

# Broadband: The Revolution Underway

## *Critical Issues and Investment Implications*

- *What are the risks and opportunities for cable and telecom firms?*
- *How will broadband affect consumer electronics?*
- *How will video be distributed?*
- *Will the balance of power shift between content producers and distributors?*
- *What will PVRs, VOD and Internet Protocol technology mean for advertising?*

## Executive Summary

As of September 30, 2003, approximately 29% of Internet subscribers around the world paid for broadband access. Since 2000, the number of broadband subscribers has increased at a compound annual growth rate of 136%, reaching an already impressive 86 million subscribers. We believe this growth will continue at a rapid pace and have vast implications for the providers of telecom services, cable, consumer electronics, personal computers, entertainment content and advertising, as well as participants in a number of other industries. In this report, we explain why broadband penetration rates will continue to rise and discuss the consequences of this phenomenon. The consequences include:

- Continued pressure on pricing for wireline voice services;
- A new cycle of digitized and networked consumer-electronics products;
- The encroachment of the PC into the traditional domain of consumer-electronics firms;
- The rise of new competitors that capitalize on the capabilities of broadband and the power of home networks;
- New entrants in video distribution;
- A greater supply of niche video content;
- A general shift in the balance of power in favor of content producers; and
- The rollout of Internet Protocol TV and the rise of niche advertising.

## A Message from Our CEO

“Broadband: The Revolution Underway” is the first in a series of studies planned by a new Alliance Capital research unit focused on strategic change. Unlike most research analysts, who cover an industry and companies within it, the Research on Strategic Change group seeks to find investable ideas that stem from economic or technological changes powerful enough to profoundly influence corporate performance across multiple industries. The advent of broadband, we believe, clearly constitutes one such transformative trend.

**LEWIS A. SANDERS**  
Chief Executive Officer  
Alliance Capital Management L.P.

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# Broadband: The Revolution Underway

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## INTRODUCTION

In the late 1990s, euphoria about the potential for the Internet to transform daily life inspired a classic investment bubble. Like all bubbles, it burst, and hundreds of billions of dollars in market capitalization disappeared. But while investors slogged through three years of a painful bear market, Internet technologies continued to progress and take hold. It is the thesis of this paper that widespread broadband implementation, which is required for the full use of the Internet's powers, is no longer a premature notion. Its advent is imminent in the United States, and in parts of East Asia, it has arrived. Some repercussions can already be felt; many more will emerge over time.

This report focuses on growth in consumer or residential broadband subscribers. The shift to broadband in the corporate sector has been underway for almost a decade, and its influence on corporate productivity has been immense. It has led to the creation of new businesses and industries and has had an enormous impact on the technology sector in general. We believe widespread consumer access to broadband will have similarly powerful consequences.

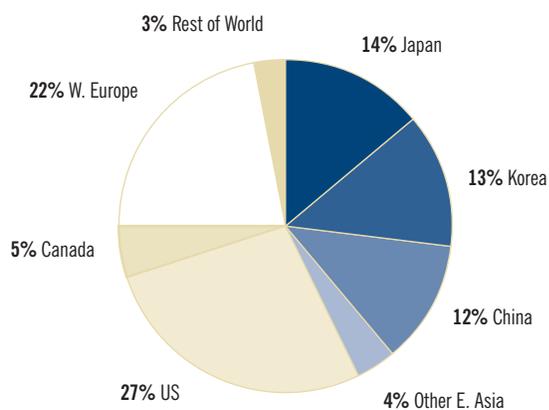
Broadband is already changing the way consumers behave and gather information. It is commonplace for consumers to research products online, check news, weather and movie listings, and investigate health issues. We regularly communicate via e-mail, chat and shop online, and download recorded music. Increasingly, broadband is also likely to change the way we spend our entertainment dollars, transmit and manage photographs, and access radio broadcasts. Potentially, it may even change how we talk on the telephone: Video conferencing in the home is becoming feasible and may one day become commonplace. Broadband will also affect the consumer-electronics devices in our homes. With the trend toward broadband home networks, the distinction between the computer and the television may blur, and a new generation of networked appliances may take root. This will indeed change daily life, with significant investment implications for companies in a host of industries over the next several years. There will be numerous winners and losers as a result of this trend. ■

## THE STATE OF BROADBAND TODAY

Let's start by looking at broadband today. By September 30, 2003, there were about 700 million Internet users worldwide, up from 382 million in 2000. Over 300 million users subscribed to an Internet service, yet only 86 million, or approximately 29%, had broadband subscriptions.<sup>1</sup> Despite this still relatively low penetration, broadband usage has grown at a phenomenal rate. Since the beginning of 2000, the number of broadband subscribers has increased at a compound annual growth rate of 136%.<sup>2</sup> We expect similarly impressive growth rates over the next several years; penetration should pass the critical 30% level in several key geographies, such as the US, Western Europe and Japan.

As you may expect, the majority of broadband subscribers today reside in developed countries. As of September 30, 2003, East Asia had the highest number of broadband subscribers, with 43% of the global total living in the region (Display 1). North America followed with 32% of broadband subscribers.

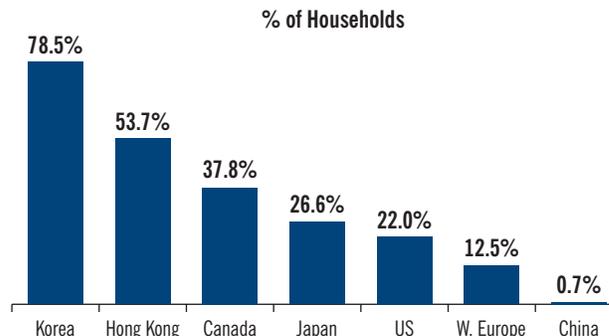
**Display 1**  
The Global Distribution of Broadband Subscribers



Source: ITU, United Nations, national statistics, Point-Topic and company data

<sup>1</sup> Alliance Capital estimates based on International Telecommunication Union, United Nations, national data, Point-Topic and company data  
<sup>2</sup> International Telecommunication Union, "The Birth of Broadband," p. A-23, United Nations, national data, Point-Topic and company data

**Display 2**  
Cable Modem & DSL Penetration Around the World



Source: ITU, United Nations, national statistics, Point-Topic and company data

Absolute numbers are slightly misleading, however, because they can be skewed by the population size of countries or regions. Penetration rates provide a better measure of progress achieved to date and the room for growth in a particular country. As shown in Display 2, broadband penetration is currently highest in Korea; Hong Kong and Canada round out the top three.

Japan currently enjoys one of the fastest growth rates of broadband subscribers in the developed world. The number of subscribers there doubled in the last four quarters alone.<sup>3</sup> Important lessons can be gleaned from Korea, Japan and other East Asian countries. Their experiences shed light on current trends and opportunities in the US and Europe.

### Why East Asia Leads

Broadband has taken root in Japan, Korea and other East Asian countries for three primary reasons: favorable demographics, progressive government policy and, most importantly, intense competition that drove down prices. Let's consider each in turn.

**Demographics.** Many East Asian countries, including both Korea and Japan, have densely concentrated urban populations. Korea is the third most densely populated

<sup>3</sup> Ministry of Public Management, Home Affairs, Posts and Telecommunications, at [www.soumu.go.jp/joho\\_tsusin/eng/Statistics/](http://www.soumu.go.jp/joho_tsusin/eng/Statistics/)

country in the world,<sup>4</sup> while 41% of Japanese live in the three largest metropolitan areas.<sup>5</sup> Population density has allowed broadband providers to supply high-speed service at relatively low installation costs.

**Policy.** In Korea, the government actively encouraged capital spending and public participation in broadband initiatives. In both Korea and Japan, regulators required the incumbent telephone company to provide open access to the local loop and allow facilities-based competition. These policies enabled competitors such as Yahoo! BB (a joint venture between Soft Bank of Japan and Yahoo!) and Hanaro Telecom (a startup supported by the Korean government) to challenge the incumbent telephone carriers in their respective markets for high-speed digital subscriber lines (DSL), a telephony-based broadband technology. At the same time, cable served as an alternative infrastructure for broadband competition in both countries.

**Competition.** The ability to challenge the telecom carriers fostered fierce competition, which drove down the retail cost of broadband. In Japan, Yahoo! BB outpaced NTT, the incumbent telephone provider, first on lower prices and higher bandwidth, and later with the introduction of broadband telephony. Today, Yahoo! BB controls over 35% of the Japanese broadband market and offers 26 Mbps speeds at a price of \$34.99 a month, or \$1.35 per Mbps. In Korea, Hanaro Telecom controls 25% of the broadband market. Korea Telecom, the incumbent telephone carrier, sells 8 Mbps service for approximately \$32.79 a month, or \$4.10 per Mbps. Competition led to lower prices, which paved the way to high penetration.

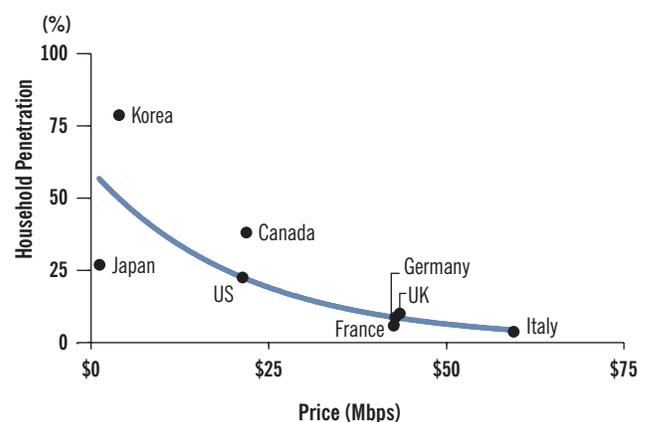
Early adoption has given some East Asian companies a head start in terms of exploiting new opportunities created by the spread of broadband. Matsushita, one of the largest consumer-electronics manufacturers in Japan, is experimenting with a host of applications that take advantage of broadband ubiquity. Sony is also

using this window of opportunity to develop and test a universal appliance that could revolutionize how consumers listen to music, watch TV and access the Internet. Samsung and LG Electronics, two large Korean manufacturers, have already developed stables of interconnected broadband devices, and both have even introduced refrigerators with broadband jacks and integrated tablet PCs. NCSOFT of Korea and SquareEnix of Japan are trying to use East Asia's head start to become global leaders in the rapidly growing online gaming industry.

### The Central Role of Pricing

We believe the world beyond East Asia is embarking on a substantial ramp up in broadband subscribers. Developed countries with high disposable income, government support and, most importantly, competition are the leading candidates for significant increases in broadband growth. Competition is key because it leads to lower prices; with the exception of price, there is no reason why an Internet user would prefer narrowband (dial-up) access over broadband access to the Internet. Display 3 shows the strong correlation between price, as measured by cost per megabits of speed, and broadband penetration.

Display 3  
Penetration Rises as Prices Drop



As of December 2003  
Source: ITU, national statistics, Point-Topic, company data and Alliance Capital

<sup>4</sup> With the exception of city-states. *Statistical Handbook of Korea 2002*, at [www.nso.go.kr/eng/handbook/chapter2.shtml](http://www.nso.go.kr/eng/handbook/chapter2.shtml)

<sup>5</sup> Ministry of Public Management, Home Affairs, Posts and Telecommunications, at [www.stat.go.jp/english/data/figures/index.htm#b](http://www.stat.go.jp/english/data/figures/index.htm#b), and Demographia, at [www.demographia.com/db-japan-ua2000.htm](http://www.demographia.com/db-japan-ua2000.htm)

We have focused on broadband penetration rates because access to the Internet via a broadband connection changes consumer behavior. Simple applications have already taken hold. According to the Yankee Group, 70% of broadband subscribers in the US play games online, 68% view streaming video and 62% download music.<sup>6</sup> In general, people with broadband connections spend more time online, even though they navigate the Internet faster. Broadband's greater speed and ease of navigation makes consumers more likely to shop online, bank online and perform a variety of other tasks online. Furthermore, we know that as broadband penetration increases in a region, applications utilizing the increased bandwidth proliferate, creating even more demand for broadband service. In Korea, grade-school students complete their homework online, making broadband access a virtual necessity for families with children. More and more uses will emerge as penetration escalates.

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<sup>6</sup> The Yankee Group, "The PC Emerges as the Newest Consumer Electronics Category," 10/23/03, p. 6, at [www.yankeegroup.com/custom/research/audio\\_conference\\_detail.jsp?ID=10721](http://www.yankeegroup.com/custom/research/audio_conference_detail.jsp?ID=10721)

In fact, broadband is already making entirely new industries possible. For example, the online gaming industry is expected to generate several billion dollars of revenue in 2003, compared to only \$500 million in 2002.<sup>7</sup> There are equally impressive statistics for online shopping and enrollment in online educational institutions. Many of the opportunities enabled by broadband have not yet been considered by the average American or even the average American company. The possibilities will unfold as penetration increases. For an example of new and feasible applications, we can look to Korea. In 2001, Seoul Broadcasting System started offering streaming video, such as popular soap operas, online at a cost of \$0.40 per episode. The service now has 1.8 million registered users and is attracting 4,000 more per day.<sup>8</sup> This is only the beginning. ■

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<sup>7</sup> Estimates based on Themis, IDC, Datamonitor and Informa Media Group  
<sup>8</sup> International Telecommunication Union, "The Birth of Broadband," p. 55

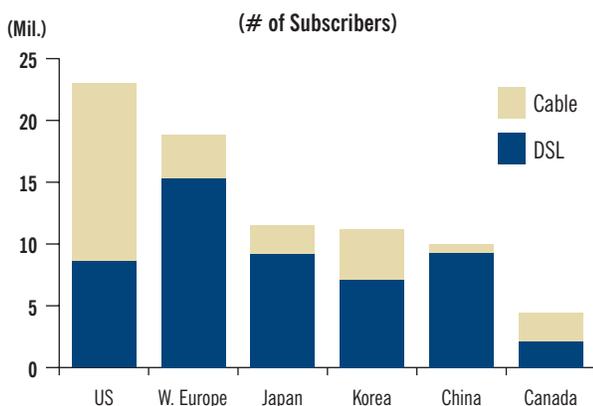
## BROADBAND IN NORTH AMERICA

We are now going to turn our focus to North America, in particular the US, because it is the largest economy in the world and the market most investors know best. It is important to remember, however, that the US is significantly behind many other countries (including Canada) in terms of broadband penetration and applications. That said, the number of broadband subscribers has been meaningfully increasing in the US in recent months. In the third quarter of 2003 alone, the nine largest cable and telephone companies added over 1.7 million broadband subscribers.

It is also important to remember that the dynamics in the US and Canada are significantly different from those in most other countries because the US and Canada have advanced and pervasive cable industries. This may stem from the fact that the US has the strongest entertainment industry. Nonetheless, the crucial point is that the scope and proliferation of pay TV (particularly via cable) is much greater in the US and Canada than almost anywhere else in the world. This has led the US and Canadian cable companies to upgrade their infrastructures to a far greater degree than most of their international counterparts. The result is a fundamentally different playing field for broadband competition.

In most countries, broadband rivalry has been acted out principally over telephony lines (typically unbundled to allow access). In the US and Canada, however, broadband competition has been taking place almost entirely on parallel cable and telephony

Display 4  
Cable Modem & DSL Penetration Around the World



Source: ITU, Point-Topic, national statistics and company data

infrastructures. In the US, cable modems have captured a commanding 62% of the market so far. As you can see from Display 4, the US is the only major geography where cable has such a dominant position.

### The Cable/DSL War in the US

For cable companies, broadband has provided a way to earn incremental revenue from their core cable-network investment. It has also reduced customer churn, particularly to satellite TV providers. Cable-modem growth has been spectacular, increasing from less than 2 million subscribers in the beginning of 2000 to over 14 million today. Comcast, the largest cable provider in the US, recently noted that over 20% of its video customers now subscribe to Comcast's data service.

For the incumbent telecom providers, or regional bell operating companies (RBOCs), DSL service offers similar benefits. Until recently, however, they have been less aggressive in offering broadband due to the technical difficulty of providing broadband service over their existing copper-wire infrastructure and reluctance to help DSL cannibalize the lucrative second telephone lines many households currently use for dial-up service. In the last year, the RBOCs have significantly stepped up their efforts to sell DSL services, as they have come to realize the short- and longer-term importance of controlling this critical pipe into the home.

Controlling the broadband pipe is essential to both the cable companies and the RBOCs because of "convergence," an idea that has been around for decades but that broadband technology actually makes possible. For the purposes of this paper, convergence means offering multiple services (such as voice, video and data) over a single connection. It gives the cable companies a way to attack the revenue streams of the telecom-service providers, and vice versa.

Convergence puts large sums at stake. In 2002, US cable companies and RBOCs generated almost \$200 billion in revenue.<sup>9</sup> Of the total, broadband services represented just 3%, or less than \$6 billion.<sup>10</sup> This ratio

<sup>9</sup> National Cable & Telecommunications Association, at [www.ncta.com/industry\\_overview/indStats.cfm?statID=9](http://www.ncta.com/industry_overview/indStats.cfm?statID=9), and company data  
<sup>10</sup> Alliance Capital estimate based on company data

will likely change in the future and will have a significant impact on the revenue streams of both sets of carriers. For both offensive and defensive reasons, the cable companies and RBOCs want and need to control the broadband access point. As broadband proliferates and other services such as telephony and video traverse the broadband pipe, both sets of carriers will increasingly be able to deliver each other's core services over the broadband connection. Pricing pressure from increased competition may lead to fewer dollars spent on stand-alone wireline telephony services and prepackaged cable. As a result, even though spending on broadband will grow, the size of the overall spending pie may not increase by nearly the same amount.

Consumers already spend a lot on communication and video services. Even before considering a broadband connection, a typical mid- to high-end consumer spends nearly \$160 per month on voice and video services. Display 5 shows what the cable companies receive. The total of about \$68 per month excludes a broadband connection. The total would increase almost 60% with the addition of broadband service.

**Display 5  
Cable Company Revenues per Customer**

| Service          | Amount          | Assumption  |
|------------------|-----------------|---|
| Basic cable      | \$41.11         | Estimated average ARPU* of Cablevision, Charter, Comcast, Cox and Time Warner |
| Premium channels | \$11.77         | Average price of Cablevision, Charter, Comcast, Cox and Time Warner           |
| Other            | \$15.00         | Estimated potential revenue from PVR, digital cable and/or VOD                |
| <b>Subtotal</b>  | <b>\$67.88</b>  |   |
| Broadband        | \$39.32         | Estimated average ARPU of Cablevision, Charter, Comcast and Cox               |
| <b>Total</b>     | <b>\$107.20</b> |   |
| % Increase       | 57.9%           |   |

\*Average revenue per customer

Display 6 shows that the telecom carriers receive about \$91 per month before DSL service but including wireless voice service. The total would be about 33% higher with the inclusion of DSL service.

**Display 6  
Telephone Company Revenues per Customer  
Without Broadband Service**

| Service         | Amount          | Assumption  |
|-----------------|-----------------|---|
| Wireline voice  | \$43.84         | Average RBOC wireline local and long-distance ARPU* |
| Wireless voice  | \$47.38         | Average RBOC wireless ARPU*                         |
| <b>Subtotal</b> | <b>\$91.22</b>  |   |
| Broadband       | \$30.46         | Average RBOC DSL price                              |
| <b>Total</b>    | <b>\$121.68</b> |   |
| % Increase      | 33.4%           |   |

\*Average revenue per customer

Now let's add other potential sources of revenue that the cable and telecom companies are likely to target through the broadband connection, but remove wireless voice revenues, since the latter are less likely to be dislocated by broadband growth. As Display 7 shows, we add \$10.50 per month for video rentals<sup>11</sup> and another \$15.00 per month for video sales<sup>12</sup> but exclude the \$47 per month for wireless voice services. After making these adjustments, we reach a total of approximately \$137 per month, excluding broadband service. Including broadband service of \$39 per month, the total grows almost 29% to about \$177 per month.

**Display 7  
Aggregate Revenues per Customer**

| Service             | Amount          | Assumption                                  |
|---------------------|-----------------|---|
| Cable companies     | \$67.88         | Subtotal from Display 5                     |
| Telecom companies   | \$43.84         | Subtotal from Display 6 less wireless voice |
| Video store rentals | \$10.50         | Three rentals per month at \$3.50 each      |
| DVD sales, etc.     | \$15.00         | One sale per month at \$15.00               |
| <b>Subtotal</b>     | <b>\$137.22</b> |   |
| Broadband           | \$39.32         | Cable modem service                         |
| <b>Total</b>        | <b>\$176.54</b> |   |
| % Increase          | 28.7%           |   |

Needless to say, \$177 per month per consumer is a significant amount of revenue, and the cable companies and RBOCs are likely to compete fiercely for it. But \$177 per month is also a major expenditure for the typical consumer. Given the growing competition in the market

<sup>11</sup> Estimate based on Digital Entertainment Group, at [www.dvdinformation.com/Highlights/index.cfm#rent](http://www.dvdinformation.com/Highlights/index.cfm#rent)

<sup>12</sup> Estimate based on Adams Media Research, at [www.findarticles.com/cf\\_dls/m0VPW/8\\_25/98335047/p1/article.jhtml](http://www.findarticles.com/cf_dls/m0VPW/8_25/98335047/p1/article.jhtml), and Digital Entertainment Group, at [www.dvdinformation.com/Highlights/index.cfm#rent](http://www.dvdinformation.com/Highlights/index.cfm#rent)

and the already heavy burden placed on consumer budgets, we believe broadband prices are likely to continue to decline, and some of the monthly consumer spending on broadband will represent a reallocation of dollars that were previously spent on traditional telecom and video services.

### Why Broadband Is So Important

Penetration rates for video, wireline voice and wireless voice services have already reached very high levels in the US. To grow their top lines, both the cable and telephone companies are looking to attract the incremental broadband subscriber and then use broadband as an entrée to attack the revenue streams of their competitors. As broadband technology improves, this is getting easier and easier to do.

When analyzing this topic, it is important to remember that both telephony and cable are relatively high fixed cost businesses. Once the investment is in place (the lines in the ground and overhead, and the switches in the central office), the incremental user represents very high margin revenue. Therefore, it is critical to both sets of suppliers to add subscribers and add revenue per subscriber. From a defensive perspective, any loss in subscribers means that a carrier must amortize a fixed cost over a smaller revenue base, thereby reducing margins. It is no wonder that cable companies are eager to enter the telephony business with Voice over Internet Protocol technology and that the telecom providers have aspirations to get into video. By attacking each other's markets through the broadband pipe, they not only increase their revenues, they protect their current customer base by locking subscribers into a bundle of offerings. Statistics show that customers who buy multiple services from the same supplier are less likely to change (or churn) to a different provider.

### VoIP: Attacking the Telecom Carriers' Core Revenue Stream

Voice over Internet Protocol (VoIP) enables competitive carriers to supply relatively high-quality phone service over the Internet at lower costs. The technology reached commercial maturity in late 2002 and 2003. Outside the US, VoIP is being rolled out over traditional telephone lines by competitive carriers who gain access to these lines by government regulations. In the US, however, VoIP is currently predominantly deployed over the cable infrastructure. US cable companies and new startup

competitors either have begun or will soon begin to roll out the service to their cable-modem customers, a group that now represents just 13.6% of US households but is growing rapidly.

There are several drawbacks to using VoIP over cable as a primary telephone line. First, VoIP does not use the existing wiring in the home. Therefore, a VoIP cable customer

**Affected Industries:**  
Cable Providers  
Telecom-Service Providers

cannot use the phone jacks already installed. In order to overcome this issue, consumers can use cordless phones (many of which handle multiple handsets from a single base station) or rewire their homes. Second, many burglar-alarm systems rely on telephone wires. If a customer disconnects his traditional phone service, he may inadvertently undermine his alarm system. Third, many current VoIP cable offerings cannot fully support lifeline 911 service, although providers are working on ways to solve this problem.

Despite these drawbacks, many US consumers are interested in cable VoIP for primary and secondary lines. Even if the cable companies and competitive carriers capture a small portion of the telephony market, their presence may exert tremendous deflationary pressure on telephony prices. BellSouth currently charges \$54.99 for unlimited local and domestic long-distance calls in the US. Vonage, an independent VoIP provider, offers unlimited local and long-distance calls in the US and Canada for \$34.99 a month. As more competitors enter the VoIP market, it is reasonable to expect wireline prices to continue to fall and US consumers to spend less per month on wireline voice services in the future.

Obviously, this trend worries the US telecom-service providers, and it has contributed to the stepped-up aggressiveness of the RBOCs in the DSL market. Reasoning

**Affected Industries:**  
Satellite-TV Providers

that a consumer cannot switch to VoIP over cable if he lacks a cable modem, the RBOCs have lowered

DSL prices and increased bandwidth in an effort to blunt, and perhaps reverse, cable-modem penetration as well as capture a larger market share of new broadband subscribers. Along these lines, they have also launched a campaign to dislodge cable from customer homes altogether by co-marketing satellite-television service. The

partnerships with the satellite providers allow the RBOCs to offer the ultimate “triple play”: voice, video and data in a single package. In July and August 2003, BellSouth, Qwest and SBC joined forces with satellite broadcasters EchoStar and DirecTV. SBC went so far as to cement the relationship with a \$500 million investment in an EchoStar convertible bond. Verizon is rumored to be considering a satellite TV co-marketing initiative but has not yet made a formal announcement. As we will discuss later, such alliances are a temporary retention strategy and are likely to be followed by plans to enter the video-distribution market over proprietary networks, although we suspect this will not occur for several years to come.

A final leg to the RBOC response to competition in their core markets has been to bundle and cross-sell their services

even further in order to increase customer retention. SBC, BellSouth and Verizon offer wireline and wireless voice packages. Verizon has even provided free wireless Internet service (i.e., Wi-Fi) to its broadband customers in New York City and could potentially offer more creative and attractive broadband packages as it extends its advanced wireless network (CDMA 1xEV-DO), which provides higher-speed data capabilities. These packages are especially potent, because they offer service combinations that the cable companies cannot currently provide. We would not be surprised if the cable companies respond by coming out with a competitive Wi-Fi service or even by partnering with wireless-service providers not affiliated with an RBOC, such as T-Mobile, Sprint PCS or Nextel, to match RBOC bundled pricing for wireless, wireline and broadband. ■

### What Price for Broadband?

Given the strategic importance of broadband for both the cable and telephone companies, competition between the two is likely to intensify over the next several years. If

**Affected Industries:**

Cable Providers

Telecom-Service Providers

experiences in Korea and Japan hold any lessons for the US, the rivalry will push prices down further. The price could fall to as

low as a few dollars a megabit (Display, top). However, the monthly rate is not likely to fall far below \$25 per month (Display, bottom).

The \$25 per month price point is interesting because Americans have demonstrated that they are willing to pay that much for dial-up Internet access. AOL, the largest dial-

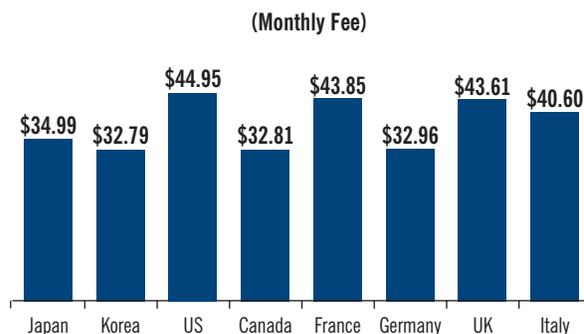
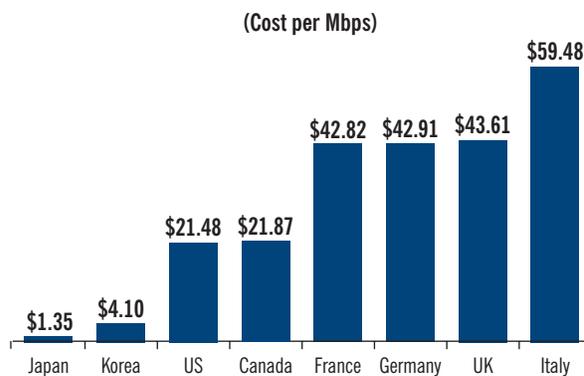
**Affected Industries:**

Dial-Up Internet-Service Providers

up Internet service provider, advertises a rate of \$23.90 per month, and MSN, the second-largest, offers \$21.95 per month

(both of which exclude the cost of a second phone line, which many dial-up users feel compelled to have). If broadband prices fall to \$25 per month, it is likely that a significant portion of the 50 million dial-up subscribers in the US will convert to broadband. Even with broadband rates currently averaging \$37.10 per month,<sup>13</sup> the largest dial-up Internet service providers are losing customers at the rate of over 3% per quarter, presumably to broadband alternatives. ■

### Broadband Prices for Representative Companies



1 Mbps or greater except for Italy  
Source: Company data as of December 2003

<sup>13</sup> Comcast, Cox, Time Warner, BellSouth, Qwest, SBC and Verizon average monthly price based on a one-year contract

## NEW COMPETITION IN VIDEO

Although the current RBOC/DBS partnerships are new and largely defensive, we believe that as technology improves and bandwidth increases, the RBOCs will not be able to resist the lure of \$53 per month going to the cable companies for basic and premium video services. The satellite-TV agreements are an interim strategy to try to hold the customer until a more comprehensive and cohesive solution becomes available. Unfortunately for the RBOCs, this solution is probably at least five years away and requires significant additional investment.

To compete head-to-head with the cable companies and offer the triple play of voice, video and data services, the RBOCs will most likely need to deliver

### Affected Industries: Network Infrastructure- Equipment Providers

video to the home over proprietary distribution networks (not via satellite partnerships). However, in order

to achieve this, they must upgrade their infrastructure in the critical last mile, which spans from the network edge to the customer home. The RBOCs have two choices: They can keep the last mile copper and boost DSL speed, or they can replace the copper running to the home with fiber-optic cable. Fiber is probably the ultimate answer, but it is still very expensive. The total cost (before paying for content and back-office video infrastructure) is estimated at over \$2,000 per household today. (This figure is likely to decline over time.) DSL is less expensive, but it slows as the distance between a home and the network edge increases, thus requiring the carriers to push fiber further out in order to bring the network edge closer to customer homes. In many instances, the carriers may feel that if they have to push fiber much further out, they may as well install fiber to the home, rather than potentially having to upgrade the plant again at a later date.

Each RBOC will need to strike its own balance between the technological limitations of DSL and the formidable costs of deploying fiber to the home. Although fiber is most likely the ultimate answer, the time and path of this migration is still very uncertain. For the next five to ten years, we expect to see various combinations of fiber and DSL in US telecom networks.

### Internet Protocol Television:

#### The Future of TV and Targeted Advertising

Using DSL, fiber or, most likely, a combination of the two, the RBOCs or competitive carriers are eventually likely to create enough bandwidth to deliver video to the home. This has already started to happen in other countries, in some with considerable success. Telephony and broadband companies in Canada, Hong Kong, France and Italy, for example, have already launched multichannel television over Internet Protocol (IPTV). We would not be surprised if the global rollout of video over DSL/fiber mimicked the global rollout of broadband, where non-US service providers were more effective with the initial launches, and the US RBOCs lagged by several years.

When the RBOCs or competitive carriers do build out their video networks, they may choose to deploy next-generation IPTV networks rather than the traditional

### Affected Industries: Cable Providers Network Infrastructure- Equipment Providers Telecom-Service Providers

systems the cable operators use today. IPTV pushes network capabilities to the cutting edge of video-delivery technology and may challenge the cable companies to match these

capabilities and upgrade their networks once again. The implementation of IPTV would have significant implications for broadband and video providers, entertainment producers, and advertising agencies, as well as providers of telecom and cable network-infrastructure equipment.

IPTV offers essentially the same services and quality as digital cable and satellite. The main difference between the current cable systems and IPTV concerns their infrastructures and how they provide service from their networks to the home. The point is technical, but worth understanding in detail because of its ramifications for other industries. Up to the edge of the network, the existing cable systems and IPTV work on essentially the same principle: They receive content from satellite feeds and distribute all channels to all points within the network. From the network edge to the customer home, however, IPTV and traditional cable differ. Traditional cable systems send all content to the set-top box in the

home and limit access to premium channels at the set-top box. In contrast, IPTV networks deliver only a single channel at any one time from the network edge to the customer's home.

The difference is crucial, because it gives IPTV operators the ability to deliver a unique advertisement to a specific consumer (a service which the current generation of digital cable systems are just beginning to provide). This capacity would enable advertisers to deliver tailored advertising to specific customers at specific points in time. Johnson & Johnson, for example, would no longer have to advertise heart medication to all football fans, regardless of their age and health needs. Instead, it could deliver heart medication advertisements only to elderly viewers, while advertising athlete's foot spray to younger viewers.

The ability to deliver specific content to a home, and the concomitant power to know what a household is watching, is likely to raise significant concerns about privacy. If consumers become comfortable with sharing demographic and personal information with networks and advertisers, targeted advertising may help advertisers offset the loss of viewer attention caused by the personal video recorder (PVR) and other time-shifting technologies. While the number of television advertisements viewed may actually decrease due to the PVR, the value of the advertisements that are viewed may increase due to the ability to target viewers more effectively.

#### Affected Industries:

Advertising Agencies

Cable Providers

Telecom-Service Providers

comfortable with sharing demographic and personal information with networks and advertisers, targeted

#### Internet Video: Undermining the Walled Garden

As they face new network challenges, both the traditional cable companies and the potential IPTV providers—whether the RBOCs or new competitive carriers—will be financially motivated to maintain a “walled garden” of viewing options. Both the current cable and future IPTV networks are structurally self-contained. They provide a predetermined number of channels at a guaranteed level of quality. To gain access to a home, an entertainment producer must negotiate with the carrier for inclusion on the carrier's supported network.

The potential problem for the cable and IPTV companies is that the very line that provides the walled garden of video options also provides a broadband connection to the Internet. This connection poses an important threat to the walled garden. An entertainment content producer, such as Walt Disney, DreamWorks or the NFL, could decide to circumvent the walled garden by offering Internet-based video-on-demand (VOD) service from its website or from the website of an online video aggregator. This would require:

- a host server for the content, localized wherever the service would be provided;
- a way to guarantee an acceptable download speed between the host server and the viewer; and
- a way to transport the downloaded video file from the broadband connection to the television set.

On a relatively small scale, these requirements are quite manageable. However, the technical barriers to full-scale Internet-VOD are daunting and therefore will probably restrict implementation to a limited, but ever growing, selection of high-demand content. In other words, the consumer will not be able to get any show at any time, but rather will be able to select from a predetermined set of entertainment options that he or she is presumably willing to pay for. Over time, this will probably divert demand from “packages” of channels. Also, entertainment producers may develop independent, Internet-based video-on-demand capabilities to use as a point of leverage in negotiations with the cable and other video providers. This would ultimately lead to even more competition for popular content. In pursuing such a strategy, entertainment producers would need to balance the advantages of direct distribution with the benefits of reaching the occasional viewer that come with being included in a basic cable package.

Entertainment producers are already experimenting with alternative distribution methods in order to operate more efficiently in a world with on-demand digital content. MovieLink, a joint venture among Metro-Goldwyn-Mayer Studios, Paramount Pictures,

Sony Pictures Entertainment, Universal Studios and Warner Bros. Studio, currently offers an Internet video-on-demand service and has already entered alliances with BellSouth and SBC. Priced competitively at \$2.95 to \$4.95 per film, the major drawbacks to MovieLink are the slow download speed and the inability of the average customer to move the download from the PC (where most broadband connections currently reside) to the TV (where most movies are watched). We discuss the issue of connecting the TV to the Internet at length in the home-electronics section later in this report. The solution to the bandwidth problem will depend on how quickly broadband speeds increase in the US, but this impediment will disappear over time.

Independent aggregators of video content are also entering the Internet video-on-demand market. AOL for Broadband BYOA (Bring Your Own Access), for example, offers radio, sports, news and video clips for \$14.95 per month. RealNetworks has a similar service, which includes 24-hour broadcasting of the NBA's TV network and rebroadcasting of Major League Baseball games. Like MovieLink, AOL for Broadband BYOA and RealNetworks give leverage to content producers by providing a new route to the consumer that is not controlled by the cable, satellite or IPTV carriers. These business models are relatively new and are likely to evolve and grow over time.

Significant revenues are at stake. Internet video-on-demand would give consumers a convenient alternative to purchasing entertainment bundles and may put pricing

**Affected Industries:**  
Cable Providers  
IPTV Providers  
Video-Content Producers

pressure on some of the premium packages sold today. At least some consumers may opt to skip the bundled movie packages and start buying premium content à la

carte from video-on-demand services. Right now, the cable companies get around this by offering their proprietary video-on-demand services only when customers opt for a premium digital package, but if other entertainment packages become readily available over the Internet, there will be competition for these dollars, and the walled garden may be breached.

Video-on-demand, either via the Internet or through proprietary systems, will also alter how consumers rent and buy videos. Households on average rent about

**Affected Industries:**  
Video-Content Distributors

three videos a month at a price of around \$3.50 per video, and they purchase about one video

a month at a price of around \$15. This totals \$25.50 per month in rental and purchase revenues that can gradually be diverted away from physical stores to video-on-demand providers, whether they be third-party aggregators, like MovieLink, AOL for Broadband BYOA or RealNetworks, or the cable and IPTV providers themselves. ■

## THE INTEGRATION OF HOUSEHOLD ELECTRONICS

Broadband will arrive in the home in two waves. The first will be the widened pipe to the home: Cable or telecom companies will supply increased bandwidth to consumers as competition continues to unfold. The second will take place within the home. Using broadband home-networking technology, consumer-electronics firms will link traditionally autonomous audio, video and gaming devices. New digital products, including TVs, cameras, DVDs, video consoles, PCs, MP3 players and cell phones, will increasingly be able to communicate with one another and enable consumers to move digital content from one device to another. Consumers will be able to view digital photos and home movies on their TV, PC or even personal digital assistant. Digital music will be swapped from a CD to a hard drive, MP3 player or cell phone. As connectivity increases and seemingly disparate functions are combined in novel formats, broadband within the home will launch a home entertainment upgrade cycle as consumers migrate to digital and networked devices.

### Home Networking

The exact form of these devices remains uncertain. It is becoming increasingly clear, however, that home networking will serve as the backbone of next-generation products, and home networks will either be wireless or use existing household circuitry. Furthermore, there will be ways to physically transfer digital content from one device to another. MovieLink's frustrations demonstrate the importance of building a viable home network: A major limitation of MovieLink is its inability to transport downloaded video content from the broadband connection point, typically next to the PC, to the TV, typically stationed in the living room or bedroom. One logical way to facilitate this transportation today is by recording the movie on a DVD and physically transferring it from the PC to the TV. Alternatively, a consumer could install a wire to connect the broadband modem to the TV. A seamless wireless connection is the most elegant solution. It requires minimal effort from the consumer, and eliminates wires which are often unsightly, inconvenient, expensive to install and cumbersome to adjust.

In the future, a number of technologies may be used to transfer digital content between devices, but there is no question that wireless fidelity (Wi-Fi) and Bluetooth will

play an important role in wireless home networking. Currently, the most popular Wi-Fi standard, 802.11b, offers a maximum theoretical speed of 11 Mbps, although in practice speeds range from 4 to 6 Mbps, enough to carry DVD-quality video. The next-generation Wi-Fi standard, 802.11g, supports a maximum theoretical speed of 54 Mbps and realized speeds of 18 to 22 Mbps, more than enough for multiple channels of DVD-quality television and just enough for 19.2 Mbps HDTV. However, the realized bandwidth for Wi-Fi technology dissipates over distance, posing a practical problem for larger homes. At the moment, the maximum usable range for both 802.11b and 802.11g is approximately 100 to 150 feet, and speeds vary depending on the location within the home. The next major leap in Wi-Fi technology will be 802.11n. Due in late 2005 or 2006, it is slated to provide realized speeds of 100 Mbps at over 300 feet. Hopefully, it will more adequately satisfy the range and bandwidth needs of today's applications.

Bluetooth operates on the same principles as Wi-Fi, but its range is much shorter. It offers speeds of just under 1 Mbps over distances of up to 30 feet. Its advantage is that it uses very little power, and thus it is ideally suited for smaller applications and devices that rely on a battery, such as personal digital assistants, MP3 players and cell phones. Wireless networks in the future are likely to use a combination of Wi-Fi and Bluetooth technologies.

Because they rely on airwaves, Wi-Fi and Bluetooth occasionally experience blackout spots where their signals cannot travel. Power-line and phone-line networks overcome the practical shortcomings of wireless approaches, but lack their mobility. Like Wi-Fi and Bluetooth, these networks avoid the hassle and expense of installing new wiring because they use the home's existing wiring. Both solutions offer maximum theoretical speeds of about 14 Mbps and realized speeds of about 4 Mbps. However, these speeds are likely to improve as the technologies mature. In the future, we are likely to see products that incorporate both wireless and power-line/phone-line approaches. Combined networks would take advantage of the mobility of wireless and the reach and reliability of existing electrical and telephone wiring.

In Japan, Yahoo! BB offers plug-and-play Wi-Fi, which integrates a Wi-Fi device into a standard broadband modem, for an additional \$9 per month. The combined Wi-Fi/modem lets consumers effortlessly send content obtained via the broadband connection to any device located within the transmission range of the Wi-Fi. Currently, about 30% of Yahoo! BB's new subscribers sign up for this service. Verizon, SBC, BellSouth, Qwest and Cox are experimenting with similar services in the US. Each achieves the ultimate goal of home networking: to link electronic devices and to transport digital data from the broadband access point into other rooms in the house.

### Household Electronics: Pandora's Box

The implications of home networks are revolutionary, and this has not been lost on consumer-electronics manufacturers. Soon, broadband will extend beyond the physical bounds of the computer and serve as a rich data source for television, telephony, recorded music, streaming radio, gaming and a host of other common consumer applications. Connected by a home network, the television, telephone, DVD player, PVR, stereo, gaming console and practically any other digitized household-electronic device can communicate with one another and even be controlled from a central location.

It is no wonder that home networking has opened Pandora's box and inspired a wide variety of new product designs. There are two basic issues that need to be addressed in the networked home. The first concerns where to store audio and video content. There is an emerging consensus that it makes sense to put content on a central server located somewhere in the home. One school of thought would locate the server in the living room; the other would use the PC hard drive, typically located in the office or den. Needless to say, PC manufacturers, software companies (especially Microsoft), consumer-electronics firms and a host of others are closely watching this debate and voicing their opinions.

The second issue involves how much functionality to put in a single device. One device that performs PVR, DVD, CD, MP3, radio and other functions would effectively be a universal entertainment appliance. Sometimes called a media center, media gateway or entertainment hub, such

a device is in sharp contrast with the approach commonly taken by most consumers today, which is to distribute functionality among a number of dedicated, and theoretically best-of-breed, devices.

This is not an entirely new debate. Historically, consumers have been reluctant to buy products that purport to do too much, opting instead for a best-of-breed approach. However, as content becomes more transferable, the better organization offered by a single product may become more important.

#### Affected Industries:

Consumer-Electronics Manufacturers  
Set-Top Box Manufacturers  
Computer Manufacturers

There are a wide variety of home-networked devices already available in the market today. For example, in the single-purpose/best-of-breed camp, Motorola makes a device called the simplifi, which wirelessly streams MP3s and Internet radio from the PC to the home stereo. At the other end of the spectrum are the multifunction products, which try to be universal. In this vein, Sony intends to add functionality to its PlayStation gaming consoles. The new PlayStation X incorporates a gaming console, TV tuner, DVD recorder and player, CD and MP3 player, and a 250-gigabyte hard drive that can store 100 hours of video.

In terms of storing and accessing content, the universal approach will be more convenient than managing a hodge-podge of different components. But a multifunction machine is unlikely to match the performance and operational ease of a dedicated device like the simplifi. Display 8 on the next page outlines the applications and functional location of several next-generation products. The table begins with the simpler products and ends with the more complex ones.

Despite the lofty ambitions of consumer-electronics and PC firms, TV set-top box manufacturers should not be counted out of the race for next-generation appliances. Scientific-Atlanta and Motorola enjoy a privileged position in the living room because their proprietary coding and communication software currently serve as the de facto standard for most cable systems in the US. In the past, they have generally followed the lead of the cable and satellite companies,

## Display 8 Networked Electronics

| Company   | Device        | Launch  | Price   | TV Tuner | Cable Tuner | CD & DVD | PVR     | Stored Video | MP3 Player | Internet Radio | Photo  | Internet Browser | Hard Drive | Gaming  |
|-----------|---------------|---------|---------|----------|-------------|----------|---------|--------------|------------|----------------|--------|------------------|------------|---------|
| Motorola  | simplifi      | Current | \$ 260  | –        | –           | PC       | –       | –            | PC         | PC             | –      | –                | PC         | –       |
| Linksys   | Wireless-B    | Current | 200     | –        | –           | PC       | –       | –            | PC         | PC             | PC     | –                | PC         | –       |
| Philips   | Streamium     | Mar-04  | 675     | –        | –           | PC       | –       | PC           | PC         | PC             | PC     | –                | PC         | PC      |
| PRISMIQ   | MediaPlayer   | Current | 200     | –        | –           | PC       | –       | PC           | PC         | PC             | PC     | PC               | PC         | PC      |
| Gateway   | Connected DVD | Current | 199     | –        | –           | Device   | –       | PC           | PC         | Unknown        | PC     | –                | PC         | –       |
| Sony      | PlayStation X | 2004    | 650     | Yes      | –           | Device   | Unknown | Device       | Device     | –              | Device | –                | Device     | Device  |
| Sony      | PlayStation 3 | 2005    | Unknown | Yes      | Unknown     | Device   | Device  | Device       | Device     | –              | Device | –                | Device     | Device  |
| Panasonic | AVC Server    | Unknown | Unknown | Yes      | Unknown     | Device   | Device  | Device       | Device     | –              | Device | Unknown          | Device     | Unknown |
| Microsoft | Media Center  | Current | 1,300   | Yes      | –           | PC       | PC      | PC           | PC         | PC             | PC     | PC               | PC         | PC      |

Device = functionality located on device  
PC = functionality located on PC

their primary customers, and tailored their products accordingly. If the cable and satellite companies decide to offer networked appliances in an effort to retain their set-top box and PVR rental fees, they may turn to their trusted and captive suppliers to provide this additional functionality.

A less likely, but nonetheless possible, scenario is that the cable companies may look to diversify their supplier base and actively bring in new entrants to the market. This would put Scientific-Atlanta and Motorola in an awkward position and force them to respond by pursuing new customer bases, including IPTV providers and even end-consumers themselves. One reason the cable companies may be reluctant to venture beyond the Scientific-Atlanta/Motorola duopoly is that the cable companies historically have been able to dictate the functionality of the set-top box, a fact that helped them to maintain the proprietary and self-contained nature of their systems. If this were to change and the set-top box manufacturers began to design products more tailored to meet end-consumer desires rather than cater to the demands laid out by the cable companies, it is likely that they would accelerate the trend toward open access set-top boxes. This movement would enhance the consumers' ability to access Internet-based video content, circumvent the walled garden and effectively disintermediate the cable companies. We will discuss this important issue in detail later in this report.

Despite the reluctance of the cable companies to meaningfully diversify suppliers, a number of government initiatives may accelerate the introduction of new networked appliances and significantly increase competition for the set-top box manufacturers. In the US, Federal Communications Commission (FCC) regulations require new TV sets to be gradually equipped with digital tuners. The process is mandated to begin in mid-2004 and to be completed by mid-2007. In addition, the FCC recently passed "plug-and-play" rules. These rules establish standards that will enable consumers to plug their cable directly into their TV (or any other device for that matter), obviating the need for a set-top box.<sup>14</sup> Many TV manufacturers plan to include plug-and-play cable tuners in their new high-definition televisions (HDTV). If manufacturers also choose to include a cable modem in these units, it would eliminate the need to have a separate wire for broadband access. As the race toward networked devices heats up, manufacturers may find it rational and advantageous to use the advent of HDTV and consumer desire for its high-quality programming as a platform to introduce multifunction, and perhaps universal, entertainment appliances.

<sup>14</sup> At the moment, the plug-and-play rules apply only to one-way services, such as basic cable and premium channels. A second agreement, covering two-way interactive services (such as video-on-demand and enhanced electronic programming guides), is being negotiated.

## Competition from Every Direction

The market for networked electronics is likely to be crowded. As indicated in Display 8, traditional consumer-electronics firms such as Philips, Sony and Panasonic have their designs on the market. Their existing product lines have suffered from relentless price compression from new low-end competitors, and they view next-generation devices as a way to differentiate their brands and earn higher margins. Display 8 also shows the presence of new entrants, such as PRISMIQ, a small California-based company. There are many others like it. If the field were not crowded enough, Motorola has its eyes on what it calls its networked-home initiative, and Scientific-Atlanta is likely to play a part as well. Moreover, the PC industry recognizes the size of the market and has shifted its attention to it as well. Given the fact that companies from such disparate industries are scrambling to enter the market, competition is likely to be fierce.

The PC represents a powerful force in the looming battle for broadband electronics. Computers are already

**Affected Industries:**  
 Computer Manufacturers  
 Consumer-Electronics Manufacturers  
 Set-Top Box Manufacturers  
 Software Developers

connected to the Internet, and they contain large hard drives for storage purposes. Computer companies also face a strong economic incentive to seek revenue growth opportunities and more profitable

products as margins in their core PC business continue to be squeezed.

Several PC manufacturers have already made forays into the living room. Hewlett-Packard and Gateway offer products similar to the Philips Streamium and PRISMIQ MediaPlayer. Gateway sells TVs and is unabashed about its desire to transform itself into a broader consumer-electronics firm. Dell, the largest PC manufacturer in the world, recently entered the TV market, as well.

Microsoft looms large in the PC camp. The Microsoft Windows XP Media Center Edition 2004 (XP Media

Center) may trump the efforts of all other current competitors. The XP Media Center operates on a PC and provides the diverse functionality of a universal appliance. The PC supplies massive storage capacity and communicates with the living-room TV via a Wi-Fi network. The XP Media Center has an internal TV tuner and is compatible with existing cable and satellite set-top boxes. The software provides extensive PVR functionality and supports a DVD writer through an adjunct program. A built-in FM tuner receives aerial radio broadcasts and lets the listener pause live FM programs. Other audio functions include Internet radio, a CD player and writer, and MP3 storage and playback.

The XP Media Center is expensive (about \$1,300 without a monitor) and thus is currently likely to appeal only to avid consumers. Nonetheless, its impressive capabilities serve as a portent for how easily the PC can take over the functions of many common consumer-electronics products. At the moment, Microsoft has decided to keep its media-center technology exclusively in the software business and has not merged it with Xbox, its hardware gaming platform, which is typically placed in living rooms. This situation could change if the PC-based XP Media Center fares poorly against Sony's PlayStation or another universal appliance. For its part, Sony could also proceed with a PC-based product, based on its Vaio line of computers, if it finds that the XP Media Center is attractive to consumers.

The proliferation of media centers may also be dangerous for set-top box manufacturers, especially if the plug-and-play rules are extended to two-way (i.e., interactive) functionality, as opposed to the current one-way standard. The XP Media Center, for example, currently solves the problem of cable and satellite tuning by superimposing its remote control on top of the set-top box. Living room-based universal appliances could do the same. It is ominous for the set-top box manufacturers that this tactic could move higher value-added functions, such as PVR, from the set-top box into the universal appliance. Set-top box manufacturers would consequently be relegated to

### The Diminished Value of Radio Broadcasting Rights

Microsoft's XP Media Center, Sony's PlayStation and other networked home appliances will free Internet radio from the confines of the PC and bring it into the living room. By linking

**Affected Industries:**  
Advertising Agencies  
Professional Athletics  
Aerial Radio Broadcast Licensees

Internet-based radio stations to the home stereo, networked devices will undermine the value of aerial radio stations, which

up to now have enjoyed a protected market due to government licensing of the radio spectrum. In other words, next-generation devices will substantially increase the supply of radio stations and thereby diminish the value of aerial broadcasting licenses.

Even outside the home, networked devices such as Apple's iPod and MP3-enabled cell phones are making it easier for consumers to use broadband audio content.

Networked electronics will also enable consumers to time-shift radio. Microsoft's XP Media Center lets listeners pause and record radio broadcasts, and it would not be difficult for Sony and others to add this functionality. Just as with a PVR, radio consumers would be able to skip advertisements. Events aired live, such as sports, news, traffic and weather, would become more valuable to advertisers since listeners are likely to want to hear them in real time and therefore would not have the ability to fast-forward through commercials. ■

building relatively simple equipment. If the plug-and-play rules are expanded, future media centers could use their own cable tuner and bypass the set-top box altogether. This, of course, would eliminate monthly set-top box rental fees, but it would also require consumers to foot the bill for the up-front purchase of the equipment.

Home networking is still evolving, but it is more than likely that the TV will become connected to the Internet, and this connection will have profound ramifications. New business models will become possible for certain industries, and new competitive factors will emerge in others.

For example, the US video-gaming industry, which has been growing at a compound annual growth rate of 116% since 1995,<sup>15</sup> will have new opportunities to generate revenue. In the US, gaming is dominated by console systems, such as the Sony PlayStation and Microsoft Xbox, which display games on the TV (as opposed to the PC). Currently, companies involved in the gaming industry generate the majority of their

revenue from either hardware sales (in the form of consoles) or software sales or rentals (the games). Over time, online gaming may change this business model and allow gamers to play with friends located in other houses (or countries). In an online environment, games can be either purchased offline (as they are today) or downloaded from an online gaming site. In the case of the latter, companies could charge per gaming session, per hour or per month for access to a variety of games. This approach shifts the business model from one of one-time software sales to an annuity-like model based on recurring revenues. It also dramatically changes the cost structure of the business.

In Korea, where PC-based gaming is more popular than console gaming, at almost any point in time over 100,000 people are online playing Lineage, the leading game in the market. This gaming phenomenon has not only accelerated the growth of broadband usage and rollout, it has shifted entertainment dollars away from traditional media suppliers in favor of online-gaming companies. With the television connected to the Internet through a home network, online gaming in the US will become more convenient and maybe even more affordable (with lower up-front costs because the consumer would not necessarily have to purchase the

<sup>15</sup> Entertainment Software Association, at [www.theesa.com/pressroom.html](http://www.theesa.com/pressroom.html)

software before playing). This transition is likely to create new opportunities for the gaming industry, and it may attract a broader audience to what is already a fast-growing business.

Internet-enabled TV may eventually be disruptive for package-pay TV and proprietary video-on-demand services (whether offered by traditional cable or IPTV). Some media centers already have menus dedicated to downloading videos from Internet-based video-on-demand companies, such as MovieLink and CinemaNow. This menu makes it easier for consumers

**Affected Industries:**

Cable Providers

Satellite-TV Providers

IPTV Providers

Video-Content Producers

to view content not provided by the traditional television industry and, as a result, curtails the power of distributors to limit consumers' access to content beyond the walled garden.

Full-scale Internet-based VOD will be constrained by technical issues. Nonetheless, the existence of a new distribution channel to the consumer, facilitated by a universal appliance, may eventually give movie and TV producers more leverage in their negotiations with cable, satellite and IPTV providers. At the very least, Internet video-on-demand will empower content producers to cut into the margins earned by distributors from their current proprietary video-on-demand services. ■

## ENTERTAINMENT TRANSFORMED

The Internet coupled with broadband represents a potent and transformative distribution channel for the entertainment industry. Faster broadband speeds are increasing the efficacy of distribution to the home. At the same time, the advent of networked electronics is altering how consumers access and use music and video programming within the home. The interaction of these parallel forces—one to the home and the other within the home—will play a crucial role in the evolution of content distribution over the next several years.

### Music Distribution: Reconfiguring the Market

To date, broadband has been wonderful for music distribution, but awful for music companies. Programs like Napster, Rhapsody and KaZaA have made it immeasurably easier for customers to access music. In this sense, broadband has been a boon for physical distribution and has probably led to a surge in music accumulated by consumers. The next generation of home electronics will likely push this trend one step further. It will connect the Internet to the living-room stereo, extending the reach of broadband music distribution to a wider audience of relatively unsophisticated Internet users.

For record companies, the problem has been figuring out how to persuade consumers to pay for downloaded music. Since the rise of Napster in 1999, music industry revenues have decreased 14.9%<sup>16</sup> despite the likely increase in overall music consumption. The dramatic increase in the supply of music, by legal means or otherwise, has compelled record companies to cut album prices. Legal download sites, such as Apple's much-publicized iTunes Music Store, Rhapsody, Wal-Mart's online music store or Sony's forthcoming site may reverse the tide. They represent a beacon of hope that record companies can transform themselves and possibly even profit from broadband distribution.

Regardless of whether the paid sites succeed, the existence of downloaded music is fundamentally reconfiguring the structure and preconceptions of the

record industry. To begin with, music downloading is forcing record companies to unbundle music. When customers use the Internet, they rarely download entire albums. Instead, they choose individual songs or bundle their own group of songs. iTunes and the other pay downloading sites have recognized this change in consumer preferences and responded to it by charging for each song downloaded.

A second change concerns the physical distribution of music. Before broadband, distribution relied on chain stores and other physical means. Larger stores, in particular, were more likely to have what the customer was looking for, and they offered the opportunity to sample music. Online music distribution satisfies both of these needs, and it does so with significantly less physical infrastructure. As a result, broadband music distribution will most likely force music stores to diversify their businesses in order to attract and retain customers, much like Barnes & Noble and Borders have had to do in the book market.

### Video: Is It Next?

So far, the movie and TV industries have been spared the fate of the record industry, primarily because video files are too large to be conveniently downloaded at current broadband speeds. However, MPEG-4, the next-generation video compression standard, will almost halve the bandwidth requirements for a typical movie, and Microsoft's Windows Media Player 9 (WMP9) offers similar compactness.

Clearly, the movie and TV industries must heed the harsh lessons of the music downloading debacle. One of their first tasks will be to create robust digital rights management (DRM) technology. Another closely related strategy is to make content easier for consumers to access legally and then incorporate safeguards to protect the use of the content. While it may be impossible to thwart the most sophisticated content pirates, video DRM technology has become quite advanced and may be sufficient to deter the average consumer. The currently available technology allows

<sup>16</sup> National Association of Recording Merchandisers, 2002 Annual Survey Report, at [www.narm.com/research\\_stats/annualsurveys/annualreport.pdf](http://www.narm.com/research_stats/annualsurveys/annualreport.pdf)

customers to download a rental movie to their hard drives, but makes the movie viewable only within a predetermined time period, often 24 hours.

Another lesson of the music debacle is that the movie industry must adapt to the realities of the networked home and seize the opportunities it creates, rather than resist or ignore the trend. Devices like the XP Media Center PC and the Sony PlayStation will enable consumers to easily download movies from the Internet and play them in their living room. The examples of Napster and Apple's iTunes show that it would be wise for the movie industry to embrace Internet downloading, preferably on legal sites, rather than let Internet-based distribution run amok in an unpoliced, unpaid and unprofitable free market. If content is easy to access (via convenient menus) and relatively inexpensive (perhaps a few dollars per movie), most people are likely to opt for the legitimate sites, rather than spend the time to find it online and download it illegally. Piracy will take off if the content is not available from a legal source, if it becomes available later than people want to watch it or if it is priced too high.

Internet downloading may also transform traditional movie-rental channels. Movies are currently released for video-on-demand after they hit the DVD and VCR rental stores, because movie studios garner about 50% of their profits from DVD and VCR rentals and sales. If this

**Affected Industries:**  
Video-Content Producers  
Video-Content Distributors

were to change and Internet-based distributors were allowed to release movies at the same time as physical stores, these rental and sales figures may not change dramatically. What would change, however, is *how* people would rent and purchase movies. It would be far more convenient to download a rental (even if it expires within 24 hours) than to go to the rental store, check if your chosen movie is in stock and return it the next day. For that matter, why bother buying a DVD in a store if you can download a copy (with permanent viewing rights) and store it on your personal hard drive or burn a copy on your home DVD writer? Aside from being more convenient for consumers, downloading would reduce physical production and distribution costs for movie producers. At the very least, the prices

charged by rental stores should decline in the face of growing competition from video-on-demand.

### A Bright Future for the Entertainment Industry

The broadband revolution undoubtedly creates risks for the entertainment industry. Digital rights management will be of paramount importance in the future. As the experience of the music industry shows, the threat of piracy is real. The movie and TV industries, however, will have the benefit of learning from the mistakes of the music industry. They have already developed robust DRM techniques, they are working closely with manufacturers to safeguard digital content and, if they choose wisely, they can adapt to the exigencies of broadband distribution.

In fact, the entertainment industry stands to benefit a great deal from broadband implementation. To begin with, the transition to downloading will diminish the role of video stores as middlemen in video

distribution. Movie rentals and sales revenue exceeded \$20 billion in 2002, and distribution outlets kept a large portion of that revenue. With the rise of downloading as a more convenient and cost-effective alternative to physical stores, movie companies may be able to retain a larger percentage of the revenues from home video rentals, largely to the detriment of incumbent store-based distribution channels. Even if incumbent physical distributors manage to preserve a portion of the home video market, their negotiating power will be weakened by the existence of broadband distribution.

**Affected Industries:**  
Video-Content Distributors

Entertainment producers may also exercise more leverage when negotiating with broadcast TV, cable and satellite distributors, particularly for more popular content. In some countries, non-video suppliers, such as the incumbent telephone companies, have already used their broadband service to enter the video television market and create additional distribution channels alongside cable and satellite. This will likely accelerate in the future. As more distributors compete for the most popular content, the balance of power will shift from distribution to content, and this shift may

### The Preeminence of Live Content

Video-on-demand and personal video recorders are essentially ways to record and replay video programming at the consumer's discretion. Many people

**Affected Industries:**  
 Advertising Agencies  
 Live-Video-Content Providers

have pointed out the potentially deleterious consequences of video-on-demand and

PVR technology for TV advertising. If consumers spend more viewing hours watching recorded programs, they can simply use their remote to skip the advertisements.

This is, of course, a new reality, but it might also mean that the importance of real-time content, such as sports,

weather and news, will increase in the advertising world. Real-time programs are better when watched as they are broadcast: Knowing the outcome of a game somehow spoils the viewing experience, and people generally want to hear news as it transmitted. Sports, weather, news and other types of time-sensitive programming will become more valuable as advertisers learn that consumers prefer not to record it and thus cannot skip the ads. As a result, time-sensitive programming will remain a sturdy recipient of TV advertising. ■

eventually lead to content producers being able to keep a larger share of the revenues.

Broadband technology will also give entertainment producers more direct access to customers. Home-entertainment appliances will enable customers to easily download movies and TV shows from Internet-based video-on-demand companies. There will be infrastructure costs associated with this opportunity, and movie studios, TV producers, sports teams and other owners of valuable content may elect to outsource to independent Internet distributors, build their own capability or use an industry consortium, such as MovieLink or CinemaNow. Whatever their choice, the existence of a direct channel to consumers will increase their knowledge of customer needs and gradually curb the negotiating power of current pay-television providers.

Broadband will also create new opportunities for niche content providers, since there will be alternative ways to widely and efficiently distribute content to precisely targeted audiences. The result will be an increase in the supply of content tailored for unique market segments.

For example, anyone with broadband access can now watch their favorite college team play on Saturday afternoon, even if the local stations choose not to air it.

**Affected Industries:**  
 Video-Content Producers

This niche content is likely to be relatively inexpensive to produce or obtain, easy to

store and categorize, and valuable to a subset of consumers willing to pay a reasonable fee to access it. We believe producers will eventually offer a wide variety of niche programming on VOD, such as recipes, fly fishing or foreign-language television programs. Imagine being able to have Wolfgang Puck walk you through a recipe whenever you want to prepare dinner!

Other innovative businesses will blossom as well. Independent movie and TV producers will be able to build their own Internet-based video-on-demand distribution capabilities or sell their wares to third-party Internet-based VOD aggregators. Aggregators could provide integrated game, video and music packages for consumers to view on their TVs, cell phones, PDAs, MP3s and computers/laptops. ■

## Investment Implications and Conclusion

It would be an understatement to point out that broadband will affect a wide swath of industries. Broadband will fundamentally alter the strategic landscape for cable and telecommunications providers. It will usher in significant changes in network infrastructure and give rise to a new generation of networked home electronics. In the process, broadband will enable new business models, lead to shifts in the balance of power between certain suppliers and purchasers of content, and engender altogether new industries.

Display 9 outlines some potential short-term, medium-term and long-term investment implications that may result from the growth of broadband subscribers. We have indicated our views on how broadband will affect each industry. These views are by necessity our own, and we are aware that they are subject to the same degree of fallibility as any other attempt to predict the future. Nonetheless, we hope they at the least help inform the debate about undoubtedly important investment decisions.

|    |                      |
|----|----------------------|
| ++ | Very Positive        |
| +  | Positive             |
| ○  | Neutral/Undetermined |
| -  | Negative             |
| -- | Very Negative        |

**Display 9**  
**The Implications of Broadband**

| Industry                                   | Short Term<br>(1 to 2 years) | Medium Term<br>(3 to 5 years) | Long Term<br>(5 years +) |
|--|------------------------------|-------------------------------|--------------------------|
| Advertising Agencies                       | ○                            | -                             | -                        |
| Aerial Radio Broadcast Licensees           | ○                            | -                             | --                       |
| Cable Providers                            | +                            | ○                             | -                        |
| Computer Manufacturers                     | +                            | +                             | +                        |
| Consumer-Electronics Manufacturers         | +                            | ○                             | ○                        |
| Dial-Up Internet-Service Providers         | --                           | --                            | --                       |
| Network Infrastructure-Equipment Providers | ○                            | ○                             | ○                        |
| Satellite-TV Providers                     | +                            | ○                             | -                        |
| Set-Top Box Manufacturers                  | +                            | ○                             | -                        |
| Telecom-Service Providers                  | --                           | -                             | ○                        |
| TV and Cable Networks                      | ○                            | -                             | -                        |
| Video-Content Distributors (Store-Based)   | -                            | --                            | --                       |
| Video-Content Producers (Movie and TV)     | ○                            | ○                             | +                        |
| Video-Game Developers                      | +                            | ++                            | ++                       |

### Advertising Agencies

Short Term    Medium Term    Long Term

○                    —                    —

In the short term, television advertising will remain one of the most effective methods for businesses to reach consumers. However, as penetration rates increase for personal video recorders, cable VOD and eventually some form of Internet-based VOD, consumers will gain greater control over how and when they watch TV programming. This increased control will enable them to reduce the number of commercials they view and will most likely lead to changes in the current business model for ad-based television networks.

Advertising- and marketing-service firms will have to adapt to the changes in consumer viewing habits. These businesses will be forced to develop alternative methods to help their clients deliver high-impact messages to targeted customers. These methods may include increased use of product placements and sponsorship, and creating serial ads or mini-movies to attract and keep customers' attention. Businesses may also shift advertising dollars away from television to new vehicles, such as paid Web searches (buying key words from Internet search engines and directing users to promoted websites). As Internet usage continues to grow with broadband penetration, paid searches will likely become more effective and take an increasingly large share in the advertising market. This will be particularly true in information-based categories such as autos and pharmaceuticals, where consumers tend to use the Internet to research products or ailments.

In the long term, the advent of Internet Protocol TV may lead to a resurgence in ad creation. IPTV's ability to finely segment audiences may mean that more ads are conceived and produced in order to communicate more effectively with each new customer segment. Widespread IPTV, however, is many years away. It is unlikely that the increased value of IPTV segmentation will compensate for the decreased viewership due to the PVR and other time-shifting technologies. Although changes to the traditional advertising business model will create new opportunities, in the long run replacing current TV ad-revenue streams with other sources of revenue will pose a formidable challenge for the advertising agencies.

### Aerial Radio Broadcast Licensees

Short Term    Medium Term    Long Term

○                    —                    — —

Networked home electronics will make it easier for consumers to access Internet-based radio broadcasts, particularly within the home. At the same time, networked portable audio devices, such as Apple's iPod and MP3-enabled cell phones, are making it easier for consumers to use broadband audio content outside the home. Both trends will effectively increase the supply of radio programming and undermine the value of aerial broadcasting rights.



## Cable Providers

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| +          | ○           | -         |

In the short term, the US cable companies will benefit from increasing broadband penetration because they are most likely to get the additional monthly revenue generated by providing the service; they also have an opportunity to sell other services, such as VoIP telephony. The only caveat to this optimistic near-term scenario is the risk that the telecom incumbents will launch a price war. If this were to occur, the cable companies would most likely have to lower their broadband prices as well.

Price cutting would lead to lower average monthly revenue per subscriber and disproportionately hurt the cable companies (as opposed to the telecom incumbents) because cable currently has a greater share in the US broadband market. Lower average monthly revenue from the existing customer base would offset at least a portion of the revenue growth generated from the addition of new subscribers and from entry into the voice market.

In the longer term, broadband may have a far less salutary effect on cable providers. As bandwidth speeds rise (and reach rates that would accommodate video and eventually high-definition TV) and networked home electronics bring broadband to the living room, consumers will find it increasingly easy to access video content from Internet-based video-on-demand sites. While technical barriers may limit the amount of content available, Internet video-on-demand will undermine the walled garden and challenge the cable companies' cherished position as the gatekeeper to video content.

This breach of the walled garden may give consumers alternative access to some video content and thereby put pricing pressure on premium video and movie packages offered by the cable companies. It may also reduce some of the purchasing power the cable companies have amassed through consolidation, since they would no longer be the only gatekeeper to the consumer's living room.

Perhaps more ominously, but over a much longer time period, broadband technology may create an entirely new class of competitors in the video-delivery business. Like telecom providers elsewhere in the world, US telecom companies may eventually offer video services over proprietary distribution networks (most likely fiber). While this process is likely to take years (if not decades), the entry of the RBOCs will transform the competitive landscape of the video-delivery industry by further eroding the cable companies' clout in negotiating with content producers and by forcing cable companies to invest further to provide technologically equivalent service.

### Computer Manufacturers

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| +          | +           | +         |

In the short term, growth in broadband subscribers is clearly positive for computer manufacturers. As more and more consumers sign up for higher-speed broadband services, consumer demand for faster and more powerful machines should grow.

In the medium and longer term, the advent of broadband within the home may also help PC manufacturers move beyond the home office and into the living room. Armed with Microsoft Windows XP Media Center Edition or proprietary software like Dell's Media Experience, PC manufacturers will be able to challenge traditional consumer-electronics manufacturers for dominance of existing and new home-electronics functionality. As products become increasingly networked, PC manufacturers will be able to enter new markets and expand their revenue-growth opportunities. Competition from traditional consumer-electronics firms will be intense, and prices are likely to fall rapidly. Nonetheless, on the whole computer manufacturers will almost certainly gain from the broadband revolution.

### Consumer-Electronics Manufacturers

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| +          | ○           | ○         |

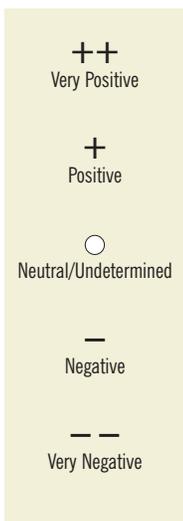
Consumer-electronics firms, too, will enjoy new opportunities with the advent of the networked home. As the incumbents in the sector, however, they face the risk of cannibalizing their existing revenues and the entry of new competitors (namely, the PC manufacturers). In the short term, consumer-electronics companies may benefit as consumers upgrade to a new generation of digitized products (such as MP3s and digital cameras) and begin to purchase networked broadband appliances. There is also a modest chance that consumer-electronics companies may encroach on some PC sales by incorporating basic PC functionality, such as Web surfing and e-mail, into consumer-electronics products such as game consoles, TVs or other universal appliances.

In the long run, the PC industry will collide with the consumer-electronics sector, and there will be a fight for dominance of the living room. It is unclear which will emerge victorious. Nonetheless, we believe the growth in broadband, home networking and the digitization of content is likely to expand the size of the entire market and therefore likely benefit both groups' top-line results. Margin pressure, however, will be intense, so a good deal of that top-line growth may not fall to the bottom line.

### Dial-Up Internet-Service Providers

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| --         | --          | --        |

Not surprisingly, the prognosis for dial-up Internet-service providers is not good. Dial-up Internet service is inferior to broadband and will continue to



fade away as broadband prices fall. In fact, we have already seen significant erosion of the dial-up customer base. The challenge for the dial-up providers is to find a new business model that takes advantage of their existing relationships with their customers so customers stick with the service when they upgrade to broadband. So far, these companies have offered value-added services, such as anti-spam software and video aggregation, in an effort to persuade customers to continue paying monthly fees even after they have upgraded to broadband. Longer term, these companies are obviously hurt by the growth in broadband as competition increases and most of their core service offering becomes obsolete.

### Network Infrastructure-Equipment Providers

Short Term    Medium Term    Long Term

○                    ○                    ○

The outlook for network infrastructure providers depends on product specialty. In the near term, suppliers that focus on Internet Protocol equipment, DSL aggregation and cable head end equipment, as well as certain providers of network-security functions, stand to benefit from higher broadband penetration. In the long term, networks will have to migrate from their existing configuration to a new architecture more suited to handle the traffic growth that higher bandwidth applications will bring. This transition will benefit manufacturers of core and edge IP/MPLS equipment and of certain types of optical and wireless gear. Vendors that supply the equipment and materials to upgrade the last mile architecture of the global incumbent telecom-service providers should also see revenue growth due to increased consumer demand for higher bandwidth. Legacy infrastructure-equipment suppliers (such as vendors of circuit switches) are likely to see their revenues continue to deteriorate as traffic migrates to the new data/packet-based optimized infrastructure.

In some emerging markets, cell phones and/or mobile personal digital assistants may become the primary means of accessing the Internet. Many emerging markets lack developed wireline infrastructure for broadband connection. Perhaps more importantly, cell phones and PDAs tend to be more affordable than PCs. These factors may drive higher-than-expected sales of third-generation wireless infrastructure and handsets in these regions.

### Satellite-Television Providers

Short Term    Medium Term    Long Term

+                    ○                    -

In the short term, US satellite-television providers are likely to benefit somewhat as they partner with telecom-service providers to offer the triple play of voice, video and data. This bundling may help increase satellite penetration rates with relatively little incremental investment by satellite providers.

In the long run, satellite providers in the US will face some of the same challenges that the cable providers will face. In particular, the rise of new video-delivery methods will weigh on prices, and revenues may decline as

dollars shift to alternative providers, including video packagers and, in the even longer term, Internet Protocol TV providers. Programming costs for the most popular content may gradually increase as the pool of purchasers expands. Perhaps more importantly, the satellite companies may not be able to compete with the two-way video services offered by wired competitors and will not be able to match the segmentation and tailored advertising capabilities of IPTV.

Outside the US, there may be increased opportunities for satellite-video providers as last-mile infrastructure is upgraded for broadband services. This new network infrastructure will enable the satellite providers to partner with the broadband suppliers (in most cases, the incumbent telecom provider) to bring pay TV services to many people who previously did not have access to them. This opportunity is hard to quantify, but satellite-video providers and new and incumbent DSL carriers are working on these offerings around the globe.



### Set-Top Box Manufacturers

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| +          | ○           | -         |

Set-top box manufacturers face both opportunities and threats from broadband. They can grow revenue through additional sales of cable modems and, as homes become networked, they may be able to take advantage of their privileged position in the living room to incorporate into their products additional home-electronics functions, such as DVD and CD players, video gaming and stereo. If this happens, set-top boxes could evolve to become universal appliances and rival the next-generation products envisioned by consumer-electronics firms and PC manufacturers. This is unlikely, but possible. There are also other opportunities for set-top box manufacturers. First, they could expand their market by selling directly to the consumer through retail channels. Second, they could sell to telecom-service providers in the US and overseas as these carriers upgrade their last-mile infrastructure and begin to offer video services. Finally, they could sell new equipment to cable and satellite companies beginning to offer high-definition TV.

The risk for the set-top box manufacturers is regulatory. The US Federal Communications Commission (always a difficult agency to predict) could require the cable companies to accept two-way plug-and-play standards, which would force cable systems to more fully interoperate with off-the-shelf consumer electronics and PCs. Currently, the cable networks are proprietary, and the companies provide customers with the set-top box in exchange for monthly rental fees. If the Federal Communications Commission requires two-way standards, the floodgates would be open for consumers to buy their own cable-tuning equipment, probably as part of a universal appliance or PC-based media center, and there would be more competition in what is now essentially a duopoly. Even with only a one-way standard in place, a number of consumer-electronics firms and computer manufacturers are marketing devices that incorporate set-top box functionality. Considering the complex

interplay between cable company intentions and the important role of regulators, it is still too early to determine how events will progress in the short and medium terms. However, in the long term, increased competition is likely to pose a significant threat to set-top box manufacturers.

### Telecom-Service Providers

Short Term Medium Term Long Term  
 — — ○

In the US, broadband poses grave risks for the telecom companies. In the short term, the incumbent telecom providers stand to benefit from increased DSL revenues, but these revenues will be diminished by the loss of second lines many customers currently use for dial-up Internet service. At the same time, the cable companies and a number of independent providers are using broadband to roll out voice over IP telephony en masse. Even if the VoIP competitors capture only a small portion of the telephony market, their presence will exert significant deflationary pressure on the RBOCs' core local and long-distance voice business.

Bundling of wireless and wireline telephony may help stem the tide, and more competitive DSL pricing may increase the telecom providers' portion of new broadband subscribers. In the long term, however, the telecom companies are likely to need to provide video services over proprietary distribution networks in order to truly compete on a level playing field with the cable companies. These networks will require significant capital expenditures and create execution risk. The upside, of course, is the ability to generate revenue from a new source and possibly increase (or at least stop the decline) of their portion of consumers' monthly spending on communication and video services.

Overseas, the picture for the incumbent telecom-service providers is better. In most cases, their competition comes from smaller competitive carriers who are less well financed, which may give the incumbents advantages in terms of scale, service offerings and brand name. However, if regional regulation strongly favors competition, it may still be difficult for the incumbents to significantly profit from increased broadband penetration, because they may have to sell access to their network infrastructure to competitors at relatively low prices, which would dampen returns.

Wireless broadband represents a wild card for both the US and overseas telecom providers. To the extent that they can link their wireline and wireless broadband businesses, they may obtain incremental revenue opportunities down the road.

### Television and Cable Networks

Short Term Medium Term Long Term  
 ○ — —

Broadband growth is likely to hurt television and cable networks. Increased penetration of personal video recorders, video-on-demand and other time-shifting technologies will enable consumers to record more programs and fast-forward through more advertisements. This may change the business model of

advertising-based television networks. The networks will still be able to use advertising revenue to support programming that viewers tend to watch live, such as sports and news, but networks are likely to lose revenues due to the perceived lower impact of most advertisements.

Eventually, the advent of Internet Protocol TV and the resulting ability to segment viewers more finely may allow TV and cable networks to generate more revenue per time slot, even though the total amount of advertising viewed may decline. For example, a consumer-products company may purchase one segment of airtime and fill it with six different commercials that target different segments of their customer base. Alternatively, the networks may eventually be able to sell the same time slot to multiple customers if their target audiences do not overlap. In both cases, fewer viewers will actually see each advertisement, but the effectiveness of the advertising will increase. Ultimately, this is likely to mitigate, but not negate, the negative effect of time-shifting. Television and cable networks will also need to address privacy issues before they can benefit from targeted advertising.

Finally, time-shifting technologies may make it less important to offer a wide variety of multi-cast networks. Because consumers' options would no longer be limited to what is currently being aired, there would be less need for cable companies to devote capacity to providing hundreds of channels or networks. Cable companies are likely to use the newly freed capacity to offer a wider variety of video-on-demand programming. In fact, consumption of the most popular, high-demand content may increase as it becomes easier for people to access it at a convenient time. This may mean that viewing of secondary and tertiary networks declines further, and their survival in the form we know them today may ultimately be in jeopardy.



**Video-Content Distributors (Store-Based)**

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| -          | --          | --        |

As broadband speeds increase and networked devices bring on-demand video content to the living room, consumers will find it increasingly easy and convenient to download videos and view them in their living room. Even if downloading captures a small portion of the market, it will put downward pricing pressure on store-based distributors. Although this trend has been forecasted for a long time, it appears that broadband will finally catalyze the long-heralded decline of store-based distribution of video content.

**Video-Content Producers (Movie and Television)**

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| ○          | ○           | +         |

Movie and TV producers may benefit from many of the technical advances of broadband. The growth of video-on-demand and online video aggregators will give entertainment producers direct access to customers. It may also give producers greater leverage in their negotiations with cable, satellite and telecom TV providers.

Content producers will lose some revenues if time-shifting reduces demand from stations for secondary and tertiary content. On the other hand, the rise of alternative distribution channels will make it easier and more economical to deliver niche programming to precisely targeted customer segments. The variety of niche content (which we define as video that some viewers are willing to pay for, but which does not necessarily merit multi-casting) is likely to grow as distribution options increase and delivery costs decrease. Overall, it is likely that fewer channels will be broadcast, but the number of programming options will increase due to the ability to access archived content on-demand.

The greatest threat posed by broadband to video-content producers is piracy. Movie and TV producers need to heed the lessons of the music-downloading debacle, implement robust digital rights management systems and give consumers a viable, legal way to access content on the Internet or risk significant degradation of their products' value.

### Video-Game Developers

| Short Term | Medium Term | Long Term |
|------------|-------------|-----------|
| +          | ++          | ++        |

With the television connected to the Internet through a home network, online console gaming becomes more convenient and affordable. Currently, most gaming revenues come from up-front sales of equipment (such as a Sony PlayStation or Microsoft Xbox) and follow-on sales of software (the games). After the initial software purchase, consumers generally own the game and can play it as much as they want without incurring additional costs. In an online gaming environment, this model may change. Consumers may opt not to purchase the software outright and instead either pay on a monthly basis for a certain number of hours of game time or pay each time they play. This transition to online gaming is likely to create new opportunities for the gaming industry, and it may attract a broader audience to what is already a fast-growing business.

### Conclusion

The greatest winner from the implementation of broadband will be the consumer. Entertainment will become easier to access and more convenient to use. Wireline telephony prices will likely decrease, and new innovative companies will rise to provide a host of new products and services. Consumer habits and preferences will alter as a result of increased options, and incumbent companies will have to respond to the new environment.

This report could have touched on a number of other industries, such as retailing (which is already coping with the likes of Amazon.com and eBay) and travel (note the importance of online models like Expedia). Mobile telephony is also likely to intersect with broadband use, particularly outside the US. Needless to say, our analysis does not purport to be comprehensive. Many changes are afoot. The changes discussed in this report are just the beginning. ■

## Glossary

|                               |   |
|-------------------------------|---|
| <b>ADSL</b>                   | Asymmetrical digital subscriber line  |
| <b>CD</b>                     | Compact disc  |
| <b>CDMA 1xEV-DO</b>           | Code division multiple access evolution-data optimized, a wireless data-transmission technology |
| <b>DBS</b>                    | Digital broadcast satellite   |
| <b>DSL</b>                    | Digital subscriber line   |
| <b>DSLAM</b>                  | Digital subscriber line access multiplexer  |
| <b>DVD</b>                    | Digital video disc  |
| <b>DVR</b>                    | Digital video recorder  |
| <b>FTTP</b>                   | Fiber to the premises   |
| <b>Internet VOD</b>           | Internet video-on-demand  |
| <b>IP</b>                     | Internet Protocol, a network-transmission technology  |
| <b>IPTV</b>                   | Internet Protocol television  |
| <b>Mbps</b>                   | Megabits per second   |
| <b>MP3</b>                    | Motion picture experts group-1, audio layer-3, a digital audio-compression technology           |
| <b>MPEG-2</b>                 | Motion picture experts group-2, a video- and audio-compression technology                       |
| <b>MPEG-4</b>                 | Motion picture experts group-4, a video- and audio-compression technology                       |
| <b>MSO</b>                    | Multiple system operator, or cable company  |
| <b>PVR</b>                    | Personal video recorder   |
| <b>RBOC</b>                   | Regional bell operating company   |
| <b>VDSL</b>                   | Very high bit rate digital subscriber line  |
| <b>VOD</b>                    | Video-on-demand   |
| <b>Wi-Fi</b>                  | Wireless fidelity   |
| <b>Windows Media Player 9</b> | A proprietary compression technology owned by Microsoft   |
| <b>WLAN</b>                   | Wireless local area network   |
| <b>802.11b</b>                | A wireless fidelity standard  |
| <b>802.11g</b>                | A wireless fidelity standard  |
| <b>802.11n</b>                | A wireless fidelity standard  |

## Managed Account Solutions from AllianceBernstein

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AllianceBernstein has been in the separately managed account business for more than 20 years. We have a long history as Regent Investor Services, which was established in 1982 and acquired by Alliance Capital in 1994. Since then we have expanded our capabilities broadly; today, we're ranked among the largest separate account asset managers with more than \$8 billion in assets under management. We offer portfolios that invest in virtually every sector, and have earned a reputation for delivering consistent investment performance backed by institutional-level services and features not typically available to individual investors.

We believe that great research is the ultimate source of superior investment returns, and that it is the quality and depth of our research commitment that sets us apart from all other money managers. Our portfolio-management teams draw on the intensive research efforts of our 200-plus fundamental and quantitative buy-side equity, fixed-income and economic analysts. Our buy-side analysts are part of a larger research complement that—along with the firm's highly regarded sell-side arm—numbers nearly 300, all sharing a culture in which insightful research is paramount.

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