A Revolution Now Underway Spells The End of TV As We've Known It

Behind the massive shift to IP video threatening today's television industry stands a newly sophisticated consumer marked by seemingly endless demands.

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The recent announcement by SBC that it will begin testing IP-based television services using Microsoft TV's IP television platform is tremendously important. With that announcement, the two companies have stated their intention to focus their attention on sending broadcast-quality television content over standard data networks, and the significance of these two companies in the communications and technology industries may lead to a seismic shift under the broadcast-TV industry.

It may spell the end of traditional radio-frequency based video delivery services.

Customers are far more discerning about the content of their video services than they are about any other form of communications.

Furthermore, new sources of content are being created everyday. IP video promises a complete transformation of the way that content is served.

What Is Content?

Originally, video content consisted of a few "off-air" channels created by the major television networks. Later, cable-TV systems were developed to handle an ever-increasing number of channels and to deliver low definition movies via coaxial cables. Now, this technology is nearing the limits of its capabilities thanks to tremendous growth in the number of cable-TV channels that have been created and the advent of High Definition Television (HDTV). Some industry experts say these options are enough and that demand for video content will not grow any more. Yet, there is no sign of diminishing consumer demand for video. In fact, there is a video content revolution underway, spurred by HDTV, video-on-demand (VOD), personal video recorders (PVRs),

Bandwidth Requirements of Leading High-Speed Applications

Source: The Yankee Group, 2004

High-Speed Application	Bandwidth Required
High-Definition Television (HDTV) Streaming	20 Mbps
High-Quality MPEG 2 Video Streaming	8 Mbps
Home Theater Audio Streaming	5.8 Mbps
Video Conferencing	1.5 Mbps
Internet Browsing	1 Mbps
Online Gaming	1 Mbps
Toll-Quality IP Voice	0.1 Mbps
Aggregate Bandwidth Required in Average Home	40-50 Mbps

digital cameras, VCRs and mobile phones.

This video revolution is being driven by an expanding "digital lifestyle" and the changing economics of "access" networks.

There are valuable lessons that can be derived from studying this revolution – in particular, studying how video is being distributed via Internet technology – as well as predictions about the future of video delivery.

The Digital Lifestyle

It is clear that the information age has fundamentally changed how we live. The internet has allowed us to be connected in ways that were unimaginable only 10 years ago, and altered our concept of home entertainment. Trips to the local video rental shop have been replaced by video-on-demand services. The VCR has given way to the PVR, which in turn is changing, from an insular device to one that is always openly connected to a network. In addition, these technology-driven lifestyle changes have driven changes in the technologies used for viewing video content. The 17-inch television is giving way to ever larger displays with improved picture quality, including huge, widescreen HDTVs.

The FCC has participated in the video revolution, too, by supporting consumers' ability to create their own channel lists, thereby making the idea of standard video packages obsolete.

As the Yankee Group suggests, all of these factors add up to an ever increasing demand for bandwidth in the home (*see fig. 1*). The problem for service providers will be keeping up with demand.

Video over the Access Network

Today, the battle line for video services is drawn between historically complementary service providers: telecommunications and cable companies. Unfortunately, in the current converged media environment, neither is ideally suited to support consumer demand very long. To support the evolving digital lifestyle, it is imperative that access networks be modernized. With its near limitless bandwidth capability, fiber optics is proving to be the technology of choice for this task.

Telecommunications companies are challenged today by the lack of bandwidth on their existing "copper pair" access networks, and the length of their "local loops." With a new generation of digital subscriber line or DSL technology named "ADSL2+," a telecommunications company can enable this copper network to support data rates of 10 megabits per second (Mbps), to a distance of two kilometers. This is the next step up in bandwidth for the copper pair networks. However, such a technology

solution will support only about 52 percent of European customers, 14 percent of North America customers, 40 percent of customers in China, and 2 percent of customers in India. So, a very large percentage of customers will need to get their video content via another means.

Network operators face heavy pressure to lower their operating costs because the prices they can charge for traditional telephone service are eroding rapidly as less expensive and high-quality Voice over IP (VoIP) services are gaining popularity along with high-speed Internet services. With the added bandwidth from fiber, the price erosion may be offset, and telecom companies can offer profitable video services.

But the amount of fiber that the telecom companies need is significant. Fiber will have to replace more than 50 percent of the existing copper networks, and there must be more fiber in existing fiber routes to support the higher bandwidth demand.

Challenges For Cable Companies

For cable companies, there are other challenges. Although cable modems are able to offer data rates of 3Mbps, and supply sufficient bandwidth for IP video services with one video stream at a time – using "MPEG4" video data compression – they are not well-suited to consumer-friendly video services. Downloading digital video content at this data rate is extremely time consuming and would likely not be a choice the average consumer would make. The same can be said of using cable modems for other bandwidth-hogging video entertainment options, such as recording video on one channel while watching another.

Domestically, the cable industry has just completed a significant modernization program. But the planning for this upgrade occurred well before the "Internet revolution" of the late 1990s, and since then the bandwidth requirements of the average home have significantly increased beyond the point that the planners anticipated. To keep up with the bandwidth demands generated by today's Internet and HDTV, cable companies will need to upgrade their networks even further.

Beyond the access network, there are two in-home considerations the evolution of the set-top box and home wiring.

Old-fashioned radio-frequency (RF) set-top boxes traditionally have cost approximately $175, and older set-top boxes that use Internet-derived "IP" technology recently have been priced slightly over $100. But newer chip-based IP video set top boxes are now on the market for approximately $70. And as HDTV content increasingly is available, more homes will use a set-top box to get it and play it on an HDTV set.. Ultimately, when all video channels are available in a digital format (U.S. TV networks are required to switch their broadcasts entirely to digital by 2007), an analog-to-digital converter set-top box or home gateway will be needed for all TV's in the home that aren't built with digital video compatibility inside. This is an additional incentive for network operators to move to IP-based video services.

The second consideration for IP TV is home wiring. IP TV will require wireless networking technology or another method for connecting the TV to a high-bandwidth IP set-top box. In newly-constructed homes, Ethernet cabling can replace the coax cabling that traditionally has been used for video services. And this same Ethernet cabling also can be used for its traditional purpose – data networking.

Where Is IP Video Being Deployed?

In the United States, there is a common fallacy that IP video doesn't work and therefore is not being deployed. Bell companies are testing IP video equipment from Microsoft, and IP video is offered by service providers in Washington, Utah, and other states. In the more advanced deployments, the access networks are offering sufficient bandwidth for both data services and IP video transmissions. It is inevitable that a nationwide IP video service will be available in the U.S., and in other nations. Already, Hong Kong and Italy have major service provider of IP video – Hong Kong Broadband Networks and FastWeb respectively – and Australia recently joined them, with its first IP Video service provider in Perth.

Where Is IP Video Headed?

Broadcast video from TV networks will account for only a small portion of the video content delivered via IP to consumers. Access to education and business meetings in real-time, HDTV quality video, pay-per-view video, and VOD services will account for more. Live IP broadcasts of events such as concerts also are possible, especially if they are supplemented by VOD sales of the broadcasts, from recordings of the event that were "stored" by the content providers.

As content providers gain confidence in IP video and its security against theft of copyrighted material, they will also enable IP video service providers to offer their content in more robust video libraries that all broadband users may enjoy.

The time is ripe for both IP video and fiber access networks. The technology is available now, and service and content visionaries already have started to build the future fiber pathways for IP video to travel into connected homes nationwide. In the next few years, the trickle of IP video deployments will grow quickly, with Asia most likely taking the lead on the global stage.

IP video represents the next stage in the continuing evolution of the digital lifestyle. ❖