Competing with HFC

Tips, Tactics, and Tricks for Switched Digital Video Providers

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Technical superiority does not always guarantee success, especially when competing against the aggressive, fast-moving cable industry. Here is some practical advice on how to leverage the strengths of switched digital video (SDV) into competitive advantages.

If you're part of the telecommunications community, chances are good that you're anxiously watching as hybrid fiber/coax (HFC) networks and SDV systems battle for the privilege of wiring the nation's homes and offices with broadband services. Virtually every telecom provider has or will soon be faced with having to embrace one of these two technologies. This difficult decision will profoundly affect their long-term profitability—perhaps even their survival.

The two competing approaches share many common features and technologies, but they differ fundamentally in their architectures, and more significantly, the assumptions they make about the future of communications. While both systems can bring voice, video, and data into homes and small businesses, SDV's switched architecture and open-ended connectivity make it able to offer a wider variety of services. Those concerned with the operational aspects of networks should also note that the embedded intelligence in SDV networks makes them easier to manage and much more capable of adopting new services as they arise.

The problem is that SDV technology is facing stiff competition from HFC, which has been embraced by the cable industry as its weapon-of-choice for reviving its flattening revenues. Initially, HFC's ability to piggyback onto existing cable infrastructures, along with optimistically low estimates of deployment costs, made it appear so attractive that even several phone companies were lured into investing heavily in HFC systems.

Despite overwhelming initial acceptance, field trial results and more detailed studies have raised many questions about HFC's actual cost, the accuracy of its business model, and its ability to support many of the advanced communication services which may become critical parts of tomorrow's economy. When the malodorous piles of hype are shoveled away, careful examination reveals that HFC is only cost-effective when offering simple, limited bandwidth, interactive services to areas with low subscriber density.

These concerns have rekindled interest in SDV technology, and the superior performance it provides. Nevertheless, clever and aggressive strategies must be employed to keep it from joining the ranks of the Beta videorecorder and the DeLorean automobile as technically superior marketing failures. Before we explore these strategies, it is a good idea to make sure we understand what HFC and SDV really are, how they differ, and their relative strengths. With this knowledge, we can then exploit SDV's strengths to maximum advantage.

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Shopping Malls Versus Libraries

HFC's roots can be traced back to community antenna television (CATV). Even the most advanced HFC infrastructures still reflect CATV's original trunk-and-branch architecture. HFC also shares CATV's broadcast service model, where the entire coaxial network carries every available channel to every subscriber's home. Unless premium channels and pay-per-view programs were scrambled, encrypted, or blocked at the curb, they were available to every household.

As cable systems got larger, long-haul fiber optic trunks were used to deliver signals to distant local loop branches. A modern hybrid fiber/coax network uses much the same architecture, except that advanced digital services are delivered to subscribers over unused television channels within the broadcast spectrum (45 MHz to 750 MHz).

Interactive HFC systems have a return, or upstream, path that is used for sending digital information from the home back to the cable headend. Most interactive cable schemes locate this upstream data path in the five MHz to 40 MHz sub-split band, where it can be used to transport digitized voice for telephony, cable modem data, or control signals from joysticks and remote controls. Because the sub-split band is prone to all kinds of interference, it is estimated that, at best, cable systems will be able to find one MHz to five MHz of spectrum clear enough to use for a return path.

Given the fact that 200 to 500 households will have to share these relatively narrow interactive channels, a local operator can usually support only one or two types of services over the upstream channel. This means that the HFC service provider must carefully select content and services which yield the greatest revenue. Much like a shopping mall, HFC must deliver "the illusion of choice," while channeling consumer behavior into the narrowest possible range of options.

In contrast, switched digital networks derive their operating model from the phone system. In a classic switched system, each subscriber has the equivalent of a dedicated connection to the central office. From there, connections can be made to any other service provider, whether it's movies from a local server, a connection to a corporate LAN, or time-shifted television programming from a commercial network. Much like a library, an SDV system is designed to respond to the needs and interests of its subscribers on an individual basis.

A Blurred Distinction

So much for textbook definitions. In the real world, things aren't quite so neatly defined. Lawrence Lockwood, cable television consultant and president of Teleresources, notes that the distinction between the SDV and HFC architectures has blurred as they have matured, and each has adopted some of the other's traits. Many proposed HFC networks have driven fiber closer to homes, in an attempt to reduce the number of subscribers sharing a particular node. By the same token, SDV systems no longer employ a pure star topology. Much like HFC, most SDV networks aggregate their switched traffic in remote nodes and use fiber optic lines as trunks to a local switch or central office.

Despite these similarities, several important architectural features and business models will probably always set the two technologies apart. Switched systems will always be distinguished by their ability to deliver the material requested to a subscriber to a specified location, rather than broadcasting it across the entire network. This has important implications, both in terms of protecting subscriber privacy and protection of the network against theft of services.

Equally important, SDV technology permits construction of open-ended networks where content is not dictated by the network operator. This gives subscribers the ability to "dial up" information, programming, or services from any provider who chooses to make them available, regardless of location or affiliation. Much like personal computers did in the 1980s, SDV's open architecture may permit development of important applications not anticipated by its designers.

This is quite the opposite for a broadcast-based architecture such as HFC, which uses the bulk of its bandwidth to deliver a bundle of lowest-common-denominator programming to the bulk of its customers, and doles out the remaining channels for a limited suite of interactive services. Also, with the exception of Internet and telephony services, HFC systems tend to be closed beyond the headend. The selection of content and services is usually determined by the network operator and a group of affiliate providers.

Learn from Your Opposition

Despite their advantages, rollouts of SDV systems have been slower because they are somewhat more complex. Since SDV places heavy emphasis on interoperability, development of equipment and standards has been somewhat slower. This has given cable networks, less concerned with these issues, a chance to roll out a series of ever more sophisticated field trials. While the results from these demonstration networks will help HFC networks fine-tune their business plans, SDV providers should also pay close attention.

In one case, several early experiments with movies-on-demand over cable showed that a typical household would rent about two-and-a-half films a month. Clearly, it's going to take more than saving people a walk to the video store to justify the hundreds of dollars worth of equipment required to wire a single home with interactive services.

This underscores the fact that broadcast television, HFC networks, and satellite television are all competing for the same limited pool of hours and dollars that the public spends on leisure and recreation. With a larger number of players in the arena, the market becomes fragmented, leaving everybody with a smaller slice of a constant-sized pie. As we shall see, part of establishing a successful SDV system will be to step outside the arena and find new services to offer which create new markets with greater growth potential.

If possible, get any information you can on the interactive cable trials held in Orlando, Florida, Omaha, Nebraska, and other parts of the country. They will provide you with important information about the types of services the HFC community is deploying, along with customer response to them.

Learn from the Pros

With the first SDV trial networks beginning operation, the next year will yield a wealth of knowledge on winning strategies for network operators and service providers. For the moment, we must rely on the opinions of visionaries and experts—and the earliest results from pioneering networks, such as the FutureVision system, which has been operational since late winter, in the town of Toms River, New Jersey.

Marty Lafferty, president of FutureVision, Inc., has rolled out a sophisticated network which delivers its services across leased telephone circuits, using the FLX switched digital video system, developed jointly by AT&T Network Systems and BroadBand Technologies Inc. (see Figure 1).

In an early Beta test, 200 cable subscribers were given FutureVision basic service for six weeks at no charge. The basic service simply matched the local cable system's programming and offered no interactive functions other than a menu-based navigation system. Yet, at the end of the trial period, 183 of the homes switched to the SDV service, based on its lower rates, its ease of use, and higher-quality picture and sound. With 2,200 homes passed as of April 1, the system will be expanding at a rate of 1,500 homes passed per month for the remainder of the year.

Lafferty is enthusiastic and generous with information about the technology, services, and strategies employed by FutureVision. In a series of interviews, he shared some of the insights he believes can help SDV become the leading technology for delivering entertainment, communication, and business services to the household. Here are a few of his suggestions:

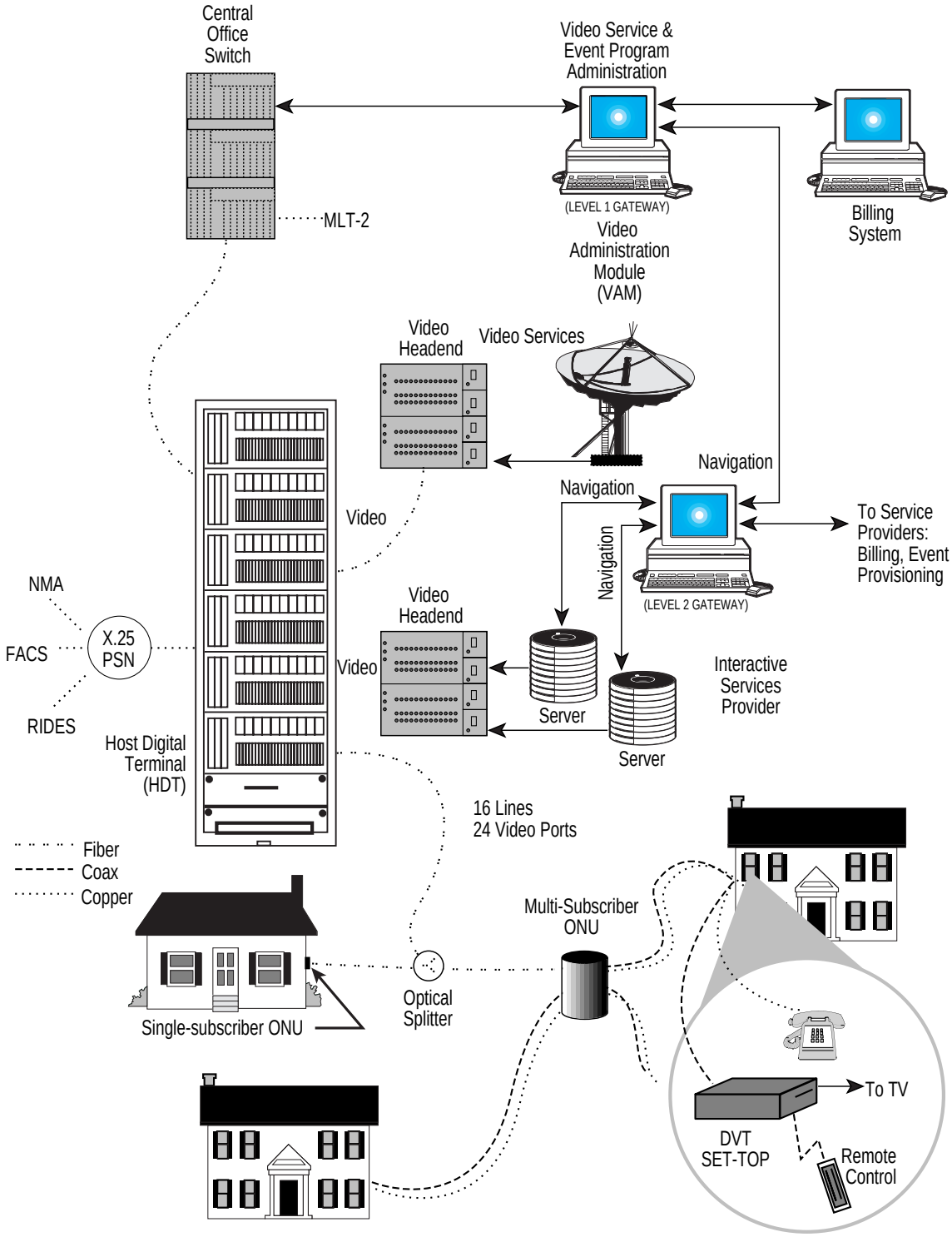
Do Your Homework

Understand your technology and your customers. If you decide to go with SDV technology, make sure you understand what it is really capable of and develop services that take advantage of it. Lafferty explains, "Two-way television migrates away from linear programming." By this, he means that new applications that allow subscribers to interact with the network will create entirely new revenue streams. If a network can retrieve reviews of a concert, provide show time information, and let a subscriber purchase tickets from an on-screen seating chart, it will be able to make money from both the purchaser, the theater, and perhaps even a sponsoring organization.

Not surprisingly, Lafferty strongly encourages extensive market studies before rollout to get an idea of which programming and services look most promising. If properly done, they can also serve to pre-announce your network among potential subscribers.

He also stresses the importance of keeping close tabs on how customers are using the network. An interactive SDV system can give you a very accurate picture of who is using what services and when, because it can keep track of every click of a customer's remote control. Statistical analysis of this data can help you fine-tune a service on a day-to-day basis, and give your advertisers concrete performance appraisals on the effectiveness of their ads.

Figure 1
FutureVision's SDV Network



Source: L. Goldberg

Offer Subscribers More Than They Bargained For

Let low-cost, high-quality basic service help sell your premium offerings. Quality of service is a big issue, and SDV's near-studio quality audio and video can give you an edge. By offering significantly better basic service at a price equal to or lower than your competition, you can attract subscribers who will probably take advantage of one or more of the other services you offer.

Making your system easier to use will also attract and keep customers. Even basic cable-equivalent service which offers 25 to 50 channels of broadcast content can be difficult to navigate. It's important to use SDV's embedded intelligence to develop easy-to-use menu systems to make navigating easier for your customers. When subscribers become comfortable with using basic interactive services, it becomes much easier to then introduce more sophisticated—and profitable—applications.

Avoid The "Me-Too" Market

Offer services HFC can't compete with. In some situations, offering an excellent picture won't be enough to ensure success. Delivery of simple video to homes is rapidly becoming a cutthroat commodity market, often with two or three players with similar services competing for the same customers.

The best strategy here is to sidestep the competition by offering the kinds of services that cable and satellite can't hope to duplicate. You can leverage the embedded intelligence of an SDV system to offer instant previews and on-screen ordering right away to make your basic services more attractive and easy to use. It is a then short step to more advanced interactive functions, such as play-along game shows, real-time polling, information retrieval services, on-demand events calendars, and community e-mail.

Even standard cable-equivalent services can be enhanced through interactivity, for example, allowing premium channels to be purchased by the week, day, or individual show. The technology also makes it quite easy to offer parents the option to lock out selected programming, based on content or cost.

Another part of leveraging the capabilities of a broadband infrastructure is to make it an integral part of the local economy. Its interactive menu system can be expanded to post restaurant menus, movie schedules, and specials at grocery stores. As the network matures, it can allow the same businesses to offer on-screen ordering for food and merchandise, as well as enabling automated reservations for restaurants and entertainment.

SDV can even give a new twist to video on demand. Imagine giving subscribers the option of either renting a hit movie, or viewing for free by agreeing to answer a marketing survey. SDV's flexibility would also allow viewers the option of seeing the same movie at a reduced rate or free if they agreed to let it be interrupted occasionally by commercials.

Deploy Early And Often

Learn about the market while you stake out territory. Get involved with field trials, demonstration systems, and anything else that gives switched video services exposure as soon as possible. It's important to make the public aware that a superior alternative to HFC exists. In many parts of the country, time is of the essence because cable operators are already upgrading their networks in anticipation of providing HFC. Even if you can only get a relatively modest area built out initially, it can serve as a "placeholder" to encourage potential customers in surrounding areas to hold off on subscribing to a broadband service until SDV becomes available.

The second benefit of early deployment is to collect marketing data that will help shape the direction of future growth. As mentioned earlier, an interactive network's ability to precisely chart subscriber preferences is a powerful tool for developing new services or refining old ones.

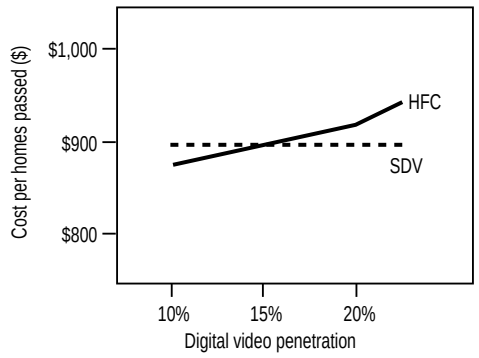
Cashing in on SDV

Don McCullough, product line manager for BroadBand Technologies (Research Triangle Park, North Carolina), explained that part of competing effectively with HFC is to make the most of some of the advantages SDV architectures offer. Here are a few examples:

SDV Thrives on Heavy Subscribership

One critical advantage SDV systems have is that they get less expensive on a per-home basis as subscriber density increases. This is the opposite of HFC systems which become more expensive as the take rate in an area goes up. As the number of subscribers increases, a fixed amount of network bandwidth must be segmented more deeply. McCullough estimates that the crossover point occurs at around $800 to $900 per home, when subscribership increases to around 15% of homes passed (see Figure 2).

Figure 2
Installed First Cost Comparison of SDV and HFC Technologies



Source: L. Goldberg

Once a network passes the crossover point, it can count on enjoying a financial advantage over its HFC competitors. This economy of scale provides system operators with the incentive to aggressively price their services and offer a wide variety of programming and services.

SDV Reduces Operational Costs

The sophisticated diagnostic capabilities available in switched systems help reduce operating and repair costs. Thanks to remote diagnosis, a repair person will be able to get a very good idea of the location of a problem—and what it will take to fix it—before ever leaving the office. Also, quality of service can easily be monitored, allowing gradual system degradation to be detected and corrected *before* customers begin to complain.

If deployed properly, SDV can give operators multiple revenue streams from a single physical network. Entertainment, telephony, data communications, and other interactive services can share the same fiber backbone, spreading the cost of management, maintenance, and repair of a single wiring system across several businesses. Reduced operating costs can allow providers to offer competitive rates, while maintaining reasonable profit margins.

SDV Gives Customers More Privacy

Electronic privacy is rapidly becoming an important issue to many folks, even those who didn't know what a "hacker" was a year ago. Although HFC networks use powerful encryption to protect their users, the fact remains that lots of private, sensitive information (such as credit card transactions, private conversations, and adult entertainment purchases) will be broadcast across the entire network. If history is any guide to the future, it will only be a matter of time before somebody figures out how to crack today's ultra-secure encryption systems.

A powerful selling point for switched systems is that they contain all traffic within a single, relatively secure path between the subscriber and the central office. This provides much less opportunity for interception and decryption of network traffic.

Switched networks also win on the flip side of the security issue because they are less susceptible to theft of services. Because of their broadcast architecture, cable systems are relatively easy to rip off. It is not uncommon to hear of an entire apartment building receiving programming from a single cable subscription, and there is a booming gray market for cable descramblers. By the cable industry's own estimates, around 14% of the subscriber population is not paying for part or all of the services they receive.

Switched systems, on the other hand, direct programming to a single, serialized receiving system across a single signal path. While no system is completely secure, SDV will strongly encourage the majority of the population to either pay for their services, or at least to not bother trying to steal them.

While we're on the subject of security, it's important to understand the importance of protecting subscriber privacy throughout the entire network. If providers are serious about this, their efforts must not stop when fiber enters the central office. The computers at an SDV central office will have transaction records detailing the viewing habits, consumer preferences, and perhaps even the telephone calls of their subscribers. In order for providers to maintain an essential trust between themselves and their customers, this information must be heavily safeguarded against misuse by both criminal and commercial interests.

A Two-Pronged Strategy

In his article appearing in the February 15, 1995 issue of *America's Network*, McCullough stresses that SDV providers cannot survive if they roll out their networks at the glacial pace usually associated with telephone companies. He does, however, recognize the formidable task of upgrading even a small regional system, and proposes that providers employ a two-

pronged strategy to make the most of their finite resources.

The first half of the strategy is called telephony-only deployment. Under this plan, fiber is driven deep into neighborhoods on a gradual basis by installing it in all new lines and replacing copper whenever feasible during routine network rehab. Within a few years, enough of the network will be broadband-capable to be able to begin rolling out switched video and other services without traumatic overhaul of the infrastructure.

During this time, McCullough suggests that providers employ a "hot site" strategy, targeting selected areas for SDV service ahead of the rest of the network. He explains that hot sites would be "areas with 25,000 to 60,000 homes where companies can fend off competitors, or take advantage of a revenue opportunity." McCullough adds, "Telcos also choose hot sites to test and refine their ability to penetrate and serve their markets." By using hot sites as a training ground, providers can refine their technology and marketing tactics with an eye toward territory-wide deployment.

A Convert Preaches

Another visionary in the SDV field is Howard Stringer, ex-president of the CBS Broadcast Group. Once a big proponent of network television, Stringer is now heading up Tele-TV, a joint television programming venture with Bell Atlantic, NYNEX, and Pacific Telesis. Stringer believes that a "full service network," employing server-based delivery systems and supporting menu-driven programming will eventually become the dominant technology. He is eager to point out that this will give rise to a high degree of diversity by giving niche programming access to large regional or even national markets. While the details of the delivery system Tele-TV will use are somewhat fuzzy, it appears to be some sort of switched architecture.

In a recent interview for *Wired* magazine, he offered some important insights into the problems with the conventional "500 channel" paradigm, and how Tele-TV intended to get around them. Below are some condensed tidbits of wisdom from that interview that illustrate how he intends to bring his ambitious vision to market. Unfortunately, for the purposes of this article, neither Stringer, nor his assistant, Monie Begley, could be reached for further comment, despite repeated attempts to contact them.

Take an Evolutionary Approach to SDV

If a full-blown switched infrastructure is not yet feasible, use bridging technologies to secure market share before somebody else does. While Stringer believes that full-service, switched systems are the future of television, he realizes that it will take some time for their complex, expensive delivery infrastructures to reach even a fraction of the population. In the interim, he intends to gain early access to customers using a wireless cable technology known as MMDS (Multichannel Multipoint Distribution System).

Although it is essentially a one-way system, MMDS can offer up to 120 channels of high-quality digital audio and video over a short-range wireless link, serving hundreds of homes within a single micro-broadcast cell. Stringer's evolutionary strategy calls for teaming up with telephone companies to provide interactive digital services to compliment MMDS programming, using either ISDN, ADSL, or both. By using relatively inexpensive bridging technologies, he hopes to capture early market share and migrate the subscriber base to more advanced services as it becomes practical.

Take Advantage of SDV's Ability To Deliver Unlimited Niche Programming

Use it to create new models for doing business which differentiate you from broadcast-style service. Stringer points out that specialized, high-quality programs become economically feasible with switched, server-based infrastructures. Rather than try to fill up a 100-channel pipe with 24 hours a day of content that appeals to the widest range of viewers, SDV can deliver a single channel of specialized programming to whoever wants it, at any time. Even if a particular program appeals to only one-tenth of 1% of the U.S. population, this represents a target market of nearly 300,000 people.

Question Authority

A switched, menu-driven broadband infrastructure turns much of the conventional business wisdom of the communications industry upside down. As Stringer says in the interview, "If you just put programming up there and leave it on the server, find your audience, and charge them a fee, and tie it to advertising—then, the economics become very different." If

he is right, it will be critical to carefully examine our most cherished beliefs about what works and what doesn't, to see if they are still valid in this new business environment. ntq

References

H. R. Gold, "Casting a Broad Net—Video, Data, Voice: One Transmission Technology Looks Like a Winner," *Barron's* (August 14, 1995):17-18.

L. Goldberg, "Brains and Bandwidth: Fiber Service at Copper Prices," *Electronic Design* (October 2, 1995).

L. Goldberg, "Broadband To The Home: Challenges on the Last Mile," *Electronic Design* (October 2, 1995).

J. Heilmann, "The Convert," *Wired*, Vol 3, No. 12 (December 1995):118-114.

R. Jones, "Baseband and Passive Transport Systems for Interactive Video Services," *IEEE Communications* (May 1994):90-101.

P. Lambert, "FTTC Makes Renewed Run at HFC," *On Demand*, Vol. 2, No. 4 (May 1995).

L. W. Lockwood, "Switched Digital Video," *Communications Technology* (January 1996):18-22.

D. McCullough, "SDV: Delivering Multimedia to the Home," *CED* (September 1995).

B. Phillips, "Broadband in the Local Loop," *Telecom* (October 1995).

R. Sharpe and H. Lalani, "Taking ATM Home," *Telephony*, Vol. 229, No. 8 (August 21, 1995):38-42.

V. Vittore, "Flip Flop—Bell Atlantic's Strategy Shift Puts SDV on the Fast Track," *America's Network* (June 1, 1995):26-28.

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