, figuring out how to allocate bandwidth as you move into program-synchronous [applications]. It gets pretty complicated pretty fast. Those systems have to be in place before an application developer can go nuts."

But until developers have more solid direction from cable operators as to when they'll pull the trigger, many application developers lack a defined roadmap for OCAP.

"There is great confusion whether OnRamp is going first and how far away OCAP is. All we want is something we can work to," says John Bryan, director of operations of emuse Americas, a company that helps developers write to various set-top middleware platforms.

One of the first places to look is the interactive program guide (IPG).

Apps of all shapes and sizes. Above: GoldPocket has OCAP in the plans, but more recent deals (like this one with CBS) will key on legacy platforms. Middle: Zodiac Gaming, the maker of this BlackJack app, could have up to 50 OCAP-compliant games ready to go in the next 12 months. Bottom: OpenTV plans to port several titles from its popular PlayJam portfolio to the OCAP platform.

"IPGs are probably the first likely place where you're going to see OCAP applications," says Tony Wasilewski, chief scientist, software systems for Scientific-Atlanta Inc.'s subscriber networks division. "We have a project open for an OCAP navigator."

For Comcast, the porting of applications that already exist–especially those that hook into the IPG–is a high priority when it comes to the operator's OCAP plans. That's primarily because key applications like VOD and the user interface are tied to it.

"That is pretty much job one," Hess says. "Without that, you don't really go anywhere."

He adds that Comcast is also putting more resources toward a Java-based version of "iGuide" that can run on an OCAP stack. The iGuide presently is Comcast's most widely deployed IPG. Comcast has since assumed more control of its IPG future via its GuideWorks co-venture with Gemstar. Time Warner Cable is in a similar spot with its in-house MystroTV division, which is tasked with creating navigators and applications to run on the operator's OCAP and pre-OCAP platforms.

Pioneer Electronics, maker of the Passport IPG, "is definitely focused on the OCAP platform," says Haig Krakirian, Pioneer's vice president of software engineering. "Our goal is to rewrite the Passport suite of applications on the OCAP platform." In

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addition to the IPG, Pioneer is also looking to port more experimental applications such as caller ID and some parlor games.

But porting apps to OCAP "is a huge task," he says, noting that the biggest technical hurdle has been getting the OCAP stack and hardware vendors to reach consensus on features and functions. He adds that the situation is being eased somewhat thanks to the emergence of OCAP stack vendors such as Vidiom and Osmosys. A division of Pioneer is also developing an OCAP stack for digital televisions even as a two-way Plug & Play deal remains in flux.

Sprint has demo'd this OCAP-based messaging app running on a Scientific-Atlanta set-top.

"We can't just sit back and wait for those deals before developing applications," Krakirian says.

Looking well beyond the IPG, OpenTV hopes to port games from its PlayJam portfolio to OCAP. PlayJam, deployed by nine different operators worldwide so far, has a library of roughly 300 titles.

Reynolds suggests that porting games is not as difficult as it might be for other applications. That's because most are coded with an underlying gameplay engine for things such as user input and how elements move on the screen.

"The bigger part of the work is redesigning the interface to make the graphics look better," Reynolds says.

OpenTV also supports "Ocode," a client/player based on Java that enables the company's applications to run on an OCAP-compliant set-top box. The player can be resident on the box or loaded alongside the application.

"It's an option for programmers and operators to tap into an existing base of applications and make them available immediately for their OCAP deployments," Reynolds explains.

Vidiom, meanwhile, makes an application development tool called Vision Workbench, which simulates an OCAP set-top box on the PC. "That allows the application developer to develop the majority of the application without connecting to the set-top or the headend. It helps to jumpstart the

ETV and the road to OCAP

Before OCAP is widely supported, application developers will be spending most of their time and effort on legacy cable boxes that do not have the horsepower to support the full OCAP stack.

While MSOs like Cox are championing OnRamp to OCAP, the cable industry (read: CableLabs) has been quietly working on a special project for enhanced television. ETV enables interactive content and apps to synch up to the actual broadcast.

But why is ETV so important? It fits into the traditional TV paradigm, for one thing.

"There's no question that ETV usage blows away anything you see in terms of portals and virtual channels," says Newnam of GoldPocket. He estimates that almost all (98 percent) of the people watching television are watching linear video.

Although the details behind cable's ETV initiative remained sketchy by press time and many elements still require approval, the project will focus on "bound" apps–those specific to the show being broadcast. Plus, as a subset of OCAP, it will work on deployed boxes, thereby giving cable its own version of the "Red Button" that BSkyB has made so popular in the U.K., and corporate cousin DirecTV hopes to exploit soon in the U.S.

–JB

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development process," Bonin explains.

Emuse, which has built iTV apps primarily on the BskyB platform in the U.K., is taking its act to the United States in the hopes of catching the cable and DBS iTV wave. It markets a tool that enables developers to create OCAP apps without the additional coding skills. Among its current projects is taking existing OpenTV apps and making OCAP versions of them, Bryan explains.

While some app developers are stepping more cautiously into the OCAP arena, Zodiac Gaming is plowing ahead on all cylinders.

Zodiac, which has deployments with Cablevision Systems Corp. and has ported some higher-end titles for the S-A PowerTV set-top operating system, runs a division focused squarely on OCAP.

"We started to look where the cable industry was headed, and our feeling was that OCAP, and I include OnRamp in that mix, is the future of where cable is going," says Alexander Libkind, Zodiac's president and CEO. "Over the next six to 18 months we think this will be a very hot area...and we want to be a player in this space."

'Over the next six to 18 months we think this will be a very hot area...and we want to be a player in this space'

–Libkind

Zodiac has about 100 games available on the PowerTV platform, "but I expect to have upwards of 25 to 50 games in OCAP in the next 12 months," Libkind says.

The business of OCAP

In addition to timing, some believe there's still a lack of clear direction on the business end of OCAP. A game publisher knows the cut it will receive for making a title for the Xbox or Playstation2, as do companies that create apps for cell phones. The situation for OCAP is a bit murkier, experts say.

"The single biggest open question is: What will the business model be for an application developer?," Lauder says. "Cable operators have yet to answer that question."

Until that gets figured out, "there might not be much in the way of third-party development," he warns. "For that [business segment] to really blossom, there need to be fewer risks on the part of the developer." ■

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KNIGHTS of the Technology Roundtable

CABLE'S TOP CTOs WIELD THE WEAPONS OF COMPETITION


Sir Bowick


Sir Davis


Sir Fawaz


Sir Fellows


Sir LaJoie

KNIGHTS of the Technology Roundtable

Some of cable's top CTOs rendezvous to give the lowdown on digital simulcast, VOD, DVRs, VoIP and iTV

Because they are crossing swords with multiple enemies on multiple fronts, cable operators can no longer afford to concentrate on just one new service at a time, but must be able to launch and support many as they act on their own and react to the EchoStars, DirecTVs and Verizons of the world.

CED *Editor Jeff Baumgartner and* CED *Contributing Editor Leslie Ellis recently caught up with some of cable's top technology talent to learn more about cable's current stable of weapons, as well as those that are still in the foundry, being built to help the industry meet the challenges of the not-so-distant future.*

Joining the call were David Fellows, the EVP and chief technology officer of Comcast Corp.; Marwan Fawaz, the SVP and CTO of Adelphia Communications; Mike LaJoie, the EVP and CTO of Time Warner Cable; and Wayne Davis, the EVP of engineering and CTO of Charter Communications. CED *held a separate conversation with Chris Bowick, the SVP of engineering and CTO of Cox Communications. An edited transcript follows.*

CED: Let's start with digital simulcasts. Where are each of you with deployments and trials?

Bowick: As far as our plans for this year are concerned, we will have digital simulcast up and running in some shape, form or fashion–and this doesn't necessarily mean all of the analog programs will be digitally simulcast–in about four markets this year. The anticipation is that we will move much faster in 2006 and beyond, but we're starting off in 2005 with probably about four.

LaJoie: We have some trials up now. We have plans to roll it out pretty much everywhere, as fast as we can, as part of a larger bandwidth initiative. We won't get it all done this year.

Fawaz: We're in trials. We have plans for launching our top 10 markets this year. The goal is similar to Mike's: We'd like to set the foundations for the transition from analog to digital, which obviously will take a long time. You have to start somewhere. In conjunction with simulcast, we are employing additional spectrum efficiency tools, like advanced statmuxing. We're also looking very closely at switched digital.

CED: How many channels in the mux?

Fawaz: Today we have a lot of SD/HD (standard definition/high definition) combinations. So we do two HDs and one SD (per 6 MHz channel), which helps us to take advantage of some of the leftover capacity on the HD QAMs. And we're also going from 10:1 to 12:1 of the multiplex.

Fellows: We've said that by the end of this calendar year, we'll be simulcast everywhere. We're already launched in a few systems, where digital boxes now tune to the simulcast channels. The only reason we aren't going faster is the availability of the ad insertion gear. We insert ads on something like 40 different channels. We make more than a billion dollars a year doing it, so it's important to have that as part of our simulcast effort. We have gear in our lab that does GigE in, GigE out. But more of our systems haven't switched to the simulcast because we don't have (ad insertion) deployed in the field yet.

Davis: We're obviously commercially launched with simulcast in Long Beach (Calif.). Now we're expanding outside of the Long Beach market, into the larger L.A. footprint. As well, we're in the

process of rolling simulcast out over the next 30 to 45 days in our Wisconsin markets. It's active and turned up in the headend, and we have friendlies on it in Wisconsin now. There are other markets behind it–which I won't speak about now–but, in general, we're looking to pass 3 million homes with digital simulcast this year. A little challenge we have is the number of headends, and the cost. So there are transport and connectivity issues now. As far as the bandwidth goes, the additional bandwidth required for this–we're taking a very traditional approach. We're moving to 100 percent 256 QAM where we're not already.

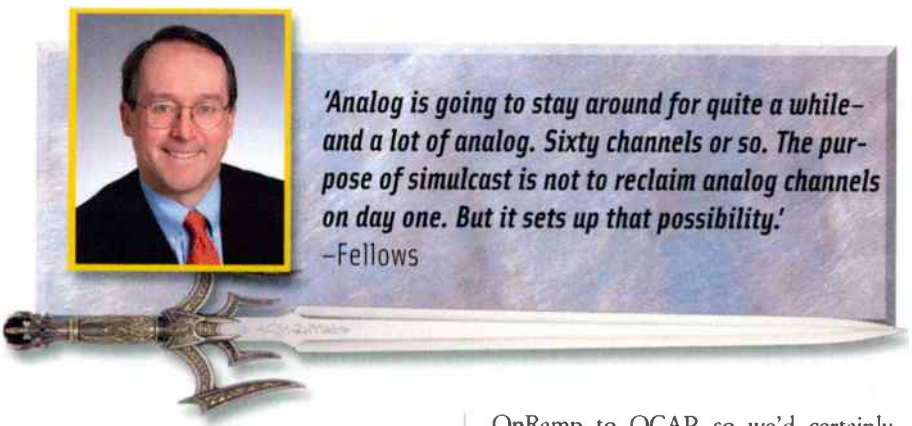
CED: Chris, you mentioned that you might not simulcast every analog channel. What factors would keep you from simulcasting some and not others?

Bowick: Remember that this is a migration over time. I think a lot of our field locations are just now beginning to play with the concept. Part of it is that. Part of it is making room for the additional 42 to 48 MHz of additional bandwidth in order to transmit another 70 channels, so there's some work that has to happen there. Just miscellaneous stuff–like ensuring that all of your analog pays and pay-per-views are up in the digital tiers as opposed to down in the analog area, and making the transition to 256 QAM across all of your network to ensure you've got the 40 percent efficiency gain there. Also, we're looking at ways to improve multiplexing efficiency–moving beyond the 8:1 for standard definition to something above 12:1 or even beyond to gain some efficiency there so you can make room for some of these simulcast networks.

CED: There's been talk for a couple of years about this $50 all-digital set-top. How is that coming, and what feature sets are you currently expecting that device to provide you at the get-go?

Bowick: We're actually in the process of working out the answer for that. We do have a concept for a low-cost box that we've proposed to both of our primary vendors. We're also aware of their low-end boxes–the DCT700 on the Motorola side and the Scientific-Atlanta equivalent box. I think in general the feature set that's available in those types of boxes is palatable to us, but...our transition to OpenCable and OCAP (Open Cable Application Platform) is very important to us, and, of course, we've been pushing OnRamp to OCAP, so we'd certainly want to ensure that any boxes that we deploy would be capable of deploying OnRamp to OCAP as a minimum and potentially a full OCAP later on.

Frankly, we are paying very close attention to the work Comcast is doing with Motorola and the work that Time Warner is doing with Scientific-Atlanta. We obviously have to face the fact that those two do have a tendency, because of their volumes, to drive those two vendors pretty significantly. I don't think you'll see our needs vary significantly from the rest of the industry in that regard.



Fellows: At Comcast, we have an active program to both produce the chips for that box, and to have vendors produce that box. It has DSG (DOCSIS Set-top Gateway) for signaling. It has an advanced video codec, either VC-1 or MPEG-4. It's capable of running OCAP, so that dictates a certain memory footprint size and processor speed. And it is all-digital, so, no analog (components) are necessary. That helps you save some money. The box next year will not be $50. In the same way, cable modems weren't $50 to start with. We're trying to make sure we have the right $50 DNA inside the set-top box, as it will get to $50 when we crank up the volume.

LaJoie: I'm not comfortable in an environment where there [are] multiple MSOs talking about the prices we pay. It's not a conversation we typically have. We all drive toward it. But we don't talk about price, for obvious reasons. Having said that, I agree with Dave: There are ways to cost-reduce the box. I think the cable modem analogy is a good one. The steps that the industry is taking will have a similar effect on set-top boxes. There are similar kinds of cost curves. The set-top box is still more complicated (than a cable modem); there's more circuitry. Besides, if you really want to get into the expense of the box, you can take the clock off the front, take the buttons off, and make it a very smart, very simple network device.

Davis: It is important for that (set-top) price to go down. As we switch to all-digital and put it in front of all the analog devices out there–having that box be less expensive is very important. It's a hurdle to overcome. We need to drive it down.

Fellows: I forgot to mention, in my list of attributes, one important addition to the things we want in that low-end box: Downloadable security.

CED: Are you developing that yourself?

Fellows: It's one of the CableLabs NGNA (Next Generation Network Architecture) projects, so it's being

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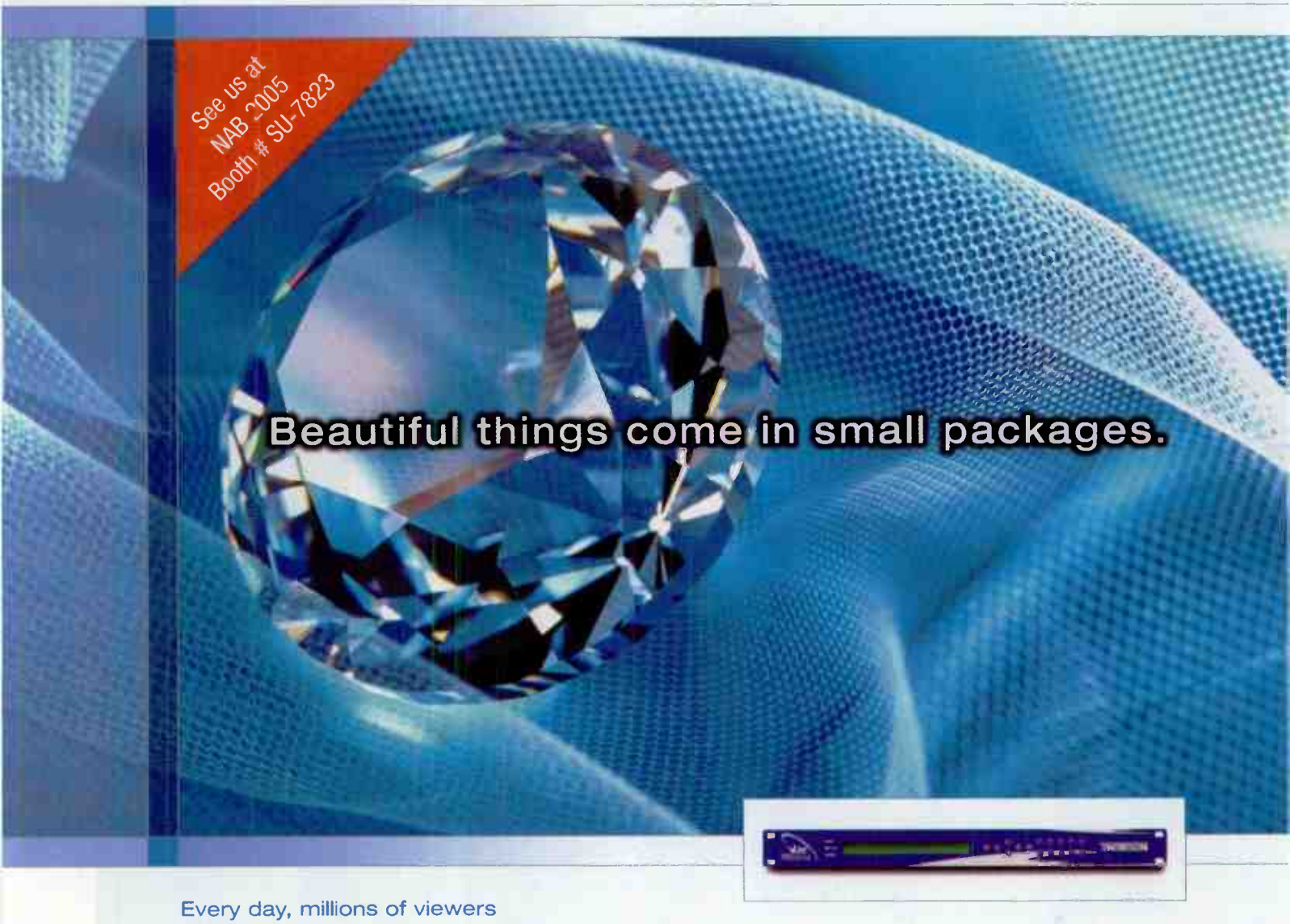

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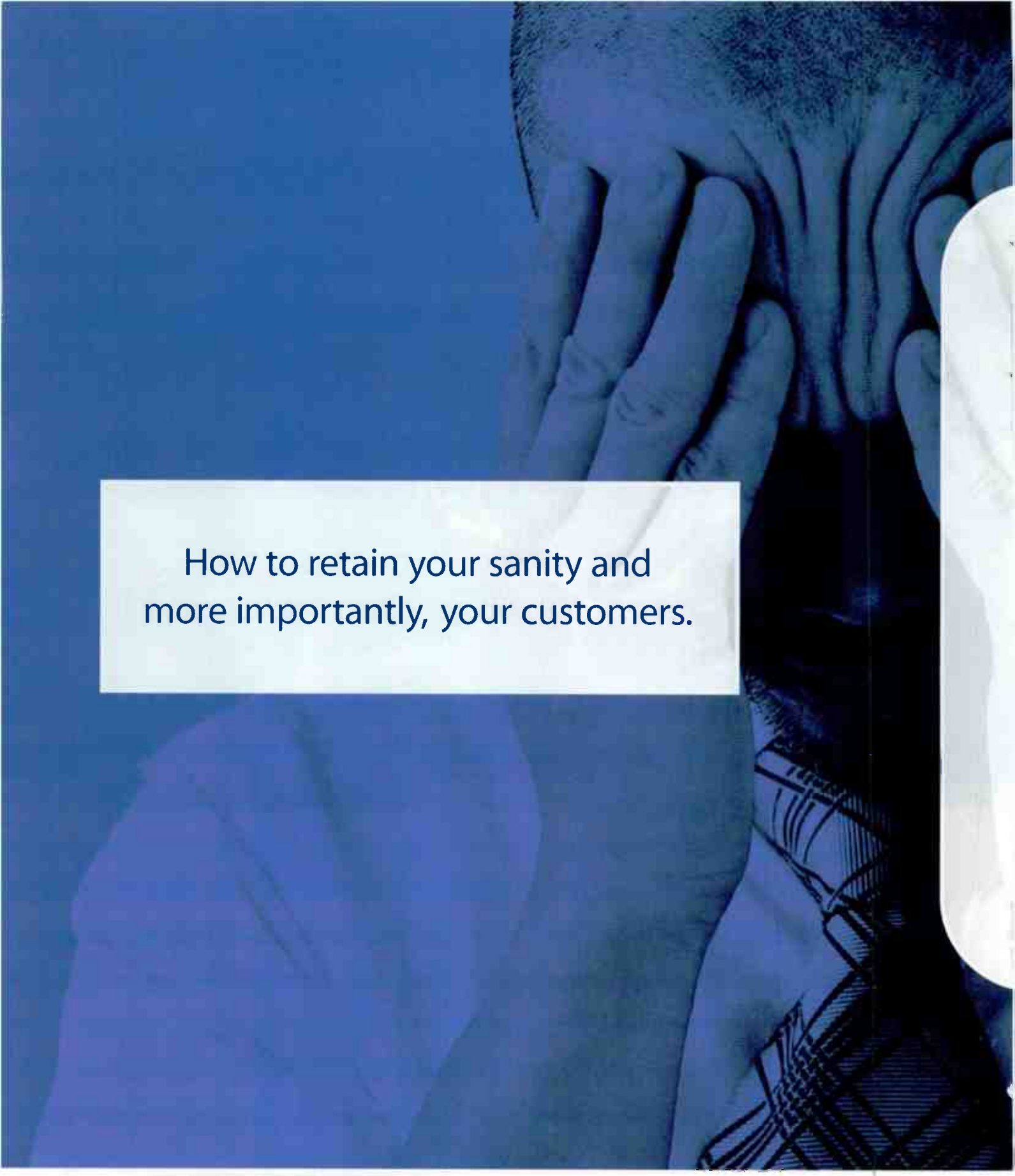

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worked on under the CableLabs umbrella. But yet, chips are being developed, and software is being developed. Downloadable versions of today's CA are being worked. *(Editor's note: Soon after this conversation, Comcast and Motorola inked a far-reaching partnership that included two joint ventures concerning Motorola's conditional access technology. Please see p. 14 for more details.)*

Fawaz: I'd like to follow up on the feature list Dave just mentioned. Obviously, an all-digital box has to support all incumbent apps–IPG (interactive program guide), VOD (video-on-demand), and so on. So I think there are two main questions that are up for debate. One is the advanced codec, which is a unique opportunity to help solve some of the bandwidth issues. The second is whether we want it to support OCAP or not. That's also debatable. Obviously you're looking at a higher memory footprint–maybe 16x64 Megabyte–that adds cost. So we're taking the analog contents out, but we're adding things that take the price back up. It's a tough balance.

CED: Does that mean you'll have a range of devices, even on the simple, digital-to-analog, low-end side of things?

Fawaz: You'll hear suppliers talking

'You're not going to see Time Warner expand spectrum above 750 MHz. There might be an isolated case here and there where we'd decide to do it–but by and large, no.'

–LaJoie, on bandwidth expansion

features. They challenge us. Do you want DOCSIS? Adelphia's answer is yes. As for how much processing power and memory we need to support OCAP... the business case needs to be run.

LaJoie: I don't believe we'll be buying boxes down the road that don't support OCAP. The boxes we buy will support it. I think that the real dollar floor on set-tops is going to drop, without a doubt, even taking into account all of the features Dave outlined. There's not one that he said that I wouldn't agree needs to be there.

You'll also see us deploying more expensive devices as well. It'll mostly be dictated by market conditions. And, we're going to see a lot of devices connected to our network that aren't owned by the cable industry. The two way CE (consumer electronics) devices that are coming–they'll take some cost off of our balance sheet.

CED: What about analog spectrum reclamation? When does that start to kick in?

Fellows: Analog is going to stay around for quite a while–and a lot of analog. Sixty channels or so. The purpose of simulcast is not to reclaim analog channels on day one. But it sets up that possibility.

Fawaz: Although it's a small part of the industry, there are still some limited bandwidth systems out there, with less than 750 MHz. The question is, do we want to upgrade those by going to 100 percent digital? Our position has been, we don't think you want to make that 100 percent cutover overnight. We don't think it's con-

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sumer-friendly. I agree with Dave. You'll have a lifeline analog service for a while. It will be a gradual transition, using a simulcast approach. We want to make the move in a consumer-friendly way.

CED: Despite the shift to digital, do you think analog can retain its value long term? I realize that you're early on with this, but do you anticipate offering a lifeline analog service?

Bowick: That's, honestly, a very debatable question both in the industry and even within Cox, because it's a very strategic discussion. Many have viewed, and I fall into this camp, that analog certainly takes up a lot of bandwidth–there's no doubt about that. And we need to be more efficient in how we use that bandwidth. And yet when you look at the strategic advantage that analog carriage has over our competitors, especially over DBS, for example–we can place A/Os as many places as we'd like without having to place a box on these bedroom and backroom television sets. To that extent, it's certainly a strategic advantage, but there's probably going to have to be some improved way of utilizing that bandwidth, because when you look at everything we'd like to add in the future and try to cram it all into 750 MHz of bandwidth, it's going to require over time that we use some advanced technologies. But in addition to that, it might also require that we recapture a little bit, at least, of that analog programming. We've looked at scenarios internally that could take us down to as few as 20 analog channels or, on the flip side, keeping all of our analog channels.

We've looked at both scenarios. Both are doable with aggressive use of advanced technologies from a compression and multiplexing standpoint and from a switched video perspective. In my estimation, what you would see longer-term is something in between.

CED: Are any of you with systems below 750 MHz thinking of doing a cutover without the simulcast?

Fellows: I'm watching with great interest the parts of Wayne's systems that have gone all-digital, just to see what kind of surprises that brings to the operations world. We've not made any further progress on picking a site to say, "That's where we're going 100 percent digital." We're in the same place–we have some systems where it seems to make a lot of sense.

LaJoie: Can we reclaim analog? Yeah, yeah, yeah, we know how to do that. All-digital? We know how to do that. These really aren't tech questions. The technol-

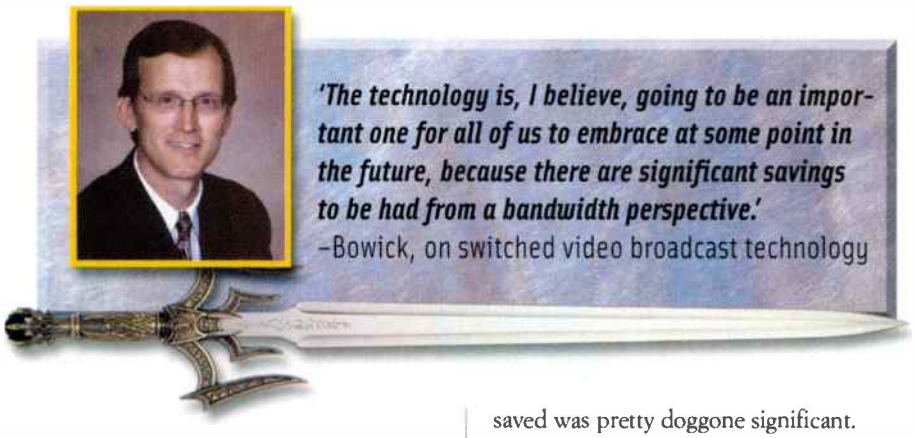
ogy is straightforward. It's overall spectrum management. There's a bunch of tools that all of us have. There's a pretty common set of issues we're all looking at. One of us may stress one path more than the other, but generally speaking, we're all looking at the same tools. The how and when of it aren't tech questions.

Davis: Let me add to that. The transition to digital doesn't necessarily have to be driven by bandwidth. If you think about having some low-cost digital set-top in front of our basic customers, which gives them access to music, VOD, the guide...the larger base of our customers are in that analog world. If we can move them into the digital world, because they *want* to be there, then there's a reason to transition, let alone the bandwidth matters we have out there.

There are also some interesting things we've found where we've gone with digital simulcast. One of the first things we did is, we launched the all-digital QAMs in Long Beach with 96 channels above 750 MHz. That was a mistake. We ended up moving that down to below 750 MHz to about 650 MHz, because we had MDUs out there, and wiring was a challenge. You address those one-by-one when you get to the offering of high-speed data. If you're going to cut over to an all-digital service where all the subscribers have it, we'd need to go address that proactively. It was a bit of a challenge for us and a learning issue, as well, and we won't make the same mistake in the other markets. We did it before we affected any customers. But there's a lot to be learned in this digital transition, probably more so on the operational side than on the bandwidth/spectrum side.

CED: One of the tools in the bandwidth toolbox is switched broadcast and Cox is one of a small group of operators that has tested and shared results on switched broadcast technology. Chris, based on the results of those earlier trials, what do you see as the next steps with that technology?

Bowick: I think it's a little early to be real definitive about it. I can tell you that the work that we did in Tyler, Texas (with BigBand Networks) on switched video was important work for us, and they really liked the outcome. The system would tell you, "We loved it. It worked as advertised. Very few glitches. Little difficulty in getting it launched." The bandwidth it saved was pretty doggone significant.



'The technology is, I believe, going to be an important one for all of us to embrace at some point in the future, because there are significant savings to be had from a bandwidth perspective.'
–Bowick, on switched video broadcast technology

But there are some concerns about switched video going forward. Right now, there's one vendor. There certainly needs to be more than one vendor. Most companies don't like to put all of their eggs in one basket, so to speak. It needs to be less of a proprietary technology and more of an open technology. What we would like to do next is continue to pursue the technology from that perspective. The technology is, I believe, going to be an important one for all of us to embrace at some point in the future, because there are significant savings to be had from a bandwidth perspective.

CED: One approach being bandied around by vendors such as S-A and Xtend Networks is bandwidth expansion. Is bandwidth expansion to 1 GHz or 3 GHz one of the tools you're considering?

Fellows: We don't need to do it. Even if we did, it's not a rebuild to 1 GHz. You take the 1-Gig amps, you drop them in at 750 MHz spacing, and you eke out more bandwidth. So it's not a rebuild, it's a drop-in upgrade. I've told S-A that I'm very glad it exists. I don't need it, but if I did, I'd want it to be there. So, I think you'll see some of us–not *us* but some of us–doing that. But it's not going to be a big deal. This is not the start of spending another eighty or ninety billion [dollars].

Fawaz: I agree. If anywhere, we'd use it in new plant extensions. The technology continues to improve, and we can take advantage of it for going-forward plant.

LaJoie: You're not going to see Time Warner expand spectrum above 750 MHz. There might be an isolated case here and there where we'd decide to do it–but by and large, no. I agree that for plant extension, it doesn't cost anything more to build the additional spectrum. So you might as well do it.

Davis: Charter is of the same mind. There are too many tools that we haven't tapped to mine the bandwidth. Charter has over 45 percent of bandwidth at 860 MHz. Whether it's advanced codecs, 256 QAM, switched digital broadcast, reduced node sizes–whatever it may be, there are tools yet to be tapped before we need to expand bandwidth.

LaJoie: There's better statmuxing, better grooming–just on and on and on. There's just so much un-mined spectrum. Bandwidth expansion really isn't on the deck. Vendors told you this? Did they tell you how many purchase orders they have?

Davis: If they can show us how to do it without digging up streets, spending an incredible amount of money, and disrupting customers, we'll listen.

Bowick: If we were to project all of our needs for bandwidth out for another five years, it's amazing how much band-

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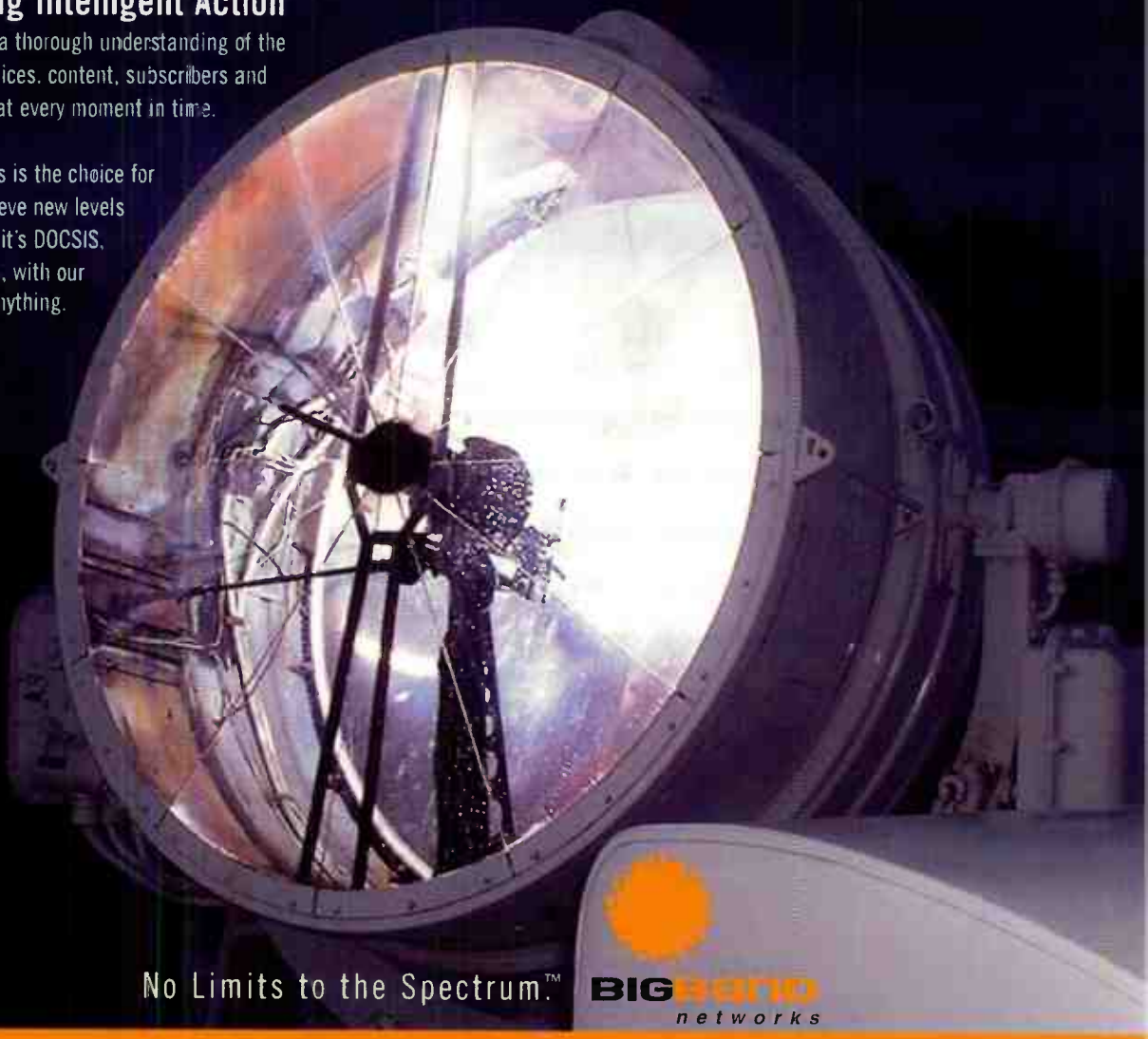

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width–given the status quo on technology and you don't do anything but just start adding services–you can come up with from a requirements perspective. I've got it mapped out in front of me for the next five years, but you could actually come up with enough bandwidth requirement that would approach 1.3 GHz. But that's without utilizing any of the advanced technologies that I was alluding to earlier. If you start looking to some of the tools available to us, for example, ensuring that our node sizes and our service groups for video-on-demand and other interactive services are less than 500 homes passed, ensuring that our multiplexing efficiency with advanced codecs is such that we can be at close to 3-to-1 for HD and close to 16-to-1 for SD, compared with where we are today, which is much less than that. Adding switched video to our repertoire for both standard-definition and high-definition, and also transitioning to DOCSIS 2.0.

I've gotta tell you, if you do all of that, there will be very little need for 870 [MHz] upgrades. Then, if you layer on top of that, the potential reclamation of some analog channels...there should be plenty of bandwidth left, and we've always said that there would be technologies that would continue to have our HFC network be the winning network.

Now, there are some costs involved in keeping our network where it needs to be and ensuring that we're using our bandwidth efficiently. But an 870 MHz upgrade, if you're offering video, voice and data services that are becoming lifeline services–and let's face it, data is becoming a lifeline service today–is not a trivial thing. It has the potential of disruption, and you have to be very careful about it.

CED: One quick conditional access question for Mike. How is your deployment of the S-A overlay going?

LaJoie: It's going fabulous and it works great. It's seamless. There's a little bit more operational complexity, but it works nicely. I'm not sure if anyone else here is doing it.

Fellows: No, but we've gone to Houston and looked at it, so I can independently confirm what Mike said.

CED: What does that mean, Mike? That you're going to do more?

LaJoie: I don't have a lot of Motorola [systems]. I'm told that we run the largest Motorola network ever built, a million devices. But other than that...

Bowick: The way I look at the S-A overlay would not be just to place

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Scientific-Atlanta boxes in Motorola systems. If the S-A overlay is a conducive technology to moving toward NGNA and specifically a conditional access system which is non-proprietary–including a transition to downloadable security–then that is how I would look at that technology for deployment within Cox, and not necessarily as a replacement for S-A boxes for Motorola boxes.

CED: Moving on to VOD. How many hours of stored content do you offer today, and what are you aiming for by year-end?

Fellows: We currently offer 2,500 hours, going to 5,000 hours this year. That's about 5,000 pieces of content going to about 10,000 pieces of content.

Fawaz: We're averaging about 1,500 hours, and will be at 2,500 hours by year-end.

Davis: We're at 1,500 hours now, and projecting 3,000 by year-end. That's market-by-market. For us, SVOD is the primary driver of hours. As we have the need, market-by-market, we may end up being over that 3,000 hours. But in general, that's where we are.

LaJoie: Our floor is 2,500 hours. Some markets have much more. It depends on which vendors they (the systems) went with. Storage is relatively easy to expand–it doesn't take more than a few weeks. Storage is not that huge of an issue.

Bowick: The number we've got on capacity right now varies depending upon how long we've been in the market, but it varies from roughly 1,000 hours to 5,500 hours in some of our more mature markets. Transitioning toward the end of the year, probably to not much more than about 5,500. Over time, that will certainly grow to, over the next several years, perhaps double capacity.

CED: How are contention rates responding to the addition of so much more free content, and the fact that customers are slowly acclimating to on-demand behaviors? Are they rising as anticipated?

Fellows: We built out at 10 percent. Sometimes we hit 10 percent at the edge. But...we rarely hit more than 3 percent. As we decouple or evolve our architecture, we can do concentration. In neighborhoods where traffic is blocked, we can add more QAMs. It's not a huge deal. It's not adding more servers.

Fawaz: We do have an advantage, because our serving areas are, on average, around 250 homes passed, per serving area. The challenge has been efficiently deploying QAMs combined with nodes. We have the reverse challenge: The efficiency of the QAMs. So we don't want to go into too small of an area as we combine. We are at six percent, but we haven't seen concurrencies go up above two percent or so.

LaJoie: It just depends on how you look at this thing, and how you build the network. We're about the same–around three percent contention. We may have seen a few higher peaks. On a system-wide basis, it tends to flatten out. Pay-per-view is great in some neighborhoods, and almost non-existent in others; the same is true with VOD. You build this out, with a number of QAM channels. Then you build service groups that pass a number of homes to achieve the desired response. Ninety-nine point five percent of the time, when somebody tries to get a stream, they get it. We've been building with content in mind since the very beginning. We keep segmenting plant. We're still combining multiple nodes on a single laser, because we haven't yet seen the contention. In some areas, we're down to one laser per node. We'll do that kind of fan-out reduction over time, as the popularity of the service increases.

CED: Does that change with HD-VOD? And how is that topic coming along?

Davis: We don't have any to offer right now. We'll do a trial by year-end, to see what the usage is. I don't see any issues with the technology.

LaJoie: The problem with HD-VOD is, there's really not a lot of great content

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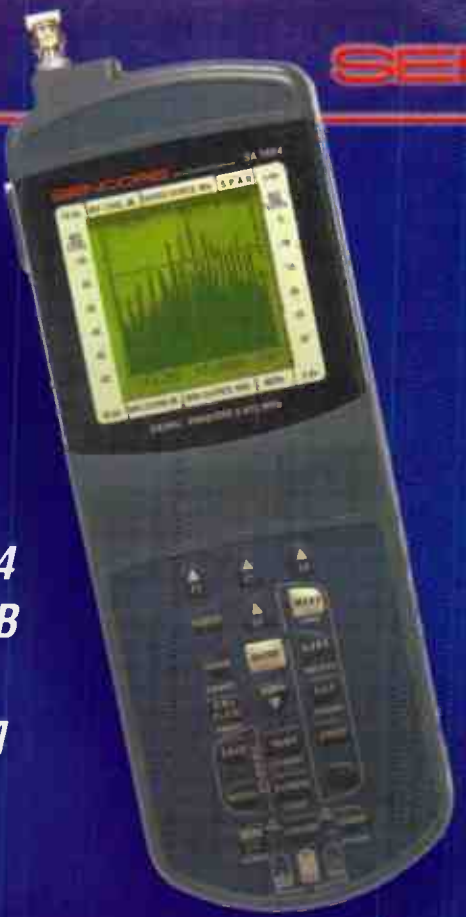

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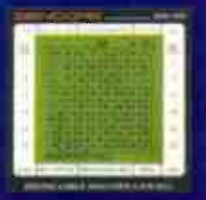

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out yet.

Fellows: In some of our systems, we offer pay movies on-demand in HD, but we're not offering any free content in HD yet.

Fawaz: We do have plans, for the end of the year, to have some HD content on VOD. But for the reasons you just heard, this is not a high priority. I think it is a significant differentiator for the industry, though.

Bowick: We have been testing it in the lab, so we are evaluating it. We do believe that it's in our future. If we look at our five-year plan, we have certainly mapped out that a significant chunk of our content is going to be high-definition VOD content, and that, by the way, is one of the other significant drivers for bandwidth in our plant.

CED: Is HD-VOD where advanced compression codecs first intersect with cable?

Fellows: For us, yes.

LaJoie: We have very specific plans for advanced codecs, but we haven't announced them publicly yet.

CED: Now's your chance.

Davis: Advanced codecs are part of our all-digital headend turn-ups.

LaJoie: You're buying boxes with advanced codecs?

Davis: No, for the headend. Encoders.

CED: Is multi-room DVR the next step in advanced features on the video side?

LaJoie: We're deploying it at Time Warner.

CED: How aggressively?

LaJoie: It's available to systems that are running the S-A guide. So right now, it's available to about 35 percent of our systems.

Fawaz: We've not deployed it yet. We have the ability to deploy on S-A, as Mike mentioned, and also on [Digeo Inc.'s] Moxi. The question we're asking our suppliers is, make sure there is full functionality in that second room–the ability to pause live TV in the second room. Also having some better storage management tools for customers, so they can move content around. Those things need to be worked out for us to go to full-scale deployment.

Fellows: Like Marwan, we've not deployed it yet. We have plans to deploy both the S-A and the Moxi boxes. Then when Motorola comes out with its plat-

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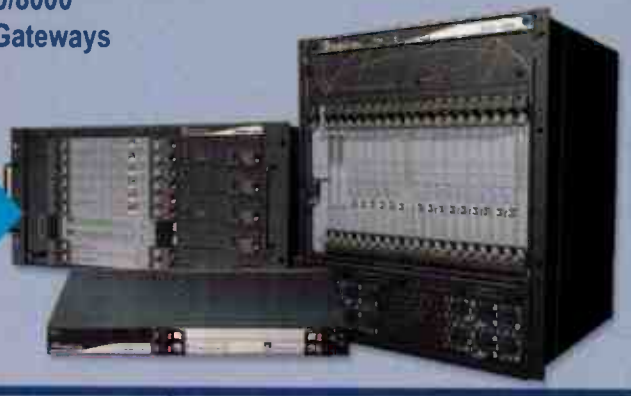

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form, we'll be trialing it also.

Davis: We're testing the S-A multi-room right now, and as soon as the Moxi is available, we'll run that through trials as well. It's not only the feature set. Multi-room DVR makes the DVR home economics look much better. There's a nice driver behind that.

Bowick: It's pretty high on our list. We've waited a long time for Motorola to come around on the DVR. DVRs are just jumping off the shelf. We love the product; our customers love the product. Now we have to find a way to deploy that more ubiquitously at less cost, and that's what multi-room is really all about. That provides a huge hook for our customers. We have it in the lab today. We've identified a market, not yet announced, that we'd like to go into early this year and evaluate how that goes, and then we'll see where it goes from there.

CED: Let's talk about OCAP. What are your plans for this year?

LaJoie: We're going to put OCAP in some systems. The schedule is not firm, but at least three this year, hopefully more. By next year, we'll be rolling it out everywhere, and all the new devices we buy will be OCAP-capable. The set-tops we buy now are OCAP-capable. And for new services and boxes–all OCAP. Of course, there's the small matter of a few million boxes that aren't able to do it. They'll be pretty much feature-compatible. You'll start seeing more applications on OCAP that you may not see on legacy boxes.

CED: Is that coming out of your Mystro group?

LaJoie: Most of it. The core software is coming out of the erstwhile Mystro guys, yes. There are other companies that are building apps as well.

Bowick: We are working feverishly on both [OCAP and OnRamp]. We have been working for quite a long time, as you know, on OnRamp and expect to deploy OnRamp and interactive television in a market within the next...month to a month-and-a-half or so, and potentially another four markets yet this year. We are working very hard in the deployment of OnRamp to OCAP as well as some quick interactive services on top of that.

In parallel with that, we have been working very hard with our vendors for an OCAP stack, but also a monitor application and an extended monitor application. I've been working with our brethren MSOs to let them know that this work was also happening in the background and would love to share some of that work with them.

Fellows: For Comcast, we're a member of the OCAP LLC that is the vehicle for [Time Warner's] OCAP stack for S-A. That same venture will create an OCAP stack that will work in a Motorola environment so that we know we have at least one available. In conjunction with Cox, we have the Double C LLC, which is the vehicle through [which] we will acquire Liberate. There, we have a whole lot of experts in the OCAP world. We're anxiously awaiting the arrival of over 100 software engineers to help us launch OCAP and applications and infrastructure in this space. So we're committed to OCAP, and we're moving down that path.

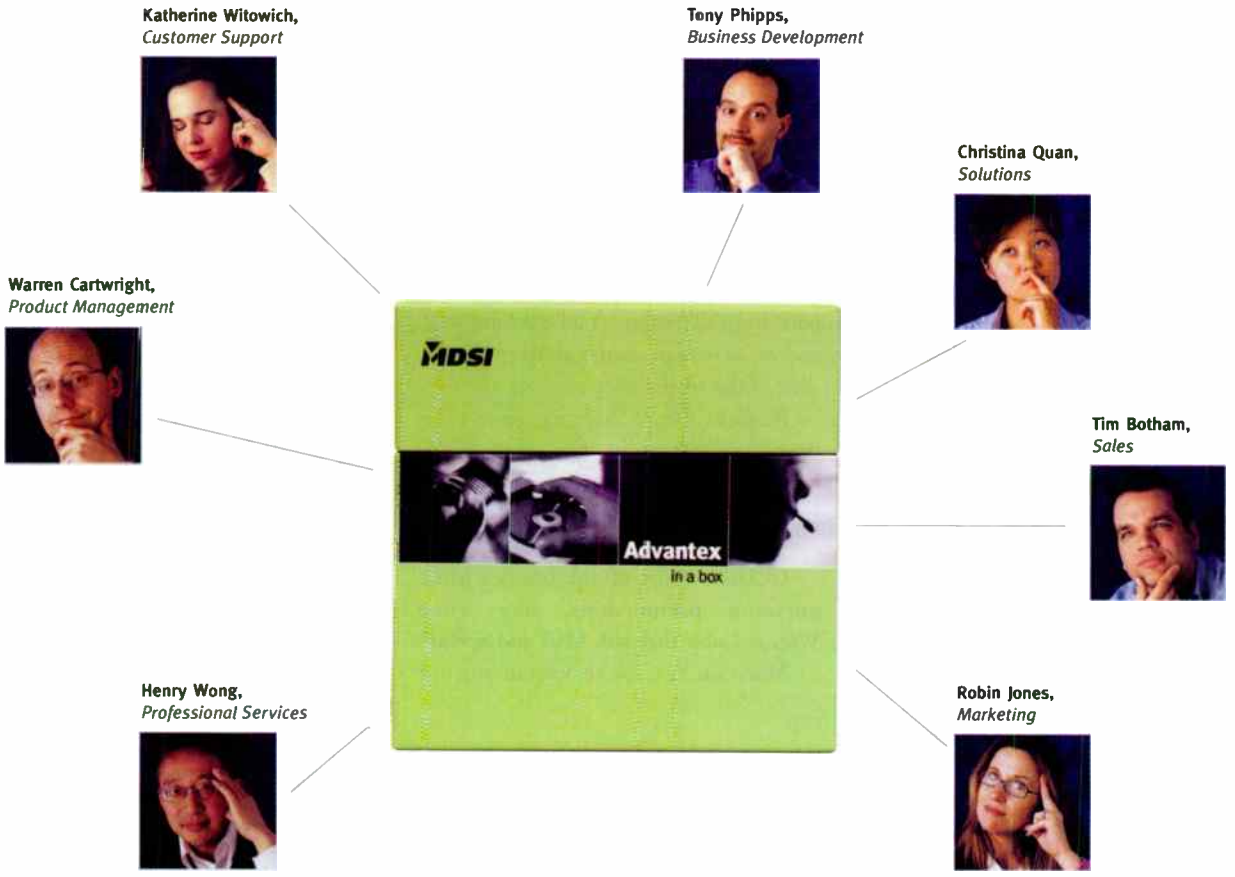
Fawaz: We, too, are committed to OCAP. We're in the getting-ready stage now, bringing resources on board. We'll be doing some lab testing and some qualifications toward year-end, to be able to provide OCAP in all of our systems sometime early next year. At the same time, we're looking to collaborate with other MSOs–Dave mentioned 100 engineers–on sharing resources and doing some common testing. We do have challenges with integration and qualifications.

Davis: We're in the OCAP camp, as well. I think Marwan makes a good point of sharing resources. No sense inventing the wheel over and over again. Where we can leverage learning, we will. We're all competing for the same resources out there. We want one OCAP headend this year and scale across the footprint next year.

CED: Do you need OCAP for the July '06 removable security ban?

Fellows: No. Well, indirectly. CableCARDs need to plug into a host device. Host device specs include OCAP. That interface is under our control, so we could change it to run with SARA (Scientific-Atlanta Resident Application) or legacy software or GuideWorks (the Comcast-Gemstar TV Guide IPG joint venture). I think all of us envision a world with multiple set-top box providers. So for our own leased world, OCAP is a great way to have applications running on different hardware platforms. Secondly, there's CHILA (CableCARD Host Interface Licensing Agreement)–so we will have two-way devices showing up next year. OCAP is the way to support our CE partners. Third is, the government may force us to do it, or some other force may come in.

CED: What are your opinions on



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how VoIP "grows up," to be more than just a bundle component? Do you want to add on to it, with SIP-like features, or wireless?

Fellows: The short answer is yes.

LaJoie: We're already moving off of TDM (time division multiplexing) in the interconnect links and moving to a SIP (session initiation protocol) interconnect. Eventually we'll get to SIP-to-SIP. Hopefully this year you may see us do a field trial with that. I think we're all looking to move toward not only a wireless mobile application that's VoIP-based, but also seamless mobility. I think all of us are hoping that's the direction it'll go.

CED: Where are the rest of you with VoIP? Dave? Last year you talked about a specific plan. Any changes?

Fellows: We're still in the original three cities: Indianapolis, Philadelphia and Springfield, Mass. Commercially. And we're bringing other properties on line.

Fawaz: We're through technical trials and into operations trials now. We're stretching all the operational issues, from installs through provisioning, order management, and, as best we can, we're trying to get to the point where we can make it as seamless as possible–all the orders flow through; there are no swivel chair scenarios. We're testing that through trials. We're within months of launching. I think you'll hear us talk of several launches in the second half of this year. We haven't said what cities, but we're qualifying based on stringent network readiness. We want to be better than the incumbent.

Davis: We're getting more aggressive with telephony. We're very pleased with what we've seen so far, in terms of triple play. I won't speak to specific markets for competitive reasons, and we haven't given any guidance on homes passed. But it's a fair amount more than we did last year.

We're pleased with what we did last year–close to a million homes passed, marketing to a little over 600,000. We're waiting for an MDU solution, which we think is right around the corner. But 2005 looks very aggressive for voice.

LaJoie: We're launched in every one of our systems, and we've announced 225,000 subscribers (note: as of YE '04). We're moving along at an accelerated pace from there. So it's all working well, and we're very pleased with the performance of the technology.

Bowick: We're bringing five additional markets online this year. We're moving very rapidly on the VoIP front, and it's going quite well for us.

CED: Are any of you besides Mike pursuing partnerships, like Time Warner Cable did with MCI and Sprint?

Marwan: Yes. We're outsourcing our terminations and operations services to a third party [Level 3]. That helped us to market more quickly than we'd anticipated.

Fellows: We're not partnering as extensively as Time Warner and Adelphia. Obviously, when you interconnect with someone for long distance and services like that–the phone numbers are ours, the switches are ours, the third party interfaces are all part of our provisioning system. We'll also be deploying SIP-based services starting with video IM, as a service. And then over time, our SIP infrastructure and our PacketCable infrastructure will merge together. So we'll wind up with a platform that is the best of the PacketCable and the SIP worlds.

Davis: We've chosen to go it alone at this point, similar to Dave. We may do [telephony partnerships] down the road, but in the markets we're launching now, we're doing all of it ourselves.

CED: What about iTV? How aggressive will you be with that this year?

Davis: We've had an interactive service in place in a fair amount of markets, using the Wink engine (now part of OpenTV) and the Digeo-developed products. It is an interesting retention dynamic. Not anything that we charge for. As we move away from that platform and deploy the Moxi DVR, similar applications and more robust applications are on the roadmap. The specific apps that we've had out there have gained a lot of attention. Local weather, games. It's surprising how much interest there is in games.

'If we can move [customers] to the digital world because they want to be there, then there's a reason to transition, let alone the bandwidth matters we have out there.' –Davis, on digital simulcast and the digital transition

Fawaz: For us, the games and ticker info, like weather, sports and news, are going extremely well. Very robust. We're closely working with the ETV (enhanced television) group out of CableLabs. I believe this has to be a cable-wide initiative in order for us to come up with common iTV applications. We have to come up with our own version of the red button and launch it not necessarily concurrently, but in a similar timeframe. And then finally iTV becomes much more successful.

Fellows: We've spent a lot of money acquiring and partnering on iTV. There's Gemstar and having control over GuideWorks, Liberate, and a couple more deals you'll see between now and when this is published, in April. We're fixing to do interactive applications. That's all I'll say today. ID

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panies with existing power lines in place with minimal capital expenditures projected are renewing their interest in BPL as a lessee, partner, or both.

"We must work with electric companies and utilities, and they're regulated. So, they are very cautious in their approach to BPL because it requires sharing of space. But it's an inexpensive way of deploying ubiquitous Internet access and it lends itself well to VoIP," Fergus says.

How it works

BPL transmits high-speed communication services, including Internet access, over existing electric infrastructure using adaptive technologies such as repeaters, couplers, etc. The wires carrying electricity are also a conduit for data signals. Power lines, of medium voltage, travel from power substations to homes or office buildings.

Power lines connecting to homes or buildings from utility poles are low voltage. Data can be transmitted by bundling RF energy on the same line with electric current. Because electric current and RF energy signals carrying data operate at different frequencies, the two don't interfere with each other.

According to definitions from the New Millennium Research Council, BPL still requires the initial connection to the Internet backbone, where a last mile solution is required, either a direct connection to the home via power lines, or WiFi-type transmitters on utility poles. Once inside the home, a BPL modem allows access to signals through any electric outlet.

Filling more than a niche?

The rural, underserved market mentality that has dominated the BPL space may be changing with the recent deployments of BPL in select urban markets. Some BPL providers, albeit few and far between, insist BPL isn't just for isolated, niche markets, but is a cost-efficient, compelling technology and business that is well suited for multiple markets, including major metropolitan areas. But not in the immediate future.

"BPL is a good alternative to cable and DSL and you can compete head-on with them, and there's a natural progression to digital TV and VoIP. But for now, it's probably better to look at markets with fewer competitors and with a mix of rural and city enclave subscribers and clusters of buildings," Fergus admits.

He should know. COMTek is offering Internet service to Manassas residents for $28.95 per month and $10 more to commercial customers. It will eventually offer tiered services, but is already testing 100 Mbps applications via a test network for emerging manufacturers, despite a dearth

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of such companies.

"There are few manufacturers of quality products in the BPL space, and that's a concern," Fergus acknowledges.

But the few existing BPL product manufacturers have noticed a slight uptick in interest. Yet they have no illusions about the challenges that lie ahead.

"We've had to build an industry, not just a company, and it's hard to sell a vision to prospective companies, but the market is moving," says Jeff Tolnar, vice president of sales, marketing and business development for Amperion Inc., a joint venture between American Electric Power and Cisco Systems that provides medium-voltage powerline communications gear. "Utilities have an asset in place with untapped, enormous value, and there are deployments of 10,000 to 20,000 homes passed. Now, we have to convince people they need what we have." Nevertheless, partnerships between utilities, energy companies, manufacturers and service providers are sprouting as BPL business models emerge. Ambient Corp., Consolidated Edison (Con Ed) and with revenue, albeit in its fledgling stage.

Two T-1 lines, a server and router are connected to Ambient's PLC system, with its MDU nodes transmitting the signal throughout the building.

Tolnar

"Our business model is looking at MDUs as a nice business," says John Joyce, president and CEO of Ambient. "But this condo complex is just one business model. Utilities, both overhead and underground, are also clearly part of our business model. And with 200-Megabit chipsets, we can offer triple play services over PLC. It's a great opportunity globally, as well."

The Con Edison/Ambient partnership is an indication of just how BPL is emerging into a business and why utilities such as San Diego Gas & Electric and others are pushing ahead with BPL trials.

"There's a potential to reach rural and underserved communities, but we also cover San Diego County and half of Orange County. We're now determining the size and scope of our customer base and will pilot BPL and look at the results," says Ed Van Herik, a spokesman for San Diego Gas & Electric.

Additionally, Internet America, HILCO Electric and Amperion have partnered to provide BPL service in north central Texas via a combined Wi-Fi and powerline Internet access service.

"Now, it's about scale. The rural, underserved markets are wide open and utilities and operators are forming new ventures this year, while large system integration partners are getting engaged. But the economics have to get better," cautions Tolnar.

Some experts believe the model to watch is a venture between Cinergy and Current Communications. Those companies are offering BPL to the greater Cincinnati area and parts of Northern Kentucky and Indiana. "Cinergy is the real test. If they can deploy and get revenue, that could prove the case," Goodstadt argues.

The Current/Cinergy venture is tapping Cinergy's electric distribution infrastructure, with Current taking the management role.

"We're providing service to thousands of customers and will do VoIP in the second or third quarter of this year," explains Jay Birnbaum, vice president of Current Communications Group LLC. "We're concentrating on small to midsize businesses and residential markets and will seek additional utilities to become a multiple service operator. Our sole purpose is to deliver BPL to rural co-ops and utilities, then move into larger markets such as Los Angeles, Long Island, Jacksonville and others and compete directly with cable and DSL."

With their brand awareness relatively high, and with billions of dollars in upgrades either completed or near-completion, competing against DSL and cable rivals won't be easy, and poses a serious challenge to BPL's growth. Admits Birnbaum: "We have to go to urban markets and compete against cable and DSL. We just have to overcome that. We need to demonstrate we can compete effectively. But BPL costs less to deploy and has added value such as symmetrical speeds in all outlets in the house. And we must compete on pricing."

More than half of Current's customers are former cable and DSL users. "Our goal is to pass 250,000 homes, along with large-scale commercial deployments. As we scale, we'll learn more," he adds.

Good idea, but does BPL have what it

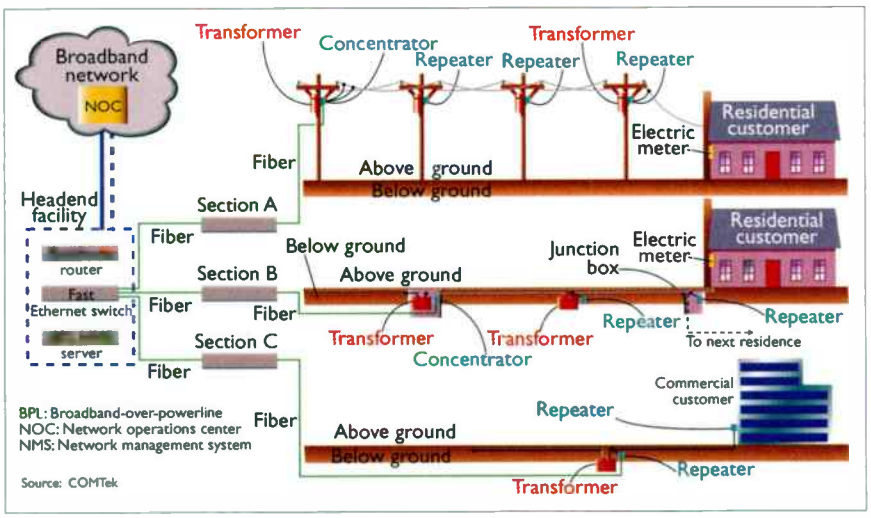

Figure 2: New architectures are sparking the BPL evolution.

Earthlink, for example, have struck a deal to provide high-speed power line-based connectivity and broadband Internet services to a 213-unit condominium on New York City's Upper West Side. The service uses Con Ed's grid system under the streets of the city.

Though certainly not a major deployment, it does represent an operational network and working business model replete

takes to effectively compete versus cable and DSL? Some are doubtful.

"BPL providers are focusing on rural areas, and utilities are very conservative and know little about broadband. That's dampening the move to BPL. They have to determine how they want to run the BPL business. There are lots of trials in the U.S., and BPL is getting its feet wet, but until they get their operational costs down in the rural areas, where it's more expensive to deploy the service, there's not much going for them right now," says Nicole Klein, analyst for the Yankee Group.

And there's the pesky interference and security issues that have dogged BPL technology for years. The new FCC rules will lighten the regulatory load for BPL by establishing specific technical and administrative requirements for BPL equipment and operators to protect against interference, encouraging news for BPL.

Manufacturers and operators remain cautious, however. "The FCC has been very supportive, but all BPL providers know they'll have to exist with common spectrum users. We're working on coupler technologies where the more efficiently you can couple with wires, the less interference. Utilities are very cautious about interference and security," Tolnar says.

Nevertheless, ventures such as Cinergy and Current are pushing ahead with BPL service and express confidence in their ability to co-exist with common spectrum users and compete head-on with cable and DSL service.

"We've passed 40,000 homes, and the hardware is out there. Fifty percent of our customers have switched from cable or DSL and there are two million gas and electric customers in our market. We're moving out our deployments to them and anticipate a high take rate," says Cinergy Spokeswoman Kathy Meinke.

Exploiting the existing distribution grids of utilities nationwide is a key value proposition to BPL. Automated meter readings, preventive maintenance, IP addresses, substations, time-of-day-pricing, and the ability to remotely connect and disconnect customers make for a more cost-efficient operation, industry players insist.

"Truck rolls and in-home installations have plagued DSL and cable. We've designed our equipment to be truck-roll free. And it costs less to deploy BPL," Birnbaum adds.

Joyce of Ambient concurs. "The cap ex is more attractive than cable. We'll take the information and data from our project in Manhattan and update our business models and will test the capability of video streaming and conferencing. The potential is there."

But is the business there? And how will BPL overcome the long odds of competing with incumbent cable and DSL providers, many of whom have learned valuable operational and marketing lessons.

"BPL can do remote turn-on and turn-off, remotely read meters, detect outages and it costs less to deploy, so there are cost-efficiencies and compelling management capabilities. The utilities look at those first, so the answer is yes, they can compete with cable and DSL. But how will they market and run the business? Utilities are seen as [being as] reliable as the telcos and cable, but aren't strong marketers, and we haven't seen a business case developed yet, so no one really knows about ROI (return on investment). But we believe that, over time, BPL will happen," concludes Goodstadt.

To what extent BPL happens is likely to depend on results from the various trials either in-progress or scheduled. However, with the FCC's blessing, technical challenges being overcome, and a growing interest among utilities nationwide, the model for triple play services to be distributed via existing power lines to both homes and businesses is emerging.

Just how powerful that model is, and whether it can effectively compete against incumbent service providers such as DSL and cable, is being determined in homes, businesses and the board rooms of utility companies, manufacturers and BPL service providers. ■

Happiness is convergence

Improving the consumer experience through packet transport

By John Caezza, President,
C-COR Access & Transport

With converging IP networks altering the world of service providers and consumers alike, cable operators are grappling with the complexities of launching and sustaining profitable new services. What's more, the latest consumer demands on networks for high definition (HD) video and interactive content (video-on-demand and voice-over-IP), along with tools to manage and monitor these applications, are placing tremendous burdens on network operators. That's because they are challenged with infrastructures and management systems that are not fully integrated.

To meet consumer demands, cable operators must transition from legacy hybrid fiber/coax (HFC) networks with incremental overlaid infrastructures to packet-based, demand-oriented, Internet Protocol (IP) networks. This transition will enable operators to deliver new and cost-competitive services that enhance the consumer's overall experience.

Today, operators have costly and redundant infrastructures consisting of hardware and software (management) elements that do not communicate with each other. These elements evolved with market demands for new services and applications, as operators deployed separate transport networks each time they launched a new product or service such as high-speed data (HSD) or digital voice. These overlays can cost operators greater than 50 percent more to maintain than converged networks.

To improve consumers' overall experience and to keep them satisfied while minimizing costs and maximizing both network and subscriber service ability, it is necessary to have one unified, scalable, multi-service transport and access network with common management capabilities for all services.

This article explores some of the IP transition aspects and consumer benefits of migrating to this next-gen delivery platform.

Charting the course to convergence

As new services become available to consumers, advanced network and management technologies must be introduced to manage the content and support user expectations for quality and service.

To support these new interactive residential and business services, the transport network must have the following characteristics and functionality in place:

- Fully bi-directional: The network must support analog or digital broadcast video, VOD interactivity, HSD interactivity, voice services and predictably more. Although the majority of the networks today purport to be two-way functional, many return plants do not have the performance integrity to support today's interactive services.
- Scalable: The network needs to support the changing demands of interactive content and the future demands of the customer. It must be upgradeable (to 10 Gbps or larger) on an "as-needed" basis, without scrapping all the equipment deployed in the network. Therefore, any transport infrastructure that is deployed must be capable of working at 10 Gbps as well as at fractional rates with an upgrade path, which does not involve major costs or disruptions for the operators or subscribers.
- Dynamic and flexible infrastructure: The network infrastructure must be capable of managing flows (content)–and be able to route them–on a per flow basis to different destinations based on customer requirements. Once the network has scaled beyond 10 Gbps, the network also needs to be able to route wavelengths with optimized scalability.
- Quality of Service (QoS): The

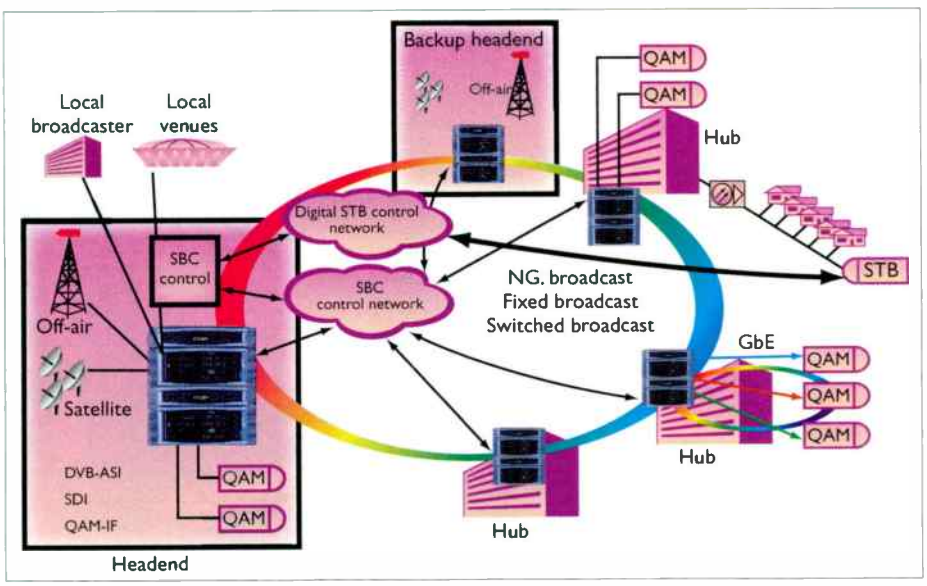

Figure 1: This represents a regional view of an integrated voice, video and data infrastructure servicing both residential and business customers. Services are provided access to the transport network in a way that helps ensure delivery and security of the content.

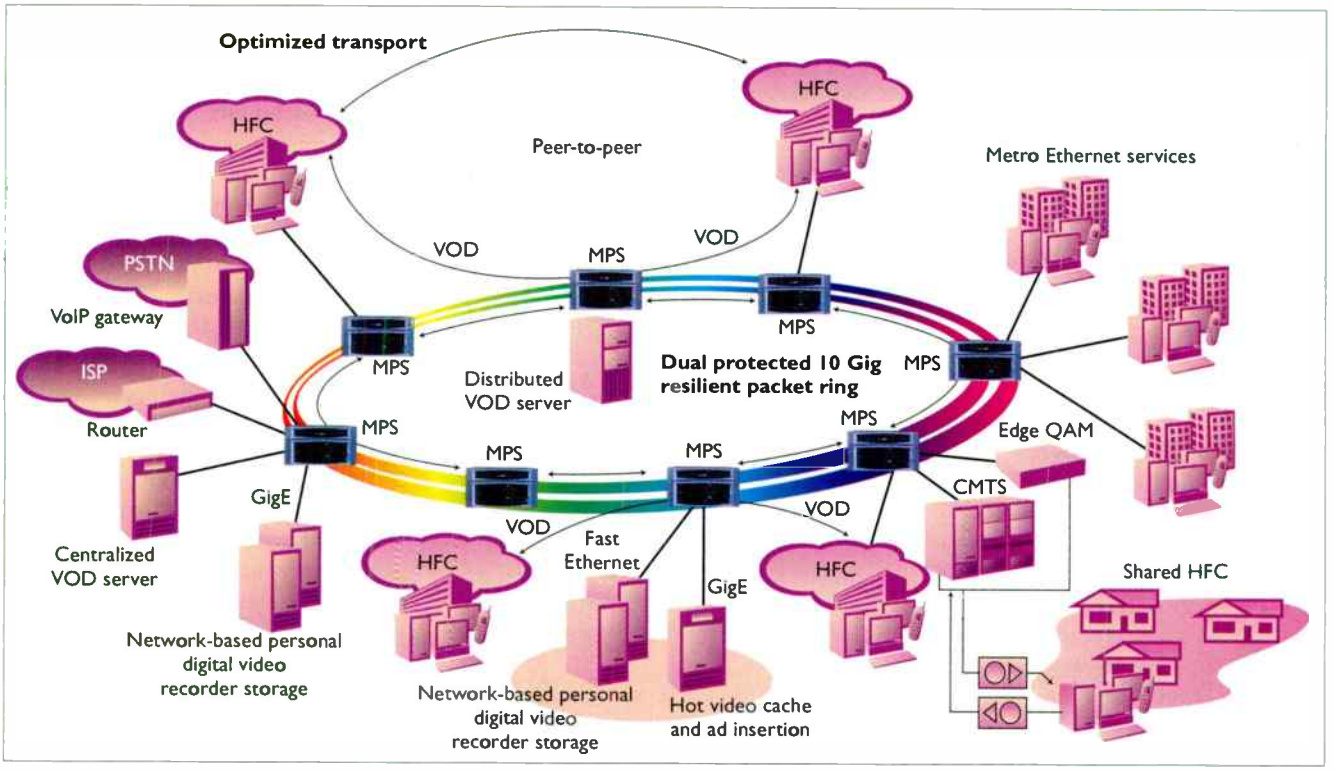

Figure 2: A representation of a high-level integrated infrastructure view for next-gen, on-demand IP video delivery, which is one of the components of a fully integrated triple-play platform. Utilization of packetized video simplifies the management and delivery of video, essentially allowing the network to deliver the content on-demand to the individual subscriber, vs. the traditional broadcast mode.

network must be enabled with enough provisioning and management granularity for individual VOD streams and tiered HSD, metro Ethernet, etc., since it is important that each service that requires guarantees (not just class of service) be provided the QoS it demands.

• Resiliency: As the network evolves from simple video to voice and business services, operators will find that it is necessary to deploy ring-based architectures in order to provide necessary restoration safeguards. Additionally, if a customer or service utilizing this network does not need protection, the operator must not be needlessly burdened with protection capability.

• Common control and integrated management: Multi-service transport networks demand high service capabilities with minimized operational expenses. When customer service is called, for example, service provisioning and billing information as well as problem mitigation and restoration information must be at their fingertips on a single system. Maintenance supervisors and technicians must be able to access the same databases for additional details that allow them to rapidly assess problems and restore service.

Video, data, voice, interactivity, residential, business, wired and wireless implementations all have different implications for the infrastructure and management systems required to achieve the desired results. Operators should not overlook the basics. They need to ensure they have a solid understanding of the existing network capabilities relative to the services that they intend to provide. With a clear understanding of where they are, and where they need to be, it's an easier task to map out their route to a converged network.

QoS: The importance of the Advanced Transport Network

Key to improving the overall consumer experience is the convergence of infrastructure and management systems that Advanced Transport Networks provide the operator. Advanced Transport Networks provide a multi-service, scalable backbone for transport of broadcast and interactive content for both residential and business services across the metro and regional networks, providing secure, reliable transport with per-flow QoS or per-SLA (service level agreement) QoS.

In addition, effective quality of service provisioning allows operators to set priorities in network configurations so that high-priority traffic always gets first priority.

Network capacity for on-demand

The network capacity needed for successfully delivering on-demand services is powered by Multi-protocol Label Switching (MPLS) and Resilient Packet Ring (RPR) protocols, which can provide up to 95 percent transport efficiency. This high efficiency compares very favorably with other technologies that may only provide efficiency of between 20 percent and 25 percent. This enables networks to support up to four times the volume of services to consumers than they could with equipment based on other technology at a fraction of the cost. More significant is that this "four-times" gain is incremental to the doubled capacity from protected-band-

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Choices

BY WALTER S. CICIORA, PH.D., RECOGNIZED INDUSTRY EXPERT ON CABLE AND CONSUMER ELECTRONICS ISSUES

Tryg Myhren was chairman of American Television and Communications (ATC) when I joined in 1982 as VP of R&D. I clearly remember Tryg saying that if there was one word to describe cable, it would have to be "choice." That has become a significant understatement. From consumer research and from anecdotal stories, we know our subscribers are having a great deal of difficulty in dealing with all of the choices available to them. That's just one facet of choice in cable. Another aspect of choice is the variety of products technologists encounter as they implement cable's services. We see the range of both of these choices as we tour the National Show's exhibit floor.

Cable subscriber choice comes in many forms. From early on, cable offered choice in programming. Digital has multiplied the scale of the choice by at least an order of magnitude, perhaps two orders of magnitude. Now we also have choices in the mode of delivery of the programming. It can be analog or digital, standard definition or high definition. The programming can be scheduled or on-demand, subscription-based or separate pay, or even "free"; i.e. included in the fee for the level of service selected. The programming can be viewed directly or after a delay via a personal video recorder (PVR).

Choice comes in the types of services. Besides video, there is high-speed data and telephony. Telephony can be switched or packet-based. High-speed data can be had at more than one level of speed.

All of this leads to a massive spread of technological choices to implement these services. Technologists must make choices which will determine the effectiveness of these services and their economics.

Making technical choices involves difficult trade-offs. My mantra has become: "There are no solutions; there are only trade-offs."

Given all of the options, it makes sense to try to understand how we–and our customers–interact with choice. I stumbled upon a book which provides some fascinating insights into the impact of choice on behavior. Our subscribers exhibit this behavior as they deal with the service choices offered by cable, and so do technologists as they struggle to select the correct technology to implement these services. The book is: "The Paradox of Choice," by Barry Schwartz [published by Harper Collins, 2004].

The book points out the obvious, that choice is good. It is liberating and provides freedom to fit individual tastes and needs. However, the book makes the point that there is a paradox. As more than just a few choices become available, the human reaction can be a "paralysis of analysis." This is the "darker side of freedom." As the number of options increase, the psychological stakes rise accordingly. Excessive choice can be demotivating.

More choice requires more effort to analyze before reaching a decision, and leads to a greater fear that the wrong choice might be made. Often, this leads to the decision not to decide. The effort of analysis is overwhelming. Perhaps a delay in de-

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width reclamation versus traditional SONET/SDH-based systems.

This powerful efficiency improvement is made possible by the use of patented Flow Based Fairness Algorithm (FBFA), which employs closed loop feedback control techniques, effectively turning the network into a distributed switch. The extremely fast feedback provided by the FBFA then enables information about congestion "hot spots" to be collected and mitigated before congestion actually impacts service. The system actually restricts "best-effort" traffic at hot spots on the ring, resulting in the "committed" or SLA traffic getting the capacity needed.

The FBFA system communicates local network status and capacity requirements in milliseconds so the entire network is aware of traffic patterns and needs network wide. It enables the network to react to ensure that there is always enough bandwidth available to serve the needs of SLA customers, while ensuring that unused bandwidth is reclaimed for use by best-effort customers when the SLA customer flows are not active.

IP and the consumer experience

The consumer experience is compromised by the lack of network integration, resulting in a lower market penetration, higher churn and ultimately, lower profits for the operator. Network operators can improve the consumer experience through a unified, converged IP network.

Top benefits include:

• Improved connectivity: Grandparents wintering in Phoenix can watch, in real-time, their grandchildren playing high school basketball in Chicago on their PCs, TVs or eventually even their cell phones. Consumers will be able to identify and receive phone calls and access Web content via their televisions. Businesses can send or collect information from their remote operations and field personnel in a real-time and secure fashion.

• Improved flexibility: As a result of having a broader, interconnected, integrated network, more content is available in both a real-time and time-shifted format. Operators and advertisers will be able to specifically target or "tunnel" content to individuals who have the highest levels of interest or purchasing potential.

• Improved availability: The technology provides a complete carrier grade solution if the customer requires it. Redundancy is available at all network levels if required and serves as necessary backup in case of network faults. This means that consumer services are much less likely to be interrupted, resulting in higher service satisfaction, better market penetration, lower churn and higher profits.

• Reduced operational expenses: The advanced transport systems allow for a better view of the network from content source to end-user. Management systems are interconnected across the consumer applications and delivery platforms providing a simplified, consolidated view of operations. This allows the operator to reduce the operational complexity and expenses of managing a large network of sophisticated services and devices to a centralized customer service center or network operations center.

• True packet multicast and broadcast capabilities: Advanced transport technology enables operators to provide optimized multicast and broadcast traffic delivery unlike circuit switched technologies. Multicast flows carry packet data or video flows from origination points and drop them off at multiple drop locations without having to replicate the packets until drop-off–thus significantly reducing core bandwidth requirements.

• Tiered service protection: Advanced Transport also provides "tiered" service protection. Tiered service protection provides operators per-SLA provisioning capability with protection granularity from 0 percent to 100 percent of the committed bandwidth and "pay-for-what-you-use" rates.

• Per-Flow Quality of Service–not just Class of Service: QoS must be based on flow classification, and forwarding information must be based on any field up to layer 4 information. This includes consumer MAC addresses, IP addresses, and single or dual VLAN tags to ensure that every consumer flow gets its own committed bandwidth and that it does not interfere with the commitment to any other consumer. This approach versus the "aggregated" or Class of Service approach prevents a misbehaving consumer flow from having the potential to destroy the SLA guarantees of all other consumers in the same class.

• MPLS & VLAN-based customer and flow separation: Separation of packets transiting through a network, whether they are carrying video payloads, business or HSD payloads, can be maintained. Each video flow will maintain separation from other video flows and will be kept separate from other data flows as well–while maintaining necessary low jitter and delay characteristics.

Likewise, commercial traffic from one customer will be kept completely separate from traffic of another customer's network. The MPLS-based data plane on the MPS allows the customer traffic as well as the video and all other traffic to be encapsulated by unique, MPLS-like labels. These flow labels allow distinct customer separation, which ensures that no flow traffic from one flow mixes with flow traffic from another customer or flow, ensuring the security and content integrity that consumers demand.

• Business services: The advanced networks are ideally suited to transport data services to businesses as well as to homes. They support E-Line and E-LAN services and are flexible enough to provide many multiplexed services to consumers fine-tuned to the application as needed. ■

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ciding will result in some of the options disappearing as a result of a rejection by the marketplace. Then the effort of selecting among the survivors will be reduced.

When consumer videotape technology became available in two formats, VHS and Betamax, most consumers resisted making the choice in the expectation that only one would survive. Only a few early adopters jumped in. We are experiencing a similar resistance to high definition television. The confusion of too many choices in displays and program sources is causing a deferral in the purchasing decision. There are other factors at work in both of these examples. Initially, the cost of the products is high. And the consumer electronics industry has trained us to expect deep and rapid price erosion. So for all of these reasons, we don't decide, we just wait.

The book studies the manner in which we make choices and it gets into behavioral studies. We make choices in expectation of a positive result called "utility." That is, we expect the result of our choice to be useful to us. Our expectation is based on either a previous experience that is remembered, or our acceptance of a promise of utility. We give more weight to an experience than to a promise.

It turns out that we have styles in the way we make choices. Two principal styles are the "Maximizer" approach vs. the "Satisficer" method. The Maximizer is characterized by the motto, "only the best will do." Maximizers struggle for perfection and usually suffer anxiety for that approach. The Maximizer may be the most common style of the technologist and gives rise to the famous quote: "In every project there comes a time to shoot the engineers and go into production." That quote expresses management's frustration with the Maximizer's insistence that if just given a little more time, he can come up with a much better design. The Satisficer, on the other hand, chooses one of the first options that satisfies the goals and moves on to the next task without worrying too much over whether he's found the best choice.

The Maximizer's curse is "opportunity cost." Opportunity cost is what is given up by the choice not made. This is relatively easy to deal with in situations with just two or maybe three options. It becomes easy to understand what was chosen and what was given up as a result of the choice. But as the number of options increase, the buildup of opportunity costs becomes overwhelming.

As you walk the National Show's exhibit floor, keep these concepts in mind as you review the choices for implementing the services to be provided to your subscribers. Think about whether you are a Maximizer or a Satisficer.

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PRODUCT REVIEWS

VoIP monitoring software

HOUSTON–Superconnect has released VoIP Aware, a Web-based monitoring application for ensuring the quality and performance of a VoIP (Voice-over-IP) system. Superconnect's real-time technology allows VoIP system operators to know about problems before their customers do, and prevent outages from occurring, a critical issue for providers offering lifeline VoIP telephone service.

VoIP Aware can be deployed onto existing networks to monitor service quality by directly polling data from customers' devices as well as analyzing real-time traffic of a VoIP connection to monitor realistic quality and performance. The application presents data in live reports, trend reports, graphs, alarms, and can also integrate into a ONE Platform site-wide dashboard display for enterprise customers with multiple ONE Platform deployments.

The ONE Platform is a Web-based infrastructure for Superconnect's broadband management and monitoring applications. The ONE Platform appliances are multiprocessor, and use RAID storage. The appliances can be installed in any data center, headend, or hub rack.

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Edge decoder

SASKATOON, Saskatchewan, Canada–VCom Inc. has introduced its CableVista I edge decoder, targeted at all-digital simulcast networks. The new decoder helps service providers speed up the development of an all-digital network by allowing them to build a digital backbone while continuing to provide analog services to their customers, according to the company. By using the CableVista I in their all-digital network, service providers can also free up bandwidth to offer additional digital video services such as VOD and HDTV.

VCom's CableVista I

The CableVista I accepts MPEG-2 transport streams over GbE using IP and converts up to 12 user-specified programs to baseband video/audio/SAP for distribution through an analog cable TV plant, allowing providers to eliminate the need for having both analog and digital headends. Once the video is in analog baseband form, it can be forwarded to a device such as the company's MA3000 system to be upconverted to a specific RF frequency for distribution. The CableVista I has hotpluggable modular components, GbE redundancy and remote control/configuration.

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FTTP connectivity

MARLBORO, Mass.–Fiber Optic Network Solutions (FONS) Corp. has introduced its Pathways solution, a line of passive optical network (PON) components and connectivity products that enable customers to implement reliable fiber-to-the-premises (FTTP) networks, including fiber-to-the-home (FTTH), fiber-to-the-business (FTTB) and multi dwelling unit (MDU) applications.

Pathways delivers flexible, scalable and field-proven solutions extending through all areas of the FTTP network, including the central office/headend, outside plant and customer premises/MDU.

Pathways enables service providers to deliver high-speed, bandwidth-rich, converged services over a single network. All of the company's Pathways solutions are geared toward increasing network reliability and efficiency, while reducing installation and operating costs, says FONS.

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FIBER OPTICS

Portable fusion splicer

AFL's SpliceMate

FRANKLIN, Tenn.–AFL Telecommunications has introduced SpliceMate, a small and portable fusion splicer, utilizing Fujikura's Profile Alignment System (PAS) technology. The splicer has a dual-camera inspection system, ensuring reliable splice results by detecting splice or cleave defects, according to the company.

Designed for splicing a variety of optical fiber types, SpliceMate's small size and light weight make it suitable for challenging environments, according to the company. In addition, the unit is easy to operate, splicing quickly while maintaining low splice loss. Automated arc calibration is provided to compensate for environmental conditions and electrode age, eliminating the need for routine arc calibration. The splicer is equipped with a dual direction 3.5-inch monitor that provides visibility in direct sunlight. An optional workstation is available, and a single- or four-fiber version is available. Features include: a 40-sec. tube heater, auto arc calibration, and a 30 m.p.h. wind protector.

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ARTICLES

The May issue of CED delves into the video side of VoIP and summarizes the technology side of NCTA's National Show.

VoIP–Looking at the big picture

Broadband operators seem to be gearing up to quickly move ahead on one or more variations of VoIP: SIP-based or PacketCable. While IP-based voice services head toward commodity status, comparatively more exotic video services are also gaining momentum with everything from relatively simple PC applications like video mail or video instant messaging to more complex and higher quality video phones. CED will offer a status report on these technologies and find out where they fit into cable's agenda–and will shed some light on how forthcoming architectures like PacketCable Multimedia can give MSOs a QoS edge.

NCTA 2005–The National Show wrap-up

CED's editors leave the programmer aisles to others and head to the other side of the hall in San Francisco to seek out all the noteworthy technical and business-related events otherwise easily overshadowed in this big show in the city by the bay.

Plus

Broadband Business–Are the telcos thinking outside the (set-top) box?

A new pull-out wallchart on Digital Simulcast Architectures

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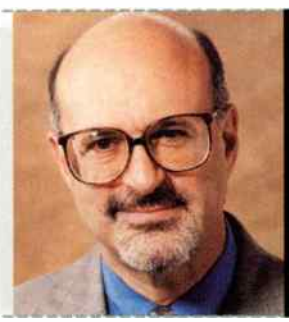
capital currents

Yakety Yak, Yakety Yak

The FCC has three proceedings underway that will let airline passengers gab on their phones throughout the flight, not just before the plane takes off and after it lands. Just yesterday I was on a flight and the lady behind me was shouting into her cellphone, until they closed the doors and she finally had to turn it off. Sigh. One of the major players that pushed the FCC in this direction was the Federal Air Marshal Service, which needs air-to-ground communications for its marshals.

Anyway, the FCC is looking at minimizing barriers for the use of three different frequency ranges for airline passenger communications. The first is the 849 MHz to 851 MHz and 894 MHz to 896 MHz range, now used exclusively by Verizon Airfone. The second is the cellphone frequencies at 850 MHz and 1800 MHz. The third is Ku-band satellite technology.

The existing Airfone license was granted in 1990, and then Airfone was acquired by GTE, which was then acquired by Verizon.



By Jeffrey Krauss, President of Telecommunications and Technology Policy

Have a comment? Contact Jeff via e-mail at: jkrauss@krauss.ws

The FCC Rules provide for six licenses, and for awhile there was a second air-to-ground operator in this band, ClairCom, but that service was shut down in 2002. The FCC Rules divide up this small amount of spectrum into narrowband channels, 6 KHz wide. That is barely adequate for voice, and useless for data. According to the FCC, Airfone usage has declined sharply in recent years.

As a result, the FCC has decided that it will not renew the Airfone license. It will instead adopt a new channel plan that supports two licensees, and auction the spectrum to new entrants. Instead of narrowband channels, there are alternative channel block plans, consisting of pairs of either non-overlapping 500 KHz and 1500 KHz blocks, or two 1500 KHz blocks that partially overlap. These would be suitable for technology similar to the latest cellphone designs such as CDMA2000 1xEV-DO and GSM EDGE, which can support data rates up to 2.45 Mbps and 384 kbps, respectively. A pair of 1.5 MHz blocks can support numerous voice calls, and even a pair of 500 KHz blocks can support e-mail and messaging. Rather than picking one channel plan now, the FCC will allow bidders to specify which plan they are bidding on, and will adopt the channel plan that brings in the highest total aggregate bid for the two licenses. To promote competition, the FCC will not allow one entity to hold both licenses.

Those 800 MHz blocks today are used for the link between the aircraft and the ground stations, with wires connecting the phones in the passenger seatback to the 800 MHz terminal. But the passenger phones don't have to be hard-wired. In a separate proceeding, the FCC is looking at allowing passengers to use their own cellphones for that link. Your cellphone could communicate with a "pico cell" onboard the plane. The pico cell would direct your cellphone to operate at the lowest possible power setting. In this scenario, the cellphone would not communicate directly with ground-based cell sites; other frequencies, either at 800 MHz or perhaps 700 MHz TV frequencies or frequencies around 2 GHz, would be used for that link.

In any case, the FCC is thinking about eliminating its rule that prohibits airborne use of cellphones. The FCC rule exists to protect against a cellphone interfering with cellular networks on the ground. Interference is possible because, unlike cellphones used on the ground, there is no shielding afforded by buildings and by the curvature of the earth when the transmitter is six miles up. But cellphone network design has changed since that prohibition was adopted in 1991, so the FCC thinks that maybe direct communications from airborne cellphones to cell sites on the ground will work without causing interference. And, oh yes, even if the FCC removes its interference protection rule, there is still the issue of interference from cellphones to the onboard air navigation systems, and that's the FAA's jurisdiction. (But see "Investigation of spurious emissions from cellular phones and the possible effect on aircraft navigation equipment," *IEEE Transactions on Electromagnetic Compatibility*, Volume 45, May 2003, which seems to show there is no problem.)

Finally, the FCC is developing rules for additional Aeronautical Mobile Satellite communications services. Some aeronautical satellite service is already provided by Iridium, Globalstar and Inmarsat, but these are not passenger services. Last year, Connexion by Boeing launched a passenger service that uses WiFi or Ethernet within the aircraft, and a Ku-band satellite link from the aircraft to the satellite to the ground. This service has a 5 Mbps forward link and a reverse link of 512 kbps. It operates under a special authorization, and the FCC is now beginning to adopt general rules. Boeing projects that by 2010, about one-third of all commercial aircraft will have Connexion by Boeing service.

And the rest of the world's commercial aircraft? They'll be signed up by ARINC's SKYlink service, by the SITA/Airbus/Tenzing OnAir service, or by the Hughes/Row 44 service, all of which are satellite-based services in the planning stage.

Eventually, you won't be able to escape the chatter. It's bad enough to have to listen to the lady behind me while the plane is on the ground. With Connexion by Boeing and a VoIP phone, you can talk non-stop from Frankfurt to San Francisco. ■

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