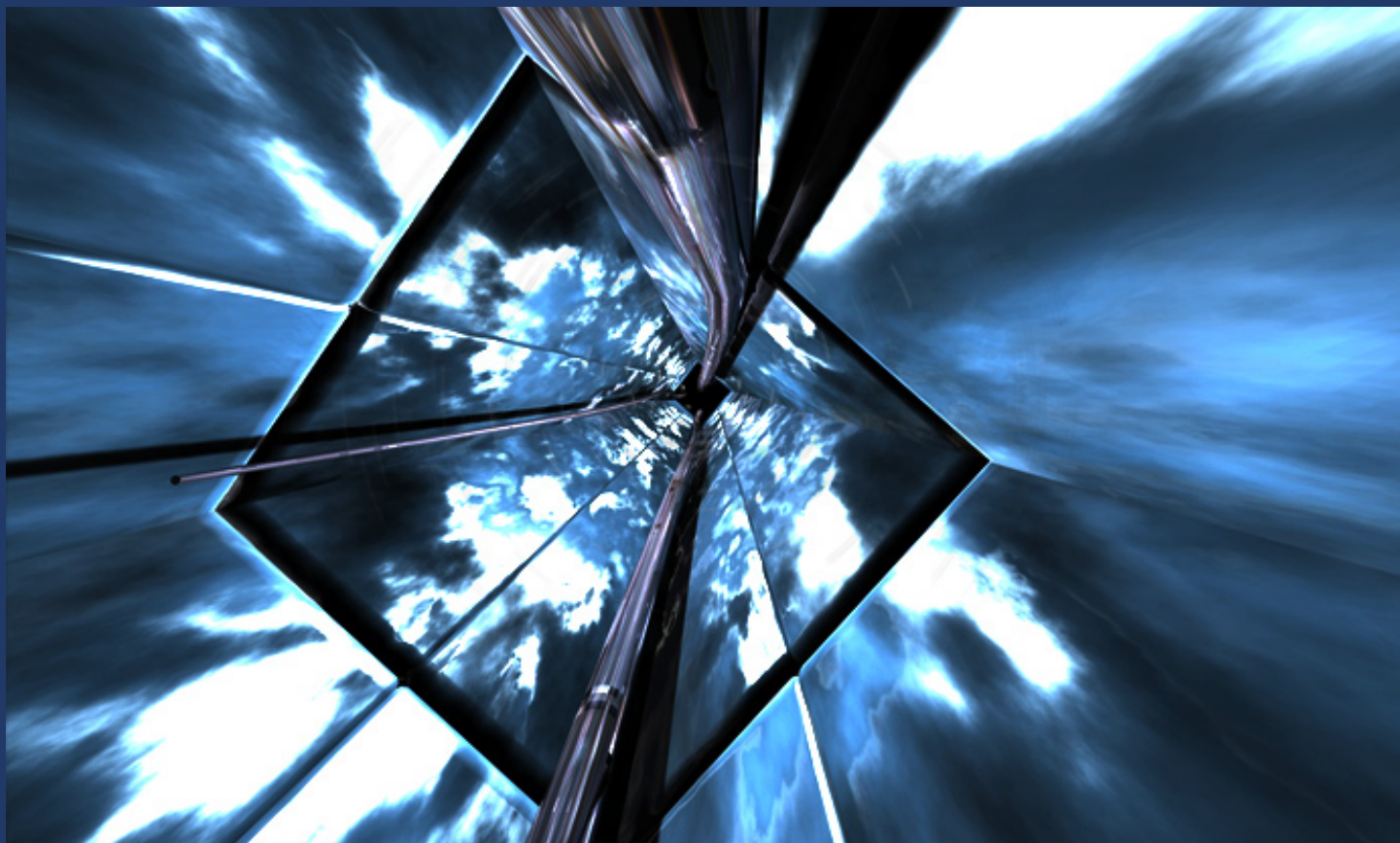


# IP Transformation\*



## Beyond the Triple Play

\*connectedthinking

Global Technology Centre

## ■ Acknowledgements

### GLOBAL TECHNOLOGY CENTRE

**Managing Director**

Bo Parker

**Managing Editor**

Christine Wendin

**Analysts**

Rob Marano, Tom Puthiyamadam, Christopher Rees, Jason Wagner

**Author**

John Gauntt

**Editorial**

Lea Anne Bantsari, Susan Mills, Saba Mirza

**Production & Graphics**

Bruce L. Leiningner

**Cover**

John Goldie

**Research**

Peter Vigil

**Advisory Review Board**

Deborah K. Bothun, Randy Browning, William Cobourn, Mitch Cohen, Kenny J. Fraser, Chris Isaac, Evan Kelly, Thomas J. Mangold, Terri McClements, Jim O'Shaughnessy, Joe Rizzo, Russell J. Sapienza, Jr, Ted Schafer, Nick van der Kloot, Jason Wagner

**Reviewers**

Vinod Baya, Eric Berg, Alan Morrison

### INDUSTRY PERSPECTIVES

During preparation of this report, we benefited from interviewing the following executives:

**Mary Clark**, Vice President, Operations; Ciberneta

**Ted Cohen**, Senior Vice President, Digital Distribution and Development; EMI Music

**Camilla Dahlen**, President; Highdeal

**Bill De Muth**, Chief Technology Officer; SureWest Communications

**Jian Fan**, Director, Business Support and Architecture; Orange

**Simon Herrington**, Head of Business Process Management, BT Wholesale

**Dave Hughes**, Chief Information Officer; BT Group

**Tim Krause**, Senior Vice President of Strategic Video Products; Alcatel

**Shaygan Kheradpir**, Chief Information Officer; Verizon

**David McNierney**, Director, Strategic Marketing; Highdeal

**Andrew Moss**, Senior Director Technical Policy, Windows Division; Microsoft

**Chris Randle**, Director of Strategy and Architecture; Cable and Wireless

**Rick Riccabono**, Founder; Rightsbridge Group

**Scott Smyers**, Chairman; Digital Living Network Alliance

## Executive Summary



***The entertainment, computing, and communications services markets are undergoing a fundamental transformation. Service providers are migrating from distinct networks for voice, data, and video services to a single broadband infrastructure based upon the Internet Protocol (IP). This shift, which creates a converged service delivery network, separates the provision of network access from the provision of services provided over that network. The implications of this change are profound, resulting in entirely new value chains and industry structures.***

Migration to an IP-based service delivery model, which is often referred to as IP transformation, is considered a foregone conclusion by service providers of all kinds. In this report, the third in our convergence series, we focus on wireline carriers, which are confronting this challenge first. It is expected that wireless service providers and cable operators will undergo a similar transformation in the near future, and an examination of carrier strategies will provide insights for these other communications services providers. How carriers implement IP transformation strategies will also have important implications for other participants in the information and communications services market, including technology suppliers, content providers, and business partners.

Carriers face a real and growing short-term threat to their voice services revenue in the form of competition from cable operators and new entrants using Voice over Internet Protocol (VoIP). But carriers face a broader and more daunting challenge in the long term as the broadband services they and cable operators provide to customers achieve higher levels of performance. As broadband becomes speedier and more reliable, the door opens for more complete separation of network access provided by carriers and cable operators, and value-added services (voice, video, interactive gaming, security services, health services, and others) that can be offered by the carriers and cable operators but also by third parties over the open Internet infrastructure. In other words, in the longer term, carriers (and cable operators) are threatened by vertical disintegration, initially with voice and ultimately with video as well.

To respond to the short-term challenge, carriers' initial IP transformation initiatives focus on adding video to their voice and data services and creating triple- and quad-play (triple-play plus wireless) bundles. The carriers believe that this approach will enable them to retain customers and garner new ones, simplify their operations, and lay the groundwork for new revenue streams. While a triple- and quad-play strategy is necessary in the short term, it alone is not enough

*This report builds on the conclusions in PricewaterhouseCoopers' two previous reports about the convergence of the communications, computing, and entertainment services markets. The series analyzes the impact of migration to an Internet Protocol-based delivery network on all value chain participants, including telecommunications carriers, cable operators and networks, content and service providers, satellite operators, software and infrastructure providers, and, especially, consumers.*



### **Competition in The First Mile**

*Makes the case that an end-to-end fiber infrastructure is neither necessary nor sufficient as a*

*strategy to respond to the competitive threat posed by cable operators. For a summary of this report's findings, see page 38.*



### **Big Bets for The U.S. Cable Industry**

*Analyzes the short- and long-term growth opportunities for*

*cable operators and networks. In particular, it discusses strategies for leveraging the on-demand delivery platform. For a summary of this report's findings, see page 39.*



IP transformation is the process through which communications and entertainment service providers will evolve their people, process, and technology to leverage a single, converged network based on the Internet Protocol (IP). IP transformation should enable greater efficiencies, lower costs, and provide the basis for value propositions centered upon applications, services, network access, and data carriage. From a technical perspective, IP transformation is the migration toward standards-based architectures that allow service providers to create multipurpose platforms sharing a common infrastructure. From a business perspective, IP transformation is the creation of new business models and relationships to support a service- and application-focused orientation.

to fully capitalize on the IP transformation opportunity or to respond to the long-term threat of services disintermediation. Instead, both carriers and cable operators must look beyond the triple play to a service strategy—one in which they will derive most of their revenue from services delivered over the network rather than bit transport. Implementing such a strategy requires the carriers to create a value-added platform that pulls third-party service providers into their unique ecosystem. This will require carriers to develop a service delivery environment with proprietary capabilities that are made available to partners to develop complementary components, systems, or services. This strategy is similar to what NTT DoCoMo accomplished in wireless data with its i-mode service or what Microsoft and Intel achieved in the PC market through the combination of Windows and the x86 hardware platform.

We call this long-term strategy the owned-but-open-and-controlled (OBOC) approach. Carriers create an indispensable platform for linking consumers to third-party and original services by opening selected parts of their service environment to external innovation. In this model, carriers must balance which platform elements to open to partners so carriers can spur innovation and competition, and which elements to monetize so carriers can retain a share of the value being created by the new services delivered over their networks. Regulatory requirements, such as network unbundling, vary across political boundaries, but enhancing the ecosystem and embracing third-party innovation pays off for even those carriers in highly regulated environments.

Such symbiosis between carriers and their partners is mandatory for an IP-mediated world that requires ensured quality of service, continually new and updated product bundles, secured intellectual property and digital rights, multiple modes of payment, unique forms of revenue sharing, and mass customization as its essential elements. How well carriers internalize the ramifications of migrating to this mode of competition—and whether they take appropriate action—will determine whether they will operate a smart distribution infrastructure for digital goods and services or provide commoditized bit transport.

### ■ IP Transformation Vision Meets Reality

The service delivery environment—the hardware, software, business processes, and human resources that support carriers' core services—will influence how well carriers can deliver both the short- and long-term vision of IP transformation. Today, carriers rely on complex, expensive, and difficult-to-maintain billing and operational support systems that manage network elements, provision services, and generate bills. These systems do not meet the requirements of the new competitive environment because they have been designed for the management of a limited, unchanging set of services.

To support the triple play, these systems must expand to include new functionality such as partner management, digital rights management, security, business modeling, flexible pricing, and content awareness. Yet, while optimizing these



systems and associated business processes for the triple and quad play is an important milestone for carriers, they must also build in the flexibility required to move beyond the triple and quad play. A service delivery environment for an IP world cannot simply replicate the tight coupling of people, process, and technology to specific services that is characteristic of current telephony services. Instead, carriers must create a loosely coupled system that encapsulates network or business functions into portable services that can be reused and repurposed to run any digital offering. Most of all, a true IP-based service delivery environment will become a source of clear differentiation in the highly competitive market of the future.

The scope of change in markets, competition, technology, skill sets, and business processes is unlike any challenge carriers have experienced. The tone at the top established by senior management will be the single most important factor in embracing these changes. A carrier's ability to collaborate will be crucial, both within the various carrier functional organizations and across a broad range of third-party partners.

## ■ Scope of This Report

This report focuses on the U.S. consumer market; however, its analysis is also likely to be valid for other countries in which the communications, connectivity, and entertainment services markets are converging. Our scope excludes the business telecommunications market, an area in which carriers also have a wide range of opportunities and challenges due to IP transformation.

After introducing the consumer market challenges carriers face, we highlight the key role of video services within triple and quad bundles and within the larger context of integrated telecommunications and information services. Next, we discuss how the carriers are currently managing the convergence of their infrastructure toward an all-IP network. Finally, we present the OBOC approach and introduce prospective carrier business models and operating best practices for leveraging this next-generation service delivery environment.



**An open-but-owned-and-controlled (OBOC) strategy will be crucial if carriers are to leverage IP transformation into long-term success. OBOC describes a competitive environment where key product standards, especially interface specifications that permit interoperability, are owned as intellectual property but are made available to others who develop complementary components, systems, or services.**

## DEFINITION OF A CARRIER

For the purposes of this paper, a carrier is defined as a facilities-based wireline telecommunications company that provides voice and data services over its own first-mile infrastructure, excluding cable operators. In the United States, carriers include incumbent local exchange providers such as BellSouth, Qwest, SBC Communications, and Verizon; competitive local exchange carriers (CLECs) that rent facilities from incumbents in order to offer discounted phone service; and interexchange carriers (IXCs) such as AT&T and MCI that specialize in long-distance service.

Outside the United States, carriers such as British Telecom, Deutsche Telekom, or NTT began as government postal,

telegraph, and telephone (PTT) ministries. Competitive network providers in these markets are often called ALTNETs (alternative networks) and include energy utilities, cable operators, and other infrastructure owners.

We exclude from the term carrier an emerging class of telecommunications providers such as Primus and Vonage in the United States and Colt and Tiscali in Europe, which exclusively employ broadband infrastructure to deliver Voice over Internet Protocol (VoIP) services. These companies do not provide network access; instead they rely on consumer broadband connections provided by wireline carriers and cable operators. ■

## FINDINGS AND RECOMMENDATIONS

### *Key Findings*

The following is a summary of our findings. This report is based upon third-party and original research, including PricewaterhouseCoopers' interviews with executives from telecommunications, digital content, billing and related services, and software companies.

■ **Carriers face different short-term and long-term threats.** In the short term, new entrants, particularly cable operators, represent a significant and accelerating threat to carrier voice revenue, enabled primarily by advances in Voice over Internet Protocol (VoIP) technologies. In the long term, further advances in broadband Internet technologies will result in higher speeds and increased reliability. As these improvements are applied to the services environment, over time there will be an ever greater threat of complete separation between bit transport provided by carriers and cable operators, and all other value-added services, including voice and video provided by third parties. In other words, carriers and cable operators are building the tools that could enable their own disintermediation.

■ **Triple and quadruple plays are necessary but not sufficient.** Carriers and cable operators are competing to exploit the multi-service opportunity of bundled voice, data, video, and mobile services. However, these services run on logically separate networks, even though they often run over the same wire and the customer receives a single bill. Although the triple and quad plays are important from a time-to-market standpoint, carriers must avoid the temptation to deliver these bundles in a way that perpetuates the shortcomings of their current services environment. Triple and quad plays are stepping stones to truly integrated Internet Protocol (IP) service environments, which do far more than transport voice, data, or video bits but will provide new products and services to consumers.

■ **Personalized services define competition.** The wireline business model of price competition for

network transport and access is no longer valid as core services are becoming commodities. Telecom competition soon will be defined by mass customization, where carriers serve subscribers who access personalized portfolios of communications, content, and interactive services. Currently, carriers are attempting limited customization for subscribers and are trying to modernize their back-end billing functions. However, without major back-end overhauls, carriers could find themselves locked out of opportunities for new value chains that are based on rapid personalized service creation and delivery of personalized services.

■ **A service environment strategy is crucial for the long term.** The Internet Protocol will help create an industry structure far different from the telecommunications model, in which carriers defined and exerted end-to-end control of the network, its primary applications, and business strategy. To compete in an IP world, carriers must create an open-but-owned-and-controlled (OBOC) service environment that is indispensable for linking users to third-party or carrier-developed applications and services. Carriers are in the midst of deciding whether to embrace the idea of launching IP-based service delivery platforms and business processes that allow partners to add value to a basic triple or quad play of communications and information services. Although public announcements reveal that leading carriers are migrating to an IP-based future, the speed and scope of this transition will be influenced by the interplay among the purchasing behavior of the customers with the most desirable demographics, the state of competition, technical advances, and the ability of carriers to upgrade their systems and networks.

■ **Networks and applications will become more loosely coupled.** Carriers need the capability to add services as the business demands without deploying new infrastructure. This imperative is causing carriers to separate network applications from the enabling business applications through abstraction layers. Most, if not all, leading carriers have a huge

investment in their current network and their business and operations support systems. Rather than jettison these investments, most carriers are wrapping their current systems in an abstraction layer to achieve the benefits of a service-oriented architecture (SOA). The goal is to create a set of shared services for common functionality such as quality of service (QoS), identity management, security, event management, digital rights management, IP address management, and workflow. This use of components will help carriers to reduce operations and support costs for new services.

■ **Partnering will be pervasive.** Carriers will redefine their operations to support changed relationships with current business partners and meet the needs of new partners from the content, retail, and related industries. The availability of security, rights management for intellectual property, and new models of provisioning, pricing, and billing will be important factors in the success of these partnerships. Carriers also will need to determine the optimal revenue-sharing ratios with partners for different categories of services. How the revenue is divided might be very different depending on whether a given service generates incremental revenue (in which case the carrier might take less) or potentially cannibalizes existing revenue (in which case the carrier might want more).

■ **Merchandising becomes an important skill.** To date, carriers have organized their retailing efforts according to customer demographics—for example, segmenting categories by monthly spending. This marketing approach made sense when carriers were selling largely homogeneous network services. However, in an IP environment, a carrier serves as the manager of a near-infinite shelf space of digital goods and services. In this market, many of the practices associated with retail (such as product placement, discounting, cross-selling, and up-selling) become increasingly important.

## *Carrier Recommendations*

■ **Prevent short-term initiatives from crippling long-term potential.** Carriers are responding to wireless, broadband, and IP substitution for circuit-switched voice with triple- and quad-play bundles. This response is a step in the right direction. However, unless carriers have a longer-term vision of how the infrastructure that they create for the delivery of triple and quad plays can set the stage to enable true differentiation, carriers likely will find themselves in a situation in which they must incur substantial internal cost from deploying each new set of applications. Whether leading with voice, data, or video, each IP service deployment must be compatible with and contribute to the creation of a multi-service architecture and business strategy that can run over a common infrastructure and be controlled by a common service delivery platform.

■ **Manage short-term complexity to gain long-term simplicity.** Not only do triple and quad plays help carriers meet the immediate competitive threat from the cable industry, but these plays also give carriers the opportunity to migrate toward the provision of voice, data, video, and mobile via an integrated network and business infrastructure. In the short term, overall complexity will increase due to the need for carriers to operate both their circuit-switched and IP networks. However, if carriers use their investments in triple and quad plays to establish technology integration, they can lay the groundwork for pursuing an integrated platform and service environment strategy that will help them reduce operations and support costs.

■ **Choose the appropriate mix of standardized and operator-specific technologies and processes.** Carriers need to understand what parts of their current and envisaged networks and business processes are subject to commoditization and what parts offer opportunities for differentiation. Business models that ensure a carrier has a monopoly in the local access market are becoming less attractive than service-oriented business models.

## FINDINGS AND RECOMMENDATIONS (CONTINUED)

Consequently, IP-based carriers should adopt as much industry-standard technology and business practice as possible—that is, an open and interoperable network. Such adoption can help carriers reduce infrastructure costs, allowing the investment of resources in service layer elements that offer the potential for exclusivity or differentiation and that are accessed by third parties through application programming interfaces (APIs) established by the carrier.

■ **Embrace third-party innovation.** Voice telephony is a commodity in an IP-dominated world. Value is created through enhancing voice with tools such as search, messaging, file exchange, or community-oriented features. Forward-thinking companies are providing interfaces that allow others to add value to the core technology. As a result, innovative developers are choosing to partner with these companies, building services or service enhancements on top of the partner's service delivery platform. While creating APIs to the service delivery environment, carriers also must develop parallel internal and market-facing business processes for effective partner management.

■ **Encourage value-based pricing for IP services.** Carriers should not assume that triple- and quad-play bundles will restore the margins they previously enjoyed on voice services. Premium pricing based upon connections, volume, duration, and geography is largely irrelevant in an IP world. Conversely, service delivery strategies that provide a complete customer experience—including hardware, software, and partner-provided services—enhance the network's value by removing the burden of integration from the customer, thus making the service more compelling. Carriers face enormous challenges in implementing billing platforms that enable usage-based or content-specific pricing, but they must create these systems to survive service-based competition. Once triple- and quad-play bundles create a critical mass of users and third parties adding value, competition will be decided by how well carriers deliver value to their

customers and partners rather than their ability to charge for the use of network resources.

■ **Evolve the network and the ecosystem in parallel.** The shift to an IP-centered competitive model cannot be totally scripted in advance. Carriers must test each deployment of people, process, and technology for delivering value both to customers and third parties. Current business processes that must accelerate in order to achieve integration include activation, provisioning, and billing. Future business capabilities to be added include rights management, identity management, security, real-time balance (pay as you go) management, and flexible payment modes. At the same time, carriers must start working with partners now to gain valuable operating experience in offering those capabilities.

■ **Accept the likelihood of significant internal disruption.** Transitioning to an IP-based future will change carriers completely. Pervasive change management strategies are fundamental to carriers' success and must be applied to seemingly mundane business processes, such as inventory control for media gateways, or more complex challenges, such as new training for service representatives or retraining line workers to work with IP-based systems. Carriers must have a strategy for taking costs out of the older system as carriers increase their investment in new IP infrastructure. This migration will disrupt many time-honored business practices and relationships.

■ **Executives must become more service delivery environment literate.** Gone are the days when the value proposition of business and operations support systems was determined by how the systems managed network elements, pulled usage data from Class 5 switches, and generated a bill. The business capabilities of a carrier now depend upon how well it can execute the preceding while also supplying subscribers with digital content and services provided by the carrier and its partners. Consequently, the importance of operations and support decisions has become much greater because the service delivery platform is the business going forward.



■ **Do not base tomorrow's vision on today's industry structure.** Leaders of the IP transformation inside of carriers might be tempted to envision where they want to be in 2010 or 2015 based on the current vertical integration of access and service. However, this will not work because the Internet Protocol removes the need for service providers to own their own facilities. The Internet Protocol does not make the advantages of scale and reach go away. It redistributes those advantages, which can be either a frightening or liberating thought, depending on how carrier leadership reacts.

■ **Transform customer perceptions while transforming capabilities.** Beyond the technical and organizational challenges for achieving IP transformation, carriers face an equal, if not greater, task: changing market perceptions of the value they provide. Adopting a new operating model offers carriers the opportunity to reposition their public image as solution and content providers. Such positioning was achieved by Japan's NTT DoCoMo and Korea's SK Telecom, which sit as equal partners with the content and service brands that are at the heart of the wireless data revolution in Asia. Similar aspirations and follow-through should be in the IP transformation plans of every carrier.

### *Cable Operator Recommendations*

■ **Cable operators, just like carriers, must anticipate the growing impact of the Internet as a content distribution platform and the inevitable challenge it represents to their business models.** Cable's advantages of superior first-mile infrastructure and experience with content distribution are temporary; carriers will continue to strive to reach parity or even superiority in both infrastructure and content capabilities. But targeting carriers as the only significant strategic threat would be unwise; ecosystem competition will include new challengers, including wireless broadband service providers. It will also require entirely new core competencies, especially technologies that add value to the cable broadband platform for third parties and business

strategies that foster a collaborative approach to new services creation.

### *Ecosystem Partner Recommendations*

■ **Technology vendors that are targeting carriers during the IP transformation era must be cognizant of both the near-term and long-term challenges facing the carriers.** The consumer segment will be a challenging market for carriers during the next five years, and it will be difficult to predict the nature and speed of the transition to an ecosystem in which carriers compete with cable operators and other broadband providers. However, vendors must anticipate this fundamental shift and make support for the long-term ecosystem competition part of their product road map now.

■ **Web-based service providers that currently ride over carrier and cable broadband infrastructures must begin to anticipate the coming changes and their role as potential partners.** Many Web companies are vertically integrated, internally performing and managing every service function required above the Internet Protocol that carries their packets. As the IP transformation occurs, carriers and cable operators will begin to offer best-in-class functionality that outperforms some of the internal capabilities of even the largest Web service providers.

Rather than fight these developments, the most forward-looking service providers will proactively engage carriers and cable operators in order to take advantage of performance-enhancing services provided to them on an outsourced basis. The healthiest and most profitable ecosystems will be those that go beyond simple outsourcing of traditional functions; they will collectively establish business practices that reward collaborative development of new services. These services will become tomorrow's Web growth stories, enriching companies that provide defined roles in broader ecosystems, rather than those companies that try to own the whole stack. ■

## ■ The Converged IP Services World of 2015

The following scenario might be reality in 10 years:

The telecommunications, software, entertainment, and consumer electronics industries have converged around broadband and Internet Protocol (IP)–based services. Consumers access diverse, personalized IP-based information, entertainment, and e-commerce services—in addition to communications services—from a variety of devices in their offices, homes, and on the move. It is hard to remember how, back in 2005, entertainment in the form of television series, movies, sports broadcasts, and news programs were all delivered within closed environments created and controlled by cable operators, satellite providers, and telecommunications carriers. Mass customization and interactivity characterize today's services and entertainment. Every major sports, culture, or news event is covered in multiple ways for different audiences.

The IP revolution has disrupted most content and service industries, destroying value chains that depended on access control. Now, only a decade later, content and service providers have migrated to the Internet for distribution, creating more intimate relationships with their customers and garnering a larger share of the profits than they could when distributors controlled the consumer relationship. Channel scarcity is a thing of the past, and grassroots content and entertainment can reach small audiences cost-effectively.

Most network access services are priced on a flat-rate subscription basis for near-unlimited connectivity, so the main opportunities for revenue growth depend on stimulating pay-per-use purchases of content or services. The communications and computing infrastructure increasingly is supplied by a small number of capital-intensive infrastructure providers such as electric power companies, which keep their facilities open to value-added service providers while concentrating on aggregating as much IP traffic as they can.

How could this dramatic change occur within so short a time? This report traces the origins of this future scenario to carrier initiatives for IP transformation: the migration of access networks to a common, standard infrastructure based on the Internet Protocol. We follow the path carriers will take toward this goal, starting with content efforts to develop IP-based video services that will complete the carriers' triple- and quad-play service bundles as the competition with the cable operators heats up. We then examine the necessity that carriers fundamentally change their business models from vertically integrated monoliths to ecosystem builders that provide a service delivery platform for third-party innovation.

## ■ The Changing Landscape for Carriers in 2005

In 2005, fixed-line telecommunications carriers face a radically altered competitive landscape, one in which the basic economics of communications and information transfer are being redefined. No longer the monopoly access providers of voice and data services, carriers must contend with increasing line substitution from a number of sources, including wireless voice service providers, cable operators, and new competitors providing peer-to-peer Internet telephony services.

This situation is a stark contrast to the industry dynamics that were in place for the majority of the telecommunications industry's century-long existence. Historically, the Public Switched Telephone Network (PSTN) provided by carriers was the prevailing, and often the only, means for consumers to access voice and data services. However, since the early 1990s, technical advances and deregulation have created competing access methods from a host of physical and virtual sources. At the most basic level, today's consumers enjoy choices they previously did not possess when selecting a service provider for voice and data services. Beyond creating competition for wireline access, these new market entrants have also redefined consumer expectations, service standards, and price points for communications and information services.



*For more details on carrier competitors, see the sidebar, "Challenges to the Wireline Business Model," below.*

### CHALLENGES TO THE WIRELINE BUSINESS MODEL

Under their present business model, carriers can no longer reduce costs to compensate for increased wireline substitution and decreased profitability of fixed-line voice services. The erosion has been most pronounced in the long-distance market, which is projected to decline in the United States from \$67 billion in revenue during 2002 to \$39 billion by 2006, according to IDC. Carrier revenue for long-distance and circuit-switched local voice services is expected to decline from \$154 billion in 2005 to \$140 billion in 2009, according to PricewaterhouseCoopers' estimates. (See Figures 1 and 2 on page 12.)

This drop-off in the wireline business resulted largely from its displacement by anytime-anyplace wireless service plans that offered less-expensive calls in addition to mobility. Not only is U.S. wireless penetration expected to reach 68 percent by the end of 2005 and more than 80 percent by 2010, but average wireless minutes of use (MoU) are expected to grow from 750 minutes per month in 2005 to more than 920 minutes per month by 2010, according to Goldman Sachs. Wireless revenue is expected to increase from \$112 billion in 2005 to \$141 billion in 2009, according to PricewaterhouseCoopers' estimates.

Although most carriers have insulated themselves somewhat against wireline substitution by building significant stakes in wireless operators, they possess no similar defense against Internet Protocol (IP)-based voice services provided by cable operators. Cable operators are expected to increase voice services revenue from \$1 billion in 2005 to \$10 billion in 2009.

Additionally, carriers face new competitors such as Skype that use peer-to-peer Internet-based service models. Unlike first-generation Voice over IP (VoIP), peer-to-peer Internet telephony routes a call directly between the computers or personal digital assistants (PDAs) of two or more users instead of passing through a central switch or server. Peer-to-peer is predominantly offered as a free service that never traverses the Public Switched Telephone Network (PSTN)—although fees are charged to access traditional phones on the PSTN. Thus, the substitution effect of peer-to-peer on carrier wireline service is relatively unknown because it is not associated with revenue forecasts. Yet, peer-to-peer VoIP presents a potentially major discontinuous change for the telecommunications industry. By replacing expensive servers with users' own PCs, peer-to-peer services scale rapidly and at costs approaching zero. And when calls completely avoid the PSTN, the tinny sound of circuit-switched voice services is replaced by CD-quality sound.

Although these forecasts for wireline substitution are sobering, they do not point to the loss of dominance by carriers in the voice services market. However, what they do reveal is more fundamental: In the consumer market segments for communications, standalone voice services can no longer determine volume and profitability. As voice becomes a commodity, competition will focus on value-added enhancements, such as mobility and bundling cheaper or free voice with broadband, video, and other content and information services. ■

Three forces—mobility, broadband, and a standards-based infrastructure—have particularly influenced these changes in the fixed-line telecommunications landscape. Mobility, in the form of wireless voice access, has shifted a large amount of voice traffic from the PSTN to cellular networks. According to the Cellular Telecommunications Industry Association (CTIA), the U.S. mobile communications population stands at about 180 million subscribers and as of December 2004 accounts for more than 1 trillion minutes of use (MoU). At the same time, broadband Internet access to the home is becoming widely adopted. Growing from approximately 6 million subscribers in June 2000 to reach 60 million by February 2005, broadband network access now reaches nearly one-quarter of all adult Americans in their homes, according to the Pew Internet and American Life Project. Finally, a standard way to connect servers and client devices has become increasingly important in redefining the communications, computing, and entertainment services markets. The Internet Protocol makes it possible to cost-effectively link servers to servers, servers to clients, and clients to clients to create an ever-expanding network upon which value-added enhancements can be built.

#### COMPARISON OF VALUE CREATION POTENTIAL FOR PSTN AND IP NETWORK ARCHITECTURES

An examination of how value is created through customer lock-in strategies in the Public Switched Telephone Network (PSTN) provider-driven network and the Internet Protocol (IP) user-driven network helps explain the competitive advantage that carriers can realize by migrating from the PSTN to an IP-based network—and its potential effect on competitors.

The PSTN is an example of a provider-driven network, a term derived from work by Michael Borrus and John Zysman at the University of California, Berkeley. Provider-driven networks are infrastructures defined and controlled almost exclusively by the network provider. The network provider designs, markets, and assembles the final product. The user receives a highly restricted service bundle that meets an unchanging need where the main value points are price, quality, and ubiquity. The vast majority of product innovation, investment, organization, and marketing in the PSTN perfected the telephone call as the primary creator of value.

In provider-driven networks, market power as well as network ownership and control are almost the same. Innovation by the network provider or its partners focuses on scaling ubiquity, reliability, or efficiency of the primary service being carried on the network—in this case voice. The relatively closed and monolithic nature of provider-driven networks leads to few fundamental innovations from third parties at the edge of the network; in the PSTN, most third-party innovations were limited to fax machines, electronic data interchange (EDI) networks, and dial-up Internet service providers.

In contrast, IP networks are user-driven networks. The definition of network services and how they are invoked, controlled, and valued are determined increasingly by subscribers. In this competitive environment, network ownership and market power are partially

decoupled. Multiple parties are able to design, assemble, and market products for the subscriber because much of the relevant technical information is freely available.

The guiding principles of value creation in user-driven networks are diversity of services and innovation to meet a set of needs that can fluctuate over time. Price, quality, and ubiquity are certainly important to determine value. However, they are not the sole factors in user-driven networks. Other elements of value include personalization, community links, search, or security. In this model, innovation occurs all along the value chain.

Regardless of their inherent bias, the goal of either system is to lock in customers. In provider-driven networks, the network owner attempts to lock customers to a particular infrastructure. Access to this infrastructure is the service, and the content of user transmissions is incidental. This has been the strategy of the telecommunications industry and is typified by the PSTN.

By contrast, the user-driven, IP-based networks attempt to lock subscribers into a set of de facto standards for communications and information services that partly determine how they define, invoke, and control resources. Access to an infrastructure is not nearly as important as defining how users interact (for example, using graphical user interfaces [GUIs] instead of command lines, standards for addressing an e-mail or defining a Uniform Resource Locator [URL]) with information or communications services. Different services ride on top of a generalized access network, and the content of user transmissions is important for determining their willingness to pay. This has been the strategy of the IT industry and will determine the evolution of IP services. ■



The cumulative result of these changes is a competitive environment in which new business models and value chains are being created and tested. The new focus increasingly is on providing customers with portfolios of bundled services drawn from the communications, content, and software sectors. Carriers are beginning to experiment with triple- and quad-play bundles that package traditional voice services with other subscription services such as high-speed data (HSD), video, or mobile access. Cable operators have expanded into HSD services and are beginning to add IP-based telephony to their video services. Other models being tested by software-only service providers such as Skype give away high-quality, PC-based voice services for free so they can build a large customer base in which to sell value-added applications.

These evolving service models undermine the value proposition of voice communications that has dominated the telecom industry. “The carriers’ whole reason for being has been to connect point A with point B, and the content of that transmission was incidental,” says Camilla Dahlen, president of Highdeal, a software provider of business and operations systems for wireless and broadband networks. “It could be a high-value conversation or a low-value conversation—it mattered not. It was valued and priced that way, which made traditional providers look at the world with a certain mindset. With the deployment of IP-based services across a range of infrastructures, we see those business models being turned completely upside down.”

### ■ The Carrier Response: Short-Term Strategies for Long-Term Success

A large-scale shift to a new model for converged communications, entertainment, and information services presents carriers with a unique opportunity. In preparing themselves to compete today with triple- and quad-play strategies, carriers can better position themselves for sustained growth tomorrow in an IP world. Yet to realize this goal of long-term success, carriers must be strategic in their short-term plans and provide much more than bundled access. As they enhance their networks to provide bundled services, they begin to create a service environment within which cost-effective, value-added enhancements and new customer experiences can be built around a core of IP-enabled functionality.

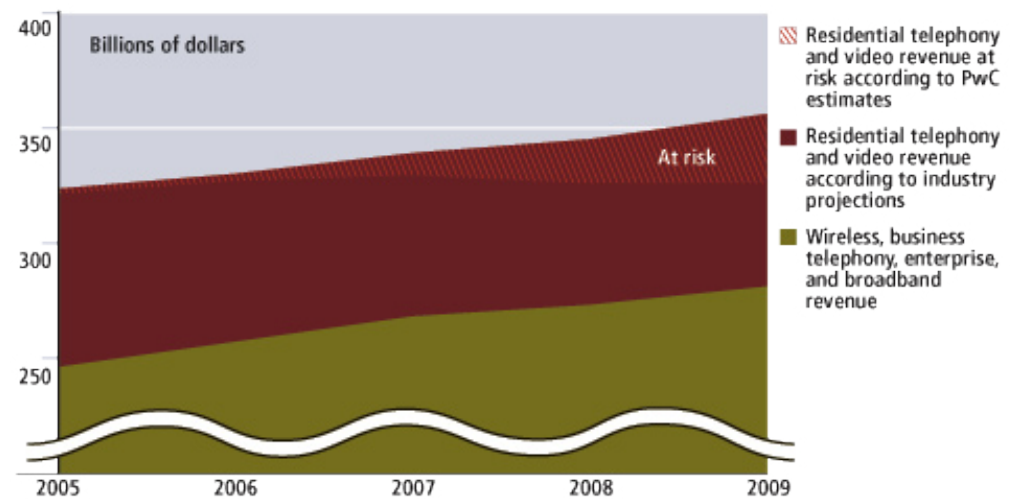
If carriers do not take this longer-term view, they run the risk of finding themselves without the ability to provide innovative services and thus are relegated to the role of providing commoditized bit transport. Simply replicating the triple- and quad-play bundles of the cable industry will likely land them in a losing price war. Cable operators can introduce commodity voice services more quickly than carriers can deploy differentiated video or other content services. Worse, if carriers define their competitive challenge solely as a struggle with the cable industry, carriers probably will be blindsided by unexpected market entrants. Figures 1 and 2 on page 12 compare carrier revenue forecasts under today’s market assumptions and PricewaterhouseCoopers’ projections that take into account the true impact of IP transformation where voice, video, and data services become low-priced commodities available from a number of competitors.



*For a discussion of value creation within an IP network, see the sidebar, “Comparison of Value Creation Potential for PSTN and IP Network Architectures,” on page 10.*

IP transformation creates great uncertainty for carriers, which is reflected in revenue forecasts. Two unknowns put carrier revenues at great risk: First, the impact on market share and service pricing from VoIP services provided by cable operators and new competitors; second, the uncertainties of the carriers new IPTV-based services. Cable operators in the United Kingdom (NTL, Telewest), where competitive consumer voice services have been available for more than six years, show that carriers may lose as much as 65 percent of their voice business to customers who are offered a voice and video bundle from their local cable operator. These factors affect at least \$35 billion in additional lost carrier revenue, according to PricewaterhouseCoopers' estimates.

FIGURE 1: CARRIER REVENUE FORECASTS, 2005–2009



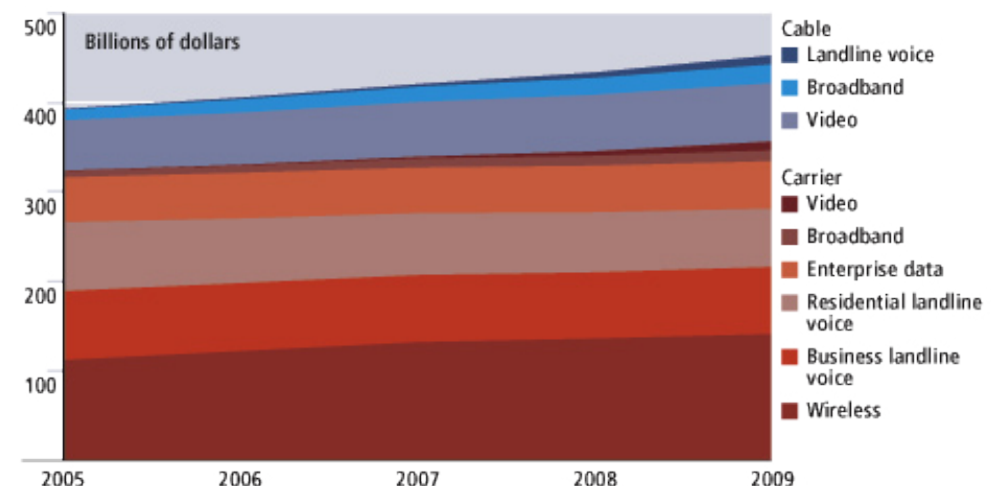
Source: Gartner, IDC, IMS, Nielsen, OECD, PricewaterhouseCoopers, 2004; NTL, Telewest, 2005

One plausible scenario is that a technically savvy leading consumer brand, such as Google, Starbucks, or Wal-Mart will begin to offer voice, video, music, or other services in partnership with an infrastructure provider like an electric utility. If this latter scenario occurs, the carriers will find themselves positioned as commodity IP bit haulers that third-party content and service providers leverage for their own success—sharing no revenue with the carrier that provides consumer access.

To succeed in both the present-day battle of the bundles and the future IP world, carriers must take a measured approach. First, they must complete their triple- or quad-play bundles with differentiated IP-based video services, or IPTV. Next, they must use this opportunity to reduce or eliminate the network and operational

Cable operators will rely far more than carriers on consumer broadband and consumer voice services to generate higher revenue. Carrier revenue is almost 500 percent larger than cable operator revenue in 2005, with little change expected by most analysts through 2009. Carrier wireless revenue alone outpaces cable revenue.

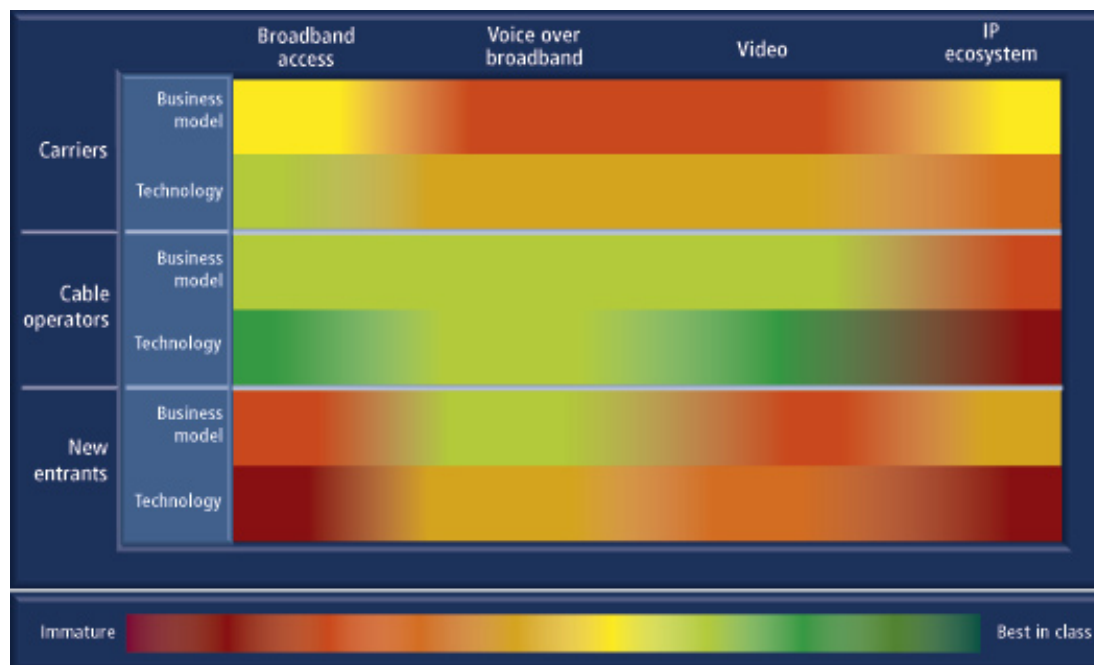
FIGURE 2: CABLE OPERATOR AND CARRIER REVENUE FORECASTS, 2005–2009



Source: Gartner, IDC, IMS, Nielsen, OECD, PricewaterhouseCoopers, 2004; NTL, Telewest, 2005

complexity of all layers of the existing infrastructure and replace it with a simplified, converged, and cost-effective platform. Then, they must fully evolve their billing and operations support infrastructure to a service delivery environment that becomes a smart distribution infrastructure desirable to the growing number of third-party IP-based content and service providers. True success will be derived from an IP ecosystem comprising carriers and multitudes of third parties jointly increasing revenue to levels that far exceed today's triple- and quad-play potential. See Figure 3 below and Table 1 on page 14 for a comparison of how carriers and their competitors are well positioned for realizing the potential of IP transformation and establishing an IP ecosystem.

FIGURE 3: OVERVIEW OF SECTOR READINESS FOR IP TRANSFORMATION



*As carriers begin their IP transformation efforts with triple-play bundles and eventually migrate to an IP ecosystem, they face competition in the consumer market from cable operators and new entrants such as Akimbo and Vonage. In comparing the business models and technology adopted by each competitor as of mid-2005, cable operators are the best positioned within this changing industry structure. Carriers, however, have a slight advantage in their readiness for establishing a true IP ecosystem. For more details, see Table 1 on page 14.*

Carriers must do all of this while adding the relentless pursuit of innovation, which has been so prominent in the computer industry, to telecom's long-standing emphasis on scale and reliability. "The challenge is being innovative enough to think a few moves ahead, smart enough to learn as you go, and agile enough to correct errors as they happen," concludes Andy Moss, senior director of technical policy for Windows at Microsoft, who leads Microsoft's strategy where business and technical directions intersect public policy issues, such as intellectual property, content protection, digital broadcasting, Voice over Internet Protocol (VoIP), and broadband.

TABLE 1: COMPARISON OF SECTOR READINESS FOR IP TRANSFORMATION

		Broadband	Voice over broadband	Video	IP ecosystem
Carriers	Technology	Point-to-point network architecture provides best upstream potential; fiber to the premises leapfrogs competition; massive investment needed to reach parity with cable operators' download-speed capabilities.	Integrating Voice over IP (VoIP) with circuit-switched voice of the Public Switched Telephone Network could be a differentiator; enterprise early adopters of the technology have favored carriers; innovation in voice technologies has not been a strength.	Deploying broadcast video is not difficult, but few carriers are doing so as it offers no differentiator; IPTV is largely unproven but potentially can surpass cable offerings with unlimited content libraries and an on-demand architecture.	Carriers' experience with interconnection requirements, current wireless infrastructure, and an open-but-owned-and-controlled (OBOC) strategy provides head start and road map for future; operations and business support systems in need of overhaul to support this.
	Business model	Carriers were late to get started, forced to play catch-up with cable operators by discounting prices, limiting cash contributions to bottom line.	Rapid shift to VoIP cannibalizes carriers' cash-cow business, strategy has been to use bundling, especially quad plays that add wireless access to wireline voice, video, and data services.	All new customers will be conversions from other providers, creating high cost of sales; content owners eager for new sales, but on-demand and unlimited content library business models have yet to be fully developed.	Previous success in yellow pages, teletext, and CLEC/IXC relationships provides starting point; wireless ecosystem a strong model to copy; few people or process resources in place to accomplish this.
Cable operators	Technology	Tens of billions of dollars invested in deploying fiber to the neighborhood (FTTN); download speed potentially unlimited; upload speeds constrained by hybrid fiber-coax (HFC) architecture.	The cable industry's data over cable service interface specification (DOCSIS) already provides quality of service (QoS); many cable operators have been selling circuit-switched voice for years; like carriers, have not focused on voice innovations.	Proven and evolving ability to deliver hundreds of channels; migration to next-generation services via IPTV.	Cable operators have yet to invest in an open platform, retaining technology that supports a vertically integrated orientation.
	Business model	Early market share lead has minimized need to discount prices; potential speed increases can offset carrier competition.	New revenue opportunity for operators; will be the first service providers to offer triple-play bundles over their own infrastructure; missing wireless component of bundle.	Satellite operators have had great success stealing customers, but partial ownership of content means cable operators make money even when viewers access content via different distributors.	Poor customer service image and strong association with video services mean cable operators may not be preferred partner for many service providers; can leverage long history of working with content industry.
New entrants	Technology	WiMax and power-line technologies are unproven but have long-term potential; regulatory environment uncertain in regard to line sharing and colocation.	Skype, Vonage, and others are proving best-effort Internet quality is good enough for many customers; lack of true QoS leaves them without ability to match future services from competitors.	Video over the public Internet will improve as broadband speeds and compression technologies improve; little control over pace of change.	Difficult to create a value-added ecosystem without an infrastructure in place; Internet service providers could leverage some technology assets.
	Business model	Difficult to recover from high capital-investment costs with carriers and cable operators already serving the market.	Non-facilities-based service providers like Skype and Vonage will need to out-innovate incumbents; peer-to-peer network architecture like that used by Skype is a truly disruptive value proposition.	Low cost of distribution allows for entirely new business models; viewing public yet to show mass interest in niche content.	Already experienced in working with third parties in an IP ecosystem; limited legacy business to protect, but limited or declining customer bases.

### ■ Complete the Service Bundle with IPTV

Carriers must respond to the threat of wireless substitution, the cable industry's triple-play-based competition, and a variety of VoIP challengers by offering their own triple- and quad-play bundles. Carriers (and their competitors) must offer more than access to telephony, broadband data, and video. Carriers have an opportunity to implement the video component of their triple- and quad-play bundles in a way that enables them to differentiate their video services from those of the cable industry.



For an overview of current carrier initiatives, see the sidebar, "Carrier Triple- and Quad-Play Market Snapshot," on page 16.



IPTV is expected to provide a broader range of combined entertainment, communications, and commerce services than are currently provided by the cable and satellite operators, and to present those services within a seamless customer experience. Carriers likely will offer the standard television channel lineup to meet the cable challenge initially. However, IPTV is more than simply the encapsulation of a broadcast television signal in the Internet Protocol for delivery over a broadband packet network. Its service environment also differs significantly from that of cable operators. (See Table 2 below.)

**TABLE 2: COMPARISON OF IPTV AND BROADCAST VIDEO NETWORKS**

	<b>IPTV</b>	<b>Broadcast</b>
<b>Type of network</b>	Internet Protocol-based (IPTV)	Broadcast
<b>Type of connection</b>	Point-to-point Two-way capability	Shared One-way capability
<b>Type of switching</b>	Network	Set-top box
<b>Ability to support an on-demand delivery model</b>	Scalable	Requires network upgrades
<b>Content switchable to consumer</b>	Theoretically unlimited	Bound by total channel count
<b>Number of CPE providers</b>	Many	Few
<b>DRM system</b>	Open, flexible	Closed, rigid
<b>Content residing on consumer first mile</b>	Only consumer-selected content	All broadcast content

### CARRIER AND CABLE OPERATOR VIDEO STRATEGIES

Cable video service is delivered over a broadcast network. In this model, channels distributed by the cable network are pushed to the set-top box and when the consumer changes a channel, the set-top box's tuner locates the appropriate channel. The consumer is a passive viewer and cannot rewind, fast forward, pause, or change angles of view.

In IPTV, only the channel that is requested by the TV or other video client is sent to the set-top box. When the consumer changes the channel, the set-top box sends a request for a particular stream of data packets. This data stream is placed in an IP multicast channel where the stream is transmitted simultaneously to anyone who requests it. This stream splitting does not degrade the quality of the signal. Because bandwidth is used more efficiently, the distributor does not suffer the inflexibility of a channel lineup limited by capacity restraints. When IPTV is combined with video-on-demand, it also enables consumers to play, pause, rewind, and fast forward video content.

To remain competitive with carriers, cable operators are eventually expected to migrate to IPTV from their existing broadcast networks. In the meantime, they are responding to the threat of the carriers' IPTV by licensing personal video recording (PVR) technology to allow their subscribers to record video content and play it locally. Cable operators have also begun deploying network-based video-on-demand services by staging thousands of hours of video on content servers within their head ends.



*For a detailed discussion of the cable operators' on-demand networks, see the PricewaterhouseCoopers report, "Big Bets for the U.S. Cable Industry."*

### DIFFERENTIATED VIDEO SERVICES THROUGH IPTV

IPTV's advantages over broadcast video, including lower operating cost, efficient delivery model, and customizability, make possible many new types of services for carriers. The following is an overview of the service opportunities afforded by IPTV:

- **Video Wide Web**—IPTV creates an environment not unlike the World Wide Web, except the content is high-quality video. Video choices will be highly personalized, allowing viewers to access both popular and niche content on their schedule—not the broadcasters. However, as a disruptive technology it will take viewers and distributors some time to fully leverage the competitive advantages of a Video Wide Web.
- **Personalized interactivity**—IPTV enables the carrier to offer many personalized interactive services. Individual and multiplayer games, additional program suggestions to the subscriber based upon their previous viewing, and access to supplemental online content to support a video stream (such as player statistics for a sports event shown in a separate window) form the basis for a more customized video experience.
- **Enhanced time-shifting through personal video recording**—Personal video recording (PVR) and network-personal video recording allow viewers to

### CARRIER TRIPLE- AND QUAD-PLAY MARKET SNAPSHOT

Carriers in the United States have announced a number of triple- and quad-play initiatives within the last year. Although the carriers differ in their particular strategy for fiber deployment, service offers, and customer segments, the announcements indicate a common determination to meet the cable triple-play challenge head on. The largest of these initiatives are summarized here.

#### BellSouth

To date, BellSouth does not have a signature initiative for deploying triple- and quad-play bundles. As of mid-2005, its fiber network passes about 1 million homes with fiber-to-the-curb (FTTC), and BellSouth intends to pass an additional 180,000 homes by year-end. The company plans to employ newer digital subscriber line (DSL) technologies, such as asymmetric digital subscriber line (ADSL) 2+ and copper pair bonding to deliver more than 12Mbps of bandwidth over a single copper line and more than 24Mbps over a bonded pair. During the first quarter of 2005, BellSouth selected Alcatel and Redback Networks for its next-generation broadband rollout. In the video segment, BellSouth is testing Microsoft's IP-based video services, or IPTV, platform for possible deployment while offering video services through a franchising arrangement with DIRECTV.

#### Qwest

Like BellSouth, Qwest is pursuing a hybrid strategy to deploy triple-play services. It made a deal with DIRECTV to bundle digital TV programming with discounted DSL service to customers in 14 states. Outside of the DIRECTV agreement, Qwest has been offering first-

generation video over very-high-speed digital subscriber line (VDSL) in Phoenix, Omaha, and suburbs of Denver.

#### SBC

In June 2004, SBC Communications announced Project LightSpeed, a five-year, \$5 billion project that aims to connect 18 million homes by 2007 via a fiber-to-the-neighborhood (FTTN) infrastructure for existing structures and fiber to the premises (FTTP) for new construction and multi-service units. Once SBC connects 90 percent of its high- and medium-value customer segments to the new infrastructure, it intends to become the number-two provider of video services by 2010. In late 2004, SBC solidified its commitment to the video market by signing a 10-year, \$400 million IPTV deal with Microsoft to supply the software infrastructure for the video component of its service bundle. The company plans to offer the first set of triple-play services under the U-Verse brand in late 2005 or early 2006.

#### Verizon

The carrier announced plans for large-scale deployment of FTTP and passed 1 million homes by the end of 2004. The first deployments initially targeted greenfield (new construction) installations and were concentrated in California, Florida, and Texas. Verizon intends to make fiber available to another 2 million homes in 2005. The company's goal is to reach approximately 30 percent of its customer base by 2009. Marketed under the FiOS brand, Verizon's triple-play bundle employs a single fiber infrastructure for voice, data, and video that removes copper entirely from the local loop. ■

determine the content they want and the preferred time of viewing it. These choices are possible through digital recording and time-shifted viewing, which can be implemented by the set-top box or the servers operated by the carrier.

- **Combined video and communications services**—Combining video content and other communications services such as VoIP, conferencing, instant messaging (IM), or alerts like caller ID takes the greatest advantage of the opportunities presented by the bundled service. As these previously separate services work together to create an immersive experience, new behaviors will arise and encourage the creation of unique services to generate new revenue streams.
- **Unlimited digital shelf space**—IPTV nearly dispenses with broadcast concepts such as a daily schedule, the sweeps rating periods, or other time-oriented parameters for video content. Instead, IPTV focuses on titles, directories, descriptions, ratings, and promotions as the commercially relevant attributes of a video stream. In this sense, IPTV operates more according to the principles of retailing than it does to broadcasting.
- **New advertising and sponsorship opportunities**—To be sure, the IPTV paradigm challenges many of the precepts that underpin traditional advertising, such as the 30-second spot included in a broadcast TV schedule. However, the rich interactivity and community applications enabled by IPTV platforms offer advertisers and sponsors new scope for targeted advertising.
- **HDTV and large-format televisions**—Consumers are rapidly adopting high-definition television (HDTV) sets as prices have fallen below \$2,000 for 40-inch screens. These devices create both the resolution to display computer-like graphics and the screen space to insert useful or entertaining items along with the main video content, something the flexibility of the IPTV platform can deliver through screen software rather than requiring the consumer to install a new media gateway or set-top box.

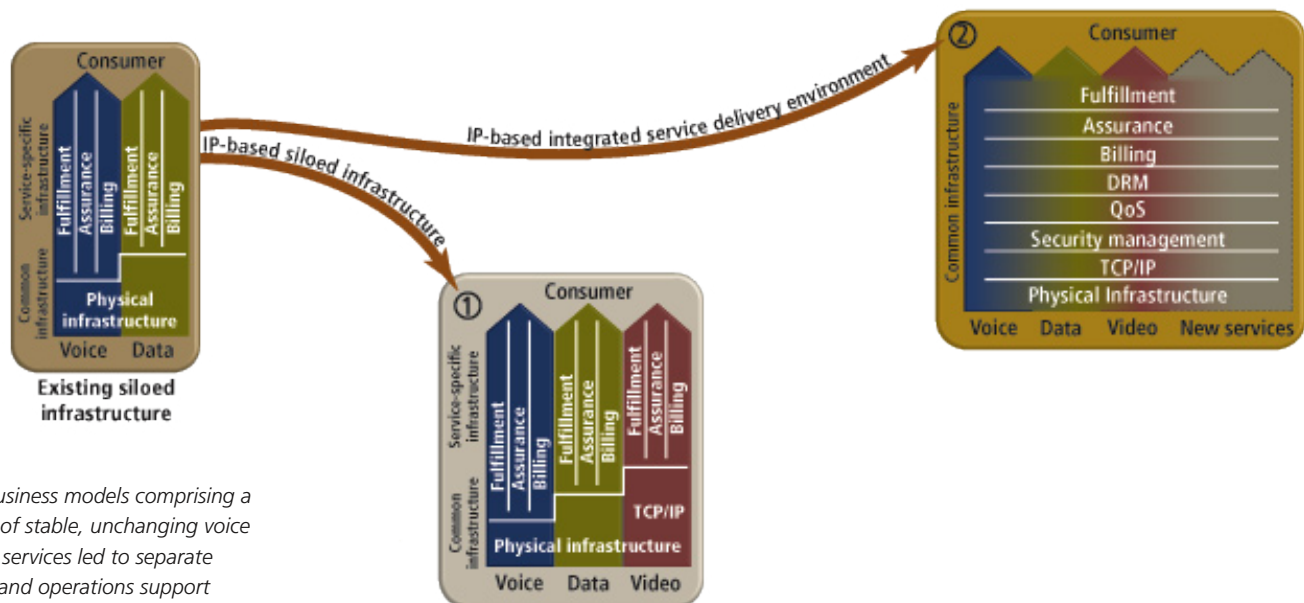
IPTV could prove to be more disruptive to the traditional business models of video distribution than VoIP will be to the carriers' wireline voice business. Key market forces such as increased broadband penetration, falling access-device costs, and fundamental changes in the movie and television industry itself are aligning to create an unprecedented opportunity. Market research company TDG forecasts the number of global IPTV subscribers will grow from 1.3 million subscribers in 2005 to 37.8 million subscribers in 2010.

#### ■ Deploy Service Bundles on a Converged Infrastructure

To be truly successful with their triple- and quad-play bundles, however, carriers must not follow their tradition of adding layers of complexity and cost to their business and operations support system infrastructure. Instead, carriers must build a converged IP infrastructure that is a dynamic, flexible resource for the delivery of innovative services. IP transformation provides carriers with a one-time opportunity to vastly increase efficiencies through reducing operations and maintenance costs. (See Figure 4 on page 18.)

***IPTV could prove to be more disruptive to the traditional business models of video distribution than VoIP will be to the carriers' wireline voice business.***

FIGURE 4: CARRIER INFRASTRUCTURE ALTERNATIVES FOR IP SERVICES DELIVERY



Carrier business models comprising a small set of stable, unchanging voice and data services led to separate business and operations support infrastructures for each service. As carriers begin their IP transformation efforts, they have two choices for a services infrastructure: siloed, as shown in 1, or integrated, as shown in 2. By default, carriers will likely move to 1, adding yet another expensive management silo to support IPTV. They should instead move to 2, which creates a service delivery environment to support not only video, but a wide array of new services in an IP ecosystem.

Standard voice telephony services delivered through the PSTN can be thought of as mass-produced simple services; that is, they had well-defined parameters for product configuration and organizational support. Likewise, consumers' buying habits were relatively simple and could be defined by geography and time of day. These parameters then determined the support requirements for network coverage, number of lines, and carrier equipment. Finally, voice telephony was subject to a single set of regulatory requirements in each jurisdiction.

However, the Internet Protocol turns nearly all of the previous assumptions on their head. If the world of voice telephony was one of mass production, the IP world is defined by mass customization. In this operating model, the carrier serves a large number of users who access personalized portfolios of complex services that are based upon different product attributes, different means of support, and different regulatory considerations.

#### A NEW APPROACH TO BUSINESS AND OPERATIONS SUPPORT

As newer services, such as Integrated Services Digital Network (ISDN) and digital subscriber line (DSL), were deployed in the PSTN, new layers of business and operations support system (B/OSS) software were installed to implement them. This resulted in overlapping, disparate, and costly B/OSS functions. This expensive infrastructure prompted most carriers to introduce new services such as ISDN at high price points, rather than setting lower prices that would encourage widespread adoption and allow the carrier to benefit from economies of scale.

Carriers use B/OSS software to manage, monitor, and control networks and services. B/OSS accomplishes three main technical and business activities: fulfillment, assurance, and billing, and each comprises many subfunctions. Fulfillment controls the infrastructure (such as inventory, order provision and activation, network



configuration, interconnect, and planning), assurance controls the service (such as service quality management, network availability and fault control, and performance management), and billing provides the business interface (such as capturing billable events, mediating between network layers, generating bills, securing against fraud, and generating data for churn management programs).

These same functions must be managed in an IP-based network. “When you’re looking across at the 21st century network, you have to have a vision of the end result and how you’re going to move from here to there. When you introduce soft switches and multiple service access nodes, what does that mean for your B/OSS environment?” says Simon Herrington, BT Wholesale’s head of business process management.

However, the IP transformation changes many of the assumptions, including those for capacity planning and pricing, that have underpinned the PSTN for decades. Capacity planning is crucial because it directly affects the market’s perception of QoS. Capacity planners have effectively used queuing theory or other linear methods to predict network resource consumption in a switched voice network, but capacity planners discover that these methods are not as tractable in an IP environment because consumption does not smooth out as traffic or the user population grows.

In addition, network capacity consumption is no longer homogeneous in an IP world. For example, if circuit voice user A and circuit voice user B are on the network simultaneously, they are using almost exactly the same switching resources and share similar perceptions of value. However, IP user A surfing the Internet, IP user B playing an interactive game, and IP user C viewing a movie will consume network resources differently and will have very different perceptions of value.

Pricing was previously fairly straightforward: When a carrier built an infrastructure to support an individual service, it could easily calculate potential consumption habits and estimate the revenue stream arising from that investment. However, an IP infrastructure is only loosely coupled to services since the same infrastructure can be used to provide an entire service portfolio. Within that portfolio are network services, some of which will be treated as always-on commodity access (such as HSD), and other value-added services, which are priced according to usage or other parameters.

The ability to flexibly price these services takes on even more importance in the IP world. Subscribers should understand what they are being charged for, why they are being charged, and why it is a good deal for them. Therefore, how a carrier prices its IP services imposes new requirements on the B/OSS and how it operates. It requires expanding the role of B/OSS into a more full-fledged service delivery environment.

“Historically, billing and pricing have been seen as operational challenges for carriers,” states Highdeal’s Dahlen. “In the new world of IP, the real issue with billing processes is not an operational one, but a marketing one. The carriers’ challenge is

***“When you’re looking across at the 21st century network, you have to have a vision of the end result and how you’re going to move from here to there. When you introduce softswitches and multiple service access nodes, what does that mean for your B/OSS environment?”***

***Simon Herrington,  
BT Wholesale***

***“When something doesn’t work, who is the customer going to call and how is that service rep going to diagnose the problem? You need to have people who understand how to diagnose IT and then you have to have somebody who understands networks.”***

***Shaygan Kheradpir,  
Verizon***

to use the B/OSS to empower their product marketing organizations to create the service offers that will generate revenues. We have a good idea about how to use IP to lower our operational cost. The whole issue of how to create new revenues in this new world is a problem today and will be a problem tomorrow as well.”

#### **CHALLENGE OF ALIGNING BUSINESS STRATEGY AND INFRASTRUCTURE**

In the near term, carriers’ infrastructure must provide end-to-end visibility of IP-based services so they can manage network operations and customer-touching business processes. Moreover, this visibility must provide information to carrier employees who are interacting with the service environment at multiple levels. “Now you have telecom services that are going through the telecom cloud but they are also going through IP data centers,” says Shaygan Kheradpir, chief information officer (CIO) for Verizon. “So when something doesn’t work, who is the customer going to call and how is that service rep going to diagnose the problem?” Kheradpir notes that supporting converged services requires unique skill sets in addition to a more flexible service delivery environment. “You need to have people who understand how to diagnose IT and then you have to have somebody who understands networks,” he says.

As carriers build new services from the ground up, carrier product development, marketing, and operations management must rethink how to create a service delivery environment capable of optimizing a service throughout its life cycle. Such optimization often requires a shift over time from using custom systems to commoditized products. As the pace of technology accelerates, new services are moving through the stages of high-price/low-uptake to low-price/high-uptake much more quickly. A service delivery environment must accommodate both the early days of new services and their custom applications, and the later stages when commodity, off-the-shelf components radically reduce costs. In other words, the service delivery environment must enable the rapid transition of lower-cost elements in the network infrastructure. Because a service delivery platform greatly influences the character of a particular service, the previous distinction between managing technology and managing service delivery has become even more amorphous.

Compounding this lack of clarity is the absence of a single process owner or controlling division that is accountable for all steps of the communications business processes managed by the service delivery environment. Normally, a network operations division controls network elements such as switches. The IT department controls information collection and distribution, and many business units handle billing and customer care. The end result is insufficient information and control to execute the business strategy with the service platform—even if an organization uses a single service delivery environment.

Customers will become disenchanted if they must call three different support numbers for three different services. Therefore, carriers need technology that allows them to monitor and view the performance of triple- and quad-play services and their history.

This technical challenge is difficult enough for carriers. Yet the people and process issues loom even larger. According to Bill De Muth, chief technology officer at SureWest Communications, a California-based broadband provider of triple-play services, a nontrivial cultural shift will be required to achieve an IP-based infrastructure. “You don’t want to get into a world where people talk about something not being ready to deploy until it is 150 percent ready. Otherwise, nothing can happen,” he says. “We’re balancing that with the IT culture, which experiments more and throws stuff out in the market to see what works.” Integrating functions handled by business and operations support systems into the new service delivery environment usually occurs in stages instead of all at once. In SureWest’s case, the company transitioned from its siloed infrastructure to an integrated service delivery environment in stages, beginning with network management, next incorporating the call center, and finally integrating sales and marketing.

### ■ Developing a Customer-Service Orientation

If carriers intend triple- and quad-play bundles to go beyond being competitive with similar cable services and allow carriers to truly differentiate, a customer-service orientation must take precedence over a network orientation. According to Verizon’s Kheradpir, the customer experience must be the predominant factor for organizational decisions. “It all comes back to what works for the customer,” Kheradpir says. “Our decisions are driven purely by that. For example, Apple Computer is very religious about their customer experience. They tune the software, the hardware, and the ecosystem. Why don’t people go out and buy cheaper and more powerful MP3 players instead of iPods? Because their experience is very well tuned with the entire ecosystem. The customer experience is paramount for us as well. And unlike Apple, we take a lot of cost if it isn’t.”

As Chris Randle, director of strategy and architecture for Cable and Wireless explains, “Just as important as the radical transformational opportunities that the new technologies offer, is the dramatic improvement in customer experience that we wish to offer. Providing this requires very tight integration of the traditional BSS and OSS systems to allow seamless, real-time, capabilities to provide, flex, and report on services—challenging the notion as to whether they really are separate entities.”

Organizing hardware, software, content, and third-party services to create a seamless customer experience calls for more than change in bits and pieces of the service delivery environment. To facilitate a greater focus on customer service, many organizations are taking a new service-oriented architecture (SOA) approach to the underlying systems that run their network.

Most carriers are in the process of separating their business systems from the underlying network through an abstraction layer. While not yet full-blown SOA, these efforts will eventually allow a carrier to provide loosely coupled important services such as QoS, digital rights management (DRM), and billing. The benefits of this approach go beyond just a reduction in operating expenses. This new service delivery environment will help carriers add third parties to their triple- and

***“You don’t want to get into a world where people talk about something not being ready to deploy until it is 150 percent ready. Otherwise, nothing can happen. We’re balancing that with the IT culture, which experiments more and throws stuff out in the market to see what works.”***

***Bill De Muth,  
SureWest  
Communications***



*For more information, see the sidebar, “Carrier Benefits of Service-Oriented Architecture,” on page 22.*

quad-play bundles. These third parties might include content providers, commerce enablers, directory specialists, search engines, and community applications.

Hand-in-hand with looser coupling between business applications and network applications, carriers are developing interfaces so that the customer will experience a consistent look and feel for manipulating communications, information, and entertainment services. For example, SBC Communications launched a unified communications suite in 2004 that allows subscribers to view recent calls, e-mail, and faxes and to send messages from a single inbox.

Other carriers such as Verizon are offering more than unified messaging and communications services, and are creating application software stacks on top of the core network and IT elements. The company is using the SOA approach to make its communications and content infrastructure behave more like a PC from the subscribers' point of view. Essentially, Verizon is creating an operating system so that subscribers will enjoy similar control over their services and connected devices as they would by launching programs on their computers.

#### CARRIER BENEFITS OF SERVICE-ORIENTED ARCHITECTURE

The tight integration between network infrastructure and business and operations support systems means that the Public Switched Telephone Network (PSTN) has not been an especially flexible infrastructure.

When the business of carriers focused almost exclusively on providing voice or data access, such limited flexibility was acceptable. However, for triple- and quad-play bundles and beyond, carriers are rethinking how to design and deploy the business and operations support software and related systems. A growing trend for system design and implementation is the service-oriented architecture (SOA).

Fundamentally, SOA is a set of design principles that encapsulates business functionality behind industry-standard, self-documenting service interfaces, where it can be accessed through requests from business systems. An SOA is typically deployed by adding an abstraction layer between calling and called applications, often initiated as an enterprise service bus. The bus is designed to solve the many-to-many maintenance problem that carriers face as they maintain literally thousands of point-to-point interfaces today. Service consumers and providers are loosely coupled by following industry standards, and services are designed to offer a full suite of current and potential uses, including an explicit emphasis on supporting as-yet unknown future applications.

A key characteristic of SOA is an emphasis on encapsulation to hide complexity from business systems and users. In an SOA, the application programming interfaces (APIs) offer explicit version control that typically allows programs to access and execute older versions even while supporting new requirements. This approach shields client programs from a never-ending headache of constant back-end re-integration or other implementation changes.

The underpinnings of SOA are not new. The Common Object Request Broker Architecture (CORBA) and Microsoft's Distributed Component Object Model (DCOM) aimed to accomplish the same thing. However, these previous approaches to service orientation ran into several problems. First, they were tightly coupled, which meant that the implementation of a service had to be closely tied to the implementation of software that might request a service. Such binding meant that changes in services or in the software that used them had to be planned and carried out in a highly coordinated fashion. Another limitation of these earlier approaches was that service requests and responses were often fine-grained, meaning that they typically contained small amounts of specific information. As a result, many requests needed to pass between the provider and the requester of a service to carry out a business function, leading to poor response times.

In applying SOA to carrier business and operations support systems, four key areas must be addressed: adopting Extensible Markup Language (XML), the industry-standard interface language; providing a middleware-based information or enterprise service bus; establishing governance and requirements for business processes that maximize the creation of coarse-grained, loosely coupled services; and enabling abstraction of interfaces from specific application programming environments such as Java or .NET through messaging standards such as Simple Object Access Protocol (SOAP). The end result of employing SOA principles for a carrier service delivery environment should be much lower ongoing maintenance costs, far greater speed and flexibility when the business environment requires rapid changes in services, and an attractive and appealing platform for third parties interested in leveraging the carrier's value propositions within an IP ecosystem. ■



Using a software platform to manage traditional network (switched services and voice mail platforms) and IT elements (application and content servers), the Verizon iobi system combines telephony, messaging, Web-based applications, and content services that can be accessed through software downloaded via a PC, an iobi Web site, a phone using a voice portal, a personal digital assistant (PDA) such as BlackBerry, a set-top box, or an intelligent customer premises equipment like the VerizonOne phone. The goal of the system is to provide the subscriber with software-based applications for advanced communications and content services such as caller ID, voice mail retrieval, address book, calendar, text messaging to wireless phones, e-mail, location-based services, personalized media, and content distribution to devices that become user-aware via iobi.

An example of a user-aware device is the VerizonOne phone—a cordless speaker-phone combined with a DSL modem, Wi-Fi router, and a processor with a screen running the iobi platform. With iobi, the VerizonOne phone becomes aware of its user, and, for example, autonomously displays location-based content such as the weather or a list of businesses nearby. It also delivers personalized content such as a user's photo albums, music, and news, which are specified and uploaded to the iobi Web site. Making connected devices aware of their user, and instantly customizable via the Web, enables them to deliver richer and more targeted applications. If the devices become user aware through a platform like iobi, they can improve quality of life, be it in vertical applications such as healthcare or in general entertainment applications. "This is a big new lever," says Kheradpir.

Whether the Verizon iobi service will prove to be as crucial in redefining how people interact with network services as, say, the graphical user interface revolutionized how people interacted with computer resources remains to be seen. What is clear is that a service environment strategy for simplifying how carrier business systems interact with network systems, how third-party partners collaborate to create value-added enhancements to the carrier network, and how subscribers interact with these converged services dramatically alters the communications, entertainment, and information services landscape.

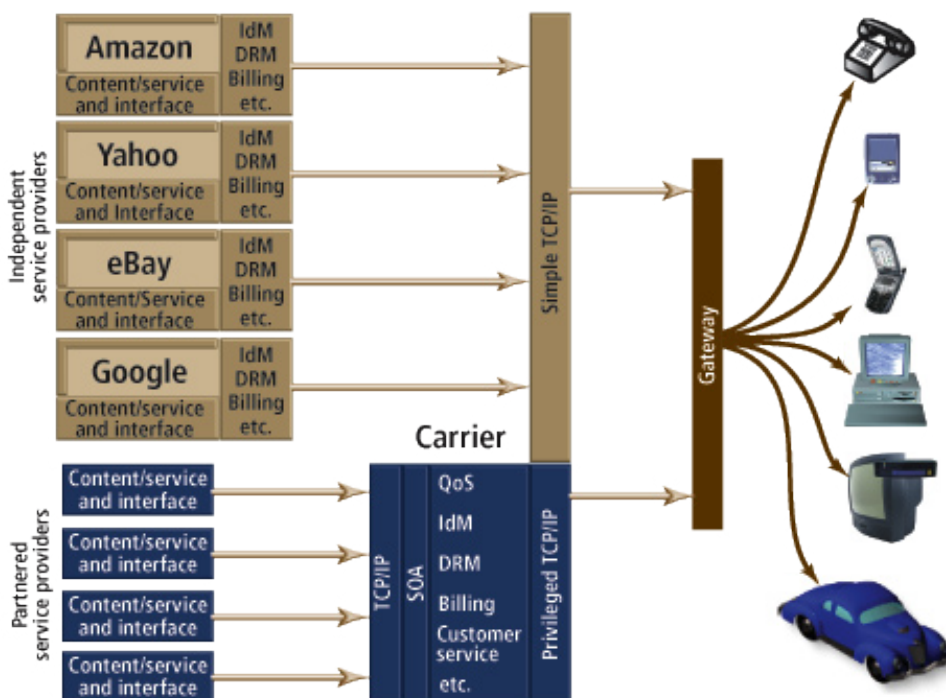
### ■ The Open-but-Owned-and-Controlled Approach to Service Delivery

An open-but-owned-and-controlled (OBOC) strategy will be crucial if carriers are to leverage IP transformation into long-term success. First suggested by Robert Spinrad at Xerox, the phrase "open but owned and controlled" describes a competitive environment where key product standards, especially interface specifications that permit interoperability, are owned as intellectual property but are made available to others who develop complementary components, systems, or services. In this environment, carriers can directly control who accesses those services, rather than indirectly through licensing intellectual property. The relevant standards are licensed rather than published and are constrained (by the number of licensees, permitted use, or depth or degree of documentation, for example). (See Figure 5 on page 24 for an overview of the OBOC service delivery environment.)

*A service environment strategy for simplifying how carrier business systems interact with network systems, how third-party partners collaborate to create value-added enhancements to the carrier network, and how subscribers interact with these converged services dramatically alters the communications, entertainment, and information services landscape.*

Carriers currently provide open Internet access (simple TCP/IP) to consumers and third parties like Amazon, Yahoo, eBay, and Google, but fail to provide differentiated services that would create value for third parties. Third parties provide functions such as identity management (IdM), digital rights management (DRM), and billing, which are not part of their core services. In an IP world, service providers could continue to manage these functions themselves or outsource them to the carrier, taking advantage of the privileged TCP/IP that is provided by the service delivery environment.

FIGURE 5: OVERVIEW OF THE OPEN-BUT-OWNED-AND-CONTROLLED SERVICE DELIVERY ENVIRONMENT



In practice, OBOC systems aim to create commodity-like competition around elements chosen by the licensor. Yet these systems remain restricted in some way, increasingly locking in the installed base as it grows. OBOC systems are in the middle of a spectrum bounded by public availability at one end and proprietary standards at the other. The art of executing an OBOC service environment strategy is balancing which elements are opened to spur innovation and competition to force down price and scale up demand, and which elements are restricted so the licensor can capture a slice of value from each innovation.



For more discussion of standards, see the sidebar, "How Industry Standards Affect Competitive Strategy," on page 25.

Two equally important factors will encourage the adoption of OBOC standards. The first is complexity itself. IP-based infrastructure, service environments, and market structures have become too complex for a single company (or a single industry for that matter) to understand, incorporate, and control. Technology, QoS, pricing models, and perceived value by customers have introduced too many variables for one organization to handle. Hence, OBOC business models for IP services innovation are almost an industry prerequisite for enabling the service delivery infrastructure in the face of a rapidly changing market for IP-based services.

The second factor is the need of content and service partners to participate in the value chain and provide product or service innovation. The Internet is affecting numerous industries outside of telecommunications. These partners and industries have a fundamental interest in ensuring that they will be able to access carrier networks on a fair and timely basis.

“Let’s say that I’m a niche provider servicing the ESPN community through our network. I don’t want to build my own billing or identity management system. I want to know if Verizon is going to enable my application on top of their platform,” says Kheradpir of Verizon. Kheradpir notes that within the iobi system, a section called the iobi shell provides a container in the system where developers can load their applications and functionally integrate with the iobi features; this adds value to both the niche provider and to the iobi platform. Verizon has developed Web services-based interfaces and a development toolkit for iobi so that software developers can create applications that run across the Verizon iobi platform.

Similarly, UK carrier Orange is also creating an OBOC service delivery platform, according to Jian Fan, director of business support and architecture. “We have already invested a significant amount of money in an IP backbone and are continuing to do so. We have also designed a shared services platform called MDSP [Mobile Data Service Platform] on top of this and see this as a multimedia platform for content/service distribution. The plan is to open the service platform up to third parties and have a number of published application programming interfaces (APIs) that will allow people access to customers for content and other services,” explains Fan.

## HOW INDUSTRY STANDARDS AFFECT COMPETITIVE STRATEGY

The adoption of technology standards is often characterized as a choice between open and closed standards. However, a range of possibilities is available, depending upon a company’s competitive strategy and the ability of an innovation to be protected legally.

A truly open standard is one in which the technical information necessary to implement the standard is available on a nondiscriminatory and timely basis to anyone, usually through publication of the interface specifications. The Internet Protocol is an open standard that is available to anyone at no charge through the Internet Engineering Task Force (IETF), which is responsible for maintaining the standard and which uses a formal, open process for making changes. Other organizations such as the Institute for Electrical and Electronics Engineers (IEEE) publish open standards such as the 802.11 family of short-range wireless broadband (Wi-Fi) standards.

Conversely, a fully closed standard is the exact opposite. It is owned as intellectual property and highly restricts who can access the relevant technical information, how they compensate the rights holder for its use, what they can do with the innovations they derive from the standard, and how changes are made.

In intermediate positions, proprietary standards become public via the sanction of another organization. This was the case with Ethernet, which was developed and owned by Xerox until the company gave the standard to the IEEE for management. Ethernet is now jointly

owned by the members of the IEEE, which published the standard in the public domain.

Finally, open-but-owned-and-controlled (OBOC) standards result from de facto market dominance rather than a formal organizational process. In this case, a pioneering company creates a service environment in which some capabilities are exposed for third-party innovation while other capabilities remain owned and controlled by the originator.

In the voice market, Skype is rapidly developing according to this formula. Skype’s core voice technology, built on top of standard Internet connections, offers highly secure, CD-quality voice communications between any two computers for free. The core technology remains a trade secret. Now that a core user base of tens of millions has been established, Skype has published a set of OBOC application programming interfaces (APIs) to attract third-party service providers interested in offering content, interactive voice response, personal information management, and other, yet-to-be-invented capabilities through the Skype network.

Another prominent example of an OBOC standard is the combination of Microsoft Windows running on Intel x86 microprocessors (Wintel), which has created a platform for which a large number of third parties continually develop applications. Other OBOC examples include the NTT DoCoMo i-mode platform for wireless data in Japan and the Apple iTunes model for digital music. ■

***The flexibility most in demand for making the IP transformation is not found so much in the attributes of an IP infrastructure, but in the minds of managers who must organize people and business processes to execute it.***

However, carriers should consider two caveats of the OBOC operating model for IP services. First, an OBOC strategy requires sizeable investment in integration of business processes and people. For example, programs to encourage third-party development are often an afterthought at most carriers. If such programs are to encourage application development, they must be priority initiatives. More detailed analysis of how the carrier makes money and how the developer, content, or service provider makes money will be necessary for these developer initiatives to succeed.

A second and even more important caveat is that the carriers' short-term choices will have significant repercussions, by which point they will have become difficult to change or reverse. For example, when video recorders first appeared, the Sony Betamax standard provided superior resolution and presentation of the recorded television signal. However, Sony chose to focus the Betamax recording capacity on 30-minute and 1-hour television shows, while those companies favoring the rival VHS standard increased the recording time to cover movies and longer sporting events. This seemingly trivial choice was instrumental for launching the video rental business and overwhelmed Sony's early lead in customers.

Thus, OBOC strategies require consistent involvement by top management in carrier organizations. When choosing what parts of the network or triple- and quad-play environment to open for innovation and what parts to restrict to ensure end-to-end quality, carriers cannot look only at the technical diagrams of the IP network. Business considerations loom at every step of the way. Consequently, the flexibility most in demand for making the IP transformation is not found so much in the attributes of an IP infrastructure, but in the minds of managers who must organize people and business processes to execute it. (See Table 3 for an overview of the benefits of an OBOC service delivery environment for carriers, partners, and consumers.)

TABLE 3: BENEFIT OF THE OPEN-BUT-OWNED-AND-CONTROLLED APPROACH

Market participant	Benefit derived from open-but-owned-and-controlled approach
Consumers	Large catalog of content at their disposal. Highly customized and personalized services possible. Content/services accessible on multiple devices. Single bill and support relationship.
Content/services providers and aggregators	No need to maintain infrastructure for service elements like QoS, security, or DRM. Premium versions of services possible. End-to-end services management handled by the carrier. New business models possible.
Carriers	New revenue streams. Deeper customer relationship. More flexibility for future services. Avoids commoditization of services or disintermediation by other market participants. Provides opportunity to establish new business models.

## ■ IP Transformation Business Models

IP transformation in the carrier services market will be guided by at least four business models: network traffic aggregator, triple- and quad-play access provider, content and service bundler, and ecosystem catalyst. Carriers likely will adopt elements of each model as they implement their IP future. Each model should not be considered a linear progression from its predecessor. Some carriers certainly will attempt to leapfrog certain stages while others will take a more measured pace.

### NETWORK TRAFFIC AGGREGATOR

The network traffic aggregator model was among the first business models to appear in the IP market. It is still being pursued in IP backbone networks by companies such as Level 3 and in access networks by many wireless access (Wi-Fi) companies that provide broadband connections in public places such as coffee shops. To achieve success using the traffic aggregator model, carriers must gain market share so they can capture scale economies. Because market share is influenced by price competition, the internal structures of successful traffic aggregators ruthlessly attack costs in any form. Carriers certainly can pool IP traffic originating from their own and partner networks, and thus possess some advantages of scale. But they also possess expensive networks and labor relations that might preclude them from becoming pure-play IP traffic aggregators.

### TRIPLE- AND QUAD-PLAY ACCESS PROVIDER

A second business model is based on the current triple- and quad-play access bundles being launched by both the carriers and the cable operators. Customer retention is the primary competitive impetus for this business model. Customers who buy more than one service from a provider will remain subscribers longer than single-service subscribers. Those that buy three or more services become even less likely to leave. As carriers and cable operators compete on triple- and quad-play bundles, they emphasize one part of the bundle (video in the case of cable, voice in the case of telecommunications) to acquire the customer and then use other parts of the bundle to retain subscribers.

“Carriers are all thinking about variations on those three or four sets of things that can be delivered and all the important business choices behind the service bundle concept,” explains Microsoft’s Moss. “Then underneath that framework, they are looking at how they are going to deliver voice, data, and video, each profitably.”

The network traffic aggregation and bundled access models lower the internal cost structure of carriers that adopt an IP-based infrastructure. As wholesale traffic or triple- and quad-play bundles come under price pressure, carriers that can integrate as many services as possible into the same infrastructure—not simply present these services on a single bill—will have better success maintaining their cost lead. However, neither of these models incorporates the creation of new services that would create incremental revenue.

***“Carriers are all thinking about variations on those three or four sets of things that can be delivered and all the important business choices behind the service bundle concept.”***

***Andy Moss,  
Microsoft***



***“What’s our economic engine? It’s not iobi. It’s that we have more people on our network who use it more. Why would they do that? Their experience is better. Their IPTV works better. Their cell phone works better.”***  
***Shaygan Kheradpir,***  
***Verizon***

Although attractive for their simplicity and their effectiveness in reducing customer churn, triple- and quad-play bundles for access alone will not guarantee carriers success. IP-based communications and information services will lead to new customer needs, habits, and choices. To capture the value created by those new opportunities, carriers must offer more than access. Non-facilities-based service providers such as Amazon, Visa, Yahoo, and other companies not yet launched will use the carrier network to ride into homes without any need to partner with the network provider in a value-creating activity.

#### **CONTENT AND SERVICE BUNDLER**

One way to differentiate carrier triple- and quad-play services is to become a content and service bundler. Significant steps in this direction have already occurred. In April 2005, Verizon announced an agreement with NBC Universal to carry its channels on the Verizon television service called FiOS TV. This agreement follows other deals Verizon has signed with Discovery Networks and Liberty Media’s Starz Entertainment Group. Another carrier triple- and quad-play provider, SBC Communications, has created a Los Angeles-based business unit with the mandate to source Hollywood content deals for the carrier’s fiber-based triple-play bundle called U-Verse. Staffed by executives from the satellite TV and entertainment markets, the new SBC unit underscores the carrier’s stated commitment to become the number-two provider of video content services by 2010.

In the content and service bundler model, both carriers and cable companies seek to establish relationships with content and service providers for either exclusive access to content (content available only through provider X), limited exclusivity over content distribution (content will be available first on provider Y’s network before general release), bundling content streams into a single package (all of the James Bond movies that star Sean Connery), or creating commercial tie-ins between content and other services (viewers of this content receive discounts for home delivery of pizza).

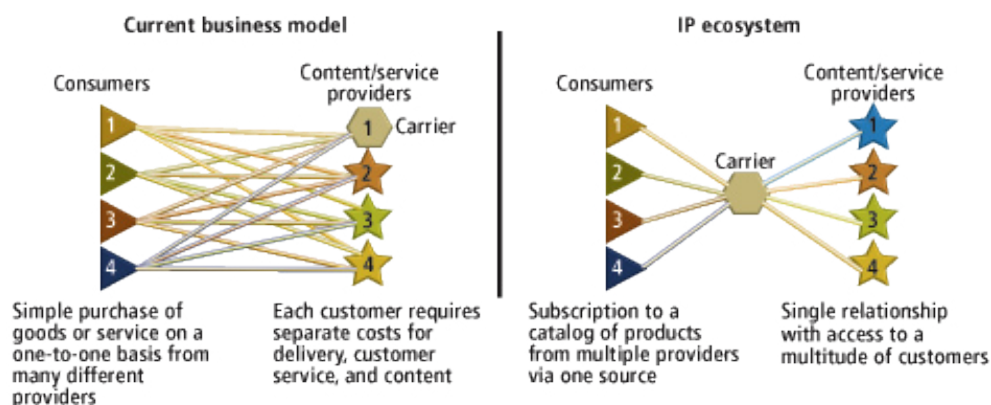
Content and service bundling allows carriers to offer value-based pricing, which holds the possibility of sustainable margins rather than continually racing to lower price (or raise bandwidth while keeping price consistent). Furthermore, value-oriented applications that improve the customer experience with IP services can also increase use of the network. “What’s our economic engine? It’s not iobi,” states Kheradpir of Verizon. “It’s that we have more people on our network who use it more. Why would they do that? Their experience is better. Their IPTV works better. Their cell phone works better.”

#### **ECOSYSTEM CATALYST**

In an IP-centered market, value is derived from various services coming together to create an integrated experience for the customer. Instead of creating monolithic closed environments for triple- and quad-play bundles and ignoring third parties connecting directly to customers over best-effort Internet broadband service, carriers should create an indispensable role for themselves by adopting a long-term ecosystem catalyst strategy.

Ecosystem-based business models acknowledge that the IP transformation shifts market power away from proprietary ownership and direct management of each piece of the value chain (as was historically true of the PSTN) toward a competitive model that is more akin to the IT industry, where many third parties continually add value. The ecosystem pioneer creates a service environment and exposes part of it for third-party innovation while another part remains owned and controlled by the originator. Rather than concentrate on internal innovation that must apply to the entire value chain, ecosystem business models encourage external innovation at specific, controlled parts of the value chain. (See Figure 6.)

FIGURE 6: SERVICE DELIVERY IN CURRENT BUSINESS MODEL AND IP SERVICES ECOSYSTEM



*Under the current business model (on the left of the figure), carriers have yet to take advantage of their position as broadband access providers to differentiate their services and provide benefits to both consumers and business partners. Because broadband access is both a physical and virtual service, carriers are uniquely positioned to simplify and integrate relationships between consumers and other service providers, as shown on the right.*

Explains Orange's Fan, "We need to introduce a service layer that will coordinate the delivery of all services across the IP and circuit-switched network to the end user. This would include features such as billing, identity management, provisioning, and content aggregation. We would be acting as an application service provider (ASP) or super wholesaler in this respect."

Ecosystem-based business models for IP services contrast to the historic bias of the telecommunications industry, which owned and controlled an enormously complex, highly reliable infrastructure for voice communications. Yet, ecosystem-based business models may be the best bet for carriers. They can differentiate themselves on the service experience to command premium pricing while using an IP standards-based infrastructure to break the linear relationship between new service deployments and rising operations costs.

Over time, the ecosystem catalyst uses aspects of internal and external innovation to raise switching costs for both partners and customers. The ecosystem catalyst sets and develops de facto product or service standards in the market, and competing but compatible submarkets evolve along links in the value chain. In the process, these submarkets cause network effects and contribute to the growing value of the service environment.

***“One of the many fundamental changes that occurs when implementing next-generation networks is that the embedded intelligence starts to move towards the edge. This offers the opportunity to be able to introduce products and services far more quickly.”***

***Chris Randle,  
Cable and Wireless***

### ■ Effect of IP Transformation on Carrier Business Processes

Regardless of the business model a carrier chooses for IP transformation, a carrier will need to change how people, process, and technology work together. Sales and partnering, digital rights management, network performance and quality of service, and billing and settlement all will change in the IP transformation.

#### SALES

Carriers now must adjust their sales, service, and partner management business processes in parallel with technology. Because telephony, data, and entertainment services have been provided separately, many of the associated sales practices developed in separate silos. In an IP world, the customer must be at the center of connected sales and service processes. The idea that every product has its own sales function and a separate call center will soon become outdated and unsustainable.

Although carriers do not yet provide completely integrated services, the trend is unmistakable. Soon, customers buying converged services will not conceive of voice, data, and video as separate items in a bundle, but as the basic “IP dial tone” they expect for communications and information services. As voice becomes just an application on an omnipresent IP network, new concepts such as ambient voice, whereby telephony assumes an always-on service model, or 3-D conference calls, where voices on a call will be virtually arrayed in space to enhance the listening experience, will force changes in sales, service, and support.

As Cable and Wireless’s Randle explains, “One of the many fundamental changes that occurs when implementing next-generation networks is that the embedded intelligence starts to move towards the edge. This offers the opportunity to be able to introduce products and services far more quickly. It also means that voice becomes another application running on the network requiring a fundamental change in mindset for us as carriers, and far more reliance on the systems infrastructure to provide carrier grade performance.”

Changing organizational practice will be as challenging as transitioning to a new technical infrastructure. For example, the cable industry is expanding its VoIP footprint aggressively, but it sells voice as an add-on commodity to the main entertainment service. Sales teams for cable operators often use voice as the final sweetener to close an entertainment sale. Consequently, new skills in cross-selling and up-selling communications and information services are necessary for triple and quad plays to work, regardless of whether the provider is a cable operator or a carrier.

According to SureWest’s De Muth, video is not the initial reason why people inquire about its service. “We do direct sales, and the data offer is what gets us in the door,” he says. SureWest has a 10Mbps symmetrical data product that has a strong word-of-mouth reputation in its service area. Once inside the home, the sales representative uses a software program that displays competitive services and rate tables. “The rep sits down with the customer and says, ‘OK, here is the current service you’re getting from your telephone provider and what you’re paying.’ Then the rep shows the customer our bundled offers and the discussion is about the value proposition.”

SureWest has the internal processes in place so that the sales representative can tailor the service to the individual needs of the customer, without being limited by a highly restricted set of tiered service bundles and price points. "Like a lot of companies, we're structured around business segments whether wireless, telco, or broadband," states De Muth. "But we've realized that it's a lot more important to become more customer centric. When a sales rep goes out to sell a triple play, we want to sell them wireless as well. Previously, the rep may not have had the proper incentives to do that."

Providing sales forces with the information, tools, and incentives to sell triple and quad plays is one of several people, process, and technology issues that will directly affect the service delivery environment. If sales and marketing organizations are motivated solely by compensation focused on new subscribers netted and overall sales volumes, they have little incentive to identify customers who have no intention of paying. Carriers will want to avoid signing up customers that may not be as profitable or who might actually do harm to the business, and a service delivery environment can provide the information necessary to avoid this. Data from the service delivery environment, such as a prior month's bad debt rate, will be important to help management agree on the processes and incentives that need alignment to reflect both individual and collective success factors.

## PARTNERING

Given the complexity of their networks, the massive collections of data to be sifted and analyzed, directory services, numerous payments, and the value chain of intermediaries between the customer and the back office, carriers have long relied on partners. Many carriers consider themselves to be well schooled in the art of partnering. However, those same carriers often do not have the same confidence regarding the number of strategic partnerships they have managed outside of the telecommunications industry.

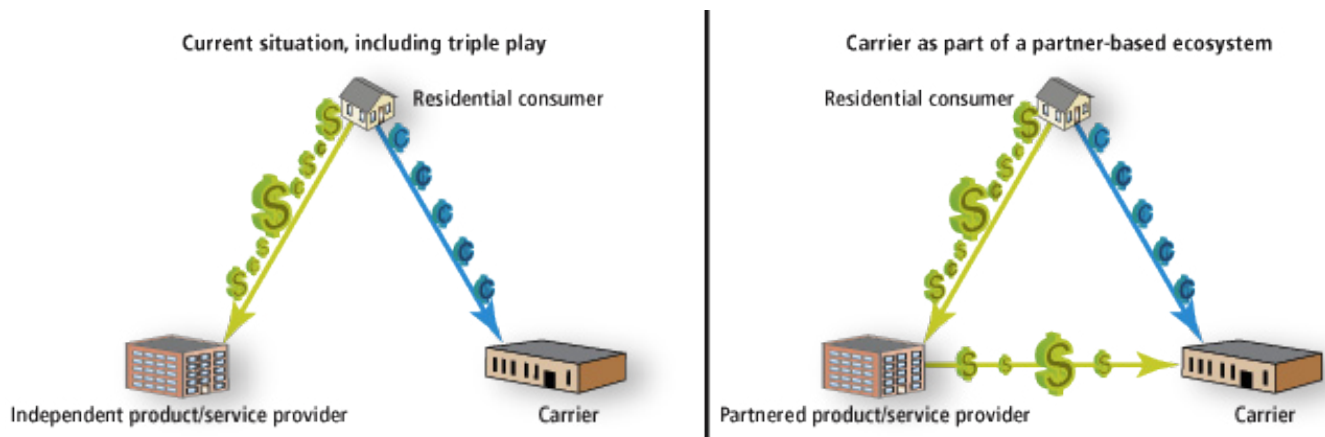
Carriers that have embarked on a triple- or quad-play strategy that relies heavily on the entertainment aspect of the bundle for differentiated pricing can look to Japan's NTT DoCoMo for an example of the partnering dynamics they should expect. As of July 2004, the wireless operator NTT DoCoMo performed billing services for 2,248 tier one content and service partners by adding the charges to the subscriber's phone bill. This number does not include the business-to-business companies that work through the DoCoMo system (for example, mobile advertising agencies working with branded companies). Nor does this number include the number of non-official content and service providers (around 50,000) that use the NTT DoCoMo i-mode platform to reach customers.

Partnering involves more than simply signing up content and service providers. Aside from screening, contacting, striking agreements, and integrating partner services into the delivery environment, carriers must also cultivate the ability to influence customer behavior near the point of purchase so they can encourage incremental sales. (See Figure 7 on page 32.) In retail, for example, nearly half of all grocery shoppers frequently deviate from their shopping lists and make unplanned

***Partnering involves more than simply signing up content and service providers. Aside from screening, contacting, striking agreements, and integrating partner services into the delivery environment, carriers must also cultivate the ability to influence customer behavior near the point of purchase so they can encourage incremental sales.***

purchases. Carriers must provide a similar capability to their partners while a customer is ordering a film, a game, or even a pizza. In addition, the success of the ecosystem model will also be dependent upon how well the other participants in the value network can quickly and efficiently respond to customer demand.

FIGURE 7: COMPARISON OF REVENUE STREAMS IN CURRENT BUSINESS MODEL AND IP ECOSYSTEM



*The open Internet (on the left of the figure) spawned two, distinct commercial relationships involving consumers: flat monthly fees for access paid to ISPs and carriers, and variable fees paid directly to content and service providers like Amazon and eBay or indirectly via advertisers like Google and Yahoo. In the open-but-owned-and-controlled service delivery environment (on the right of the figure), carriers have the opportunity to create a third relationship—and additional revenue—in which third parties pay variable fees to the carrier for partnered services accessed via its ecosystem.*

In addition to direct partners, carriers likely will work closer with intermediaries between the content and distribution ends of the value chain. Such interaction has not been common for carriers. However, in the entertainment industry (the leading growth accelerator for the sale of content), intermediaries have long existed between content owners and content distributors.

For example, strictly speaking, MTV is an intermediary that aggregates music-related video content. It does not fund the development of the artist, distribute the signal to the subscriber, or collect money from the viewer. Yet, MTV is an enormous participant in the music industry because it is an expert at programming content that revolves around the lifestyle choices of an attractive demographic. Music content owners (record labels, publishers, and artists) often find it more effective to position their content through the lens of the MTV brand rather than attempt to directly engage the music consumer.

Hence, an intermediary such as MTV offers value to both the content originator and distributor. Intermediaries likely will play more enhanced roles, providing links between content originators, carriers, and other service providers by supplying a complete branded experience through various channels (TV, handheld device, automobile) enabled by the IP network.

#### DIGITAL RIGHTS MANAGEMENT

Beyond the ongoing technical, legal, and business process debates, the fundamental fact is that digital rights define the value propositions of both content owners and carrier service providers. Without digital rights management, many of the business models envisioned for triple- and quad-play bundles would simply break down.



DRM comprises all of the technical and business processes that secure, audit, and provide a system of compensation for intellectual property. Soon, a DRM transaction will occur at every point of content consumption—a song heard on a portable player, an on-demand movie seen in the home, or an electronic book read on a portable viewer.

Most DRM solutions are proprietary or verticalized to meet the needs of a particular content segment (such as music or films) or a particular participant in the value chain (publishers or record labels). This situation adds significant cost to content providers because they must create separate versions of the same content to be handled by different client devices and network systems. In an ideal situation, content providers would master their content only once, or maybe twice, to differentiate between the high definition (HD) version and the regular version, for example.

The high-level goal is DRM interoperability. Ideally, content providers could decide how they want to protect their content and enforce business rules, and then choose the DRM system that best fits their needs at that particular point. Device manufacturers want to have discretion about which DRM system they build into their products



*For a discussion of digital rights negotiation, see the sidebar, “Digital Rights Challenges in an IP Services Ecosystem,” below.*

## DIGITAL RIGHTS CHALLENGES IN AN IP SERVICES ECOSYSTEM

In an Internet Protocol (IP) services ecosystem, carriers must navigate the complexities of rights ownership and digital rights management for music and video content. They need to understand how digital rights are held and then invest in the technology and business processes to effectively manage these rights.

Negotiations have not always been successful for either party. When the first major deals were created between content owners and carriers, the rights and remuneration negotiations were not especially productive, according to Ted Cohen, senior vice president for digital distribution and development at EMI Music. “The typical argument we heard was, ‘We [operators] spent billions of dollars creating this infrastructure so we deserve more,’ with the labels responding, ‘Wait a minute, we spent billions of dollars developing these artists and content and they are the reason the people are generating more traffic on your network so we deserve more.’” Cohen notes that as the market for digital music carried over operator networks has grown, the subsequent negotiations have become far more tractable as both sides recognize that they will lose out by taking inflexible positions.

A simple example—acquiring the rights to a ringtone—can help explain the complexities involved in rights management. A ringtone, one of the most popular services in wireless networks, is generally a new monophonic or polyphonic version of a popular song. The performance right and the mechanical right, which come from the music publisher, must be acquired before creating a ringtone. When the ringtone is not a derivative but is a copy of the original master (the mastertone), those rights must be acquired from the record company. For example, if a carrier wanted to use content from a record album

such as Bruce Springsteen’s *Born in the USA*, the carrier or its representative would first approach the record company to acquire or license a master use right. Then, in parallel, the carrier would go to the music publisher for the performance and mechanical rights.

Additionally, if the carrier decided that it wanted to use the Springsteen audio content as the music background for a piece of video, it would need to acquire and license yet another set of rights called synchronization rights, which recognize that the song has been synchronized with a visual medium.

Such complexity also carries implications for carriers looking to license music videos. Until recently, most music videos were produced for promotion and not for commercial exploitation. Therefore, it was not possible to acquire the master use rights necessary for charging people to download music videos even though the market demand and willingness to pay existed. Thus, at the present time many hundreds, if not thousands, of music videos can be shown but are not available for commercial licensing and exploitation.

In addition to restrictions on content use, both parties must also consider the business rules governing how content will be delivered and experienced by the consumer. For example, in some situations the content owner (perhaps a new band) may not want any restrictions on whether a user can transfer content files from one device to another. A key concern for the content owner is the kind of flexibility a digital distributor such as a carrier can offer for packaging, protecting, and defining how a piece of content will be used. This usage model can range from more conservative to more permissive depending on the content provider’s goals. ■

***Carriers have a grand opportunity to extend the triple and quad play by offering partners and customers tiered quality of service.***

and to make those decisions without locking themselves out of certain content offers that might be based on a different DRM system.

Carriers could make a major impact here. The evolution of content from a passive payload to one that is integrated with a software wrapper specifying business rules is gathering pace. Consequently, version control for DRM becomes a major concern. There is the potential that a consumer purchases a product protected by DRM that is incompatible with the DRM on the playback device he or she possesses. This situation could become more common as more consumer electronics devices in the home start communicating with each other, with PCs, or with cable or media gateways. The carrier, then, could offer a service that enables these devices to discover just what version is needed from the network so the content can be viewed and protected as intended by the originator.

A likely result is a federated structure that is optimized for a given content type or usage model. In this scenario, carriers can provide technical interoperability and a flexible set of business processes to support many content types, user profiles, and usage models.

#### **NETWORK-BASED QUALITY OF SERVICE**

Carriers have a grand opportunity to extend the triple and quad play by offering partners and customers tiered QoS. In the triple- and quad-play environment, QoS encompasses more than guaranteeing network performance at the edge or the core of the network, or both. Innovative forms of QoS might include higher bandwidth and latency protection for multiplayer gaming, peer-to-peer solutions for sharing video between family members (for example, temporary uplink blasts at 10Mbps), or even loosely managed video streams that a consumer chooses to view through a video portal that eliminates the aggregator role currently played by cable operators or carriers.

The OBOC network enables service delivery to be configured and controlled to meet published service levels. Those IP services that are delivered across the Internet, and through only the best-effort Internet portion of the carrier's network, may or may not receive the needed QoS levels for a given service, since the service provider cannot configure and control the entire service delivery link. When the end-to-end connection is entirely within the carrier's own network, guaranteed QoS becomes possible.

Historically, carriers built separate networks and operations management systems to deliver their services, primarily telephony and data services. Each network provided its own service configuration tools to establish and maintain guaranteed service levels, especially during periods of congestion. However, enabling QoS required the cooperation of all infrastructure layers from top to bottom and from end to end. Any compromise of QoS anywhere in the hierarchy of protocols would decrease the overall QoS for a given service.

As the networks converge their delivery of voice, data, and video into one IP-based network, the QoS capabilities also are merging into a single management and delivery framework. Instead of provisioning and activating each service through its own management system, carriers and operators can now deliver IP-based services that share a common management system. When IP services are delivered across a carrier's OBOC network that has proprietary service management capabilities, the customer experience improves. These capabilities enable partners to offer innovative services with guaranteed QoS.

### **BILLING AND SETTLEMENT**

Even if carriers succeed in optimizing their ability to work with partners to sell and protect content, the current lack of billing flexibility in operations support systems presents a formidable obstacle for nurturing a growing ecosystem. Likewise, even if billing system vendors work with carriers to deploy robust systems that allow flexible pricing schemes, the business processes governing wholesale and retail settlement between carriers and their partners must change substantially for a service environment model to work.

In the wireless sector, arguably the communications segment that is most advanced in using next-generation business models for interactive content, it is still common for settlement periods between operators and their content partners to average 120 to 180 days. For example, with service delivery using the Qualcomm Binary Runtime Environment for Wireless (BREW) platform for wireless data applications, the payment passes from the consumer to the operator, who then settles with Qualcomm, who then settles with the content partner.

The closed model of BREW trades the security of a trusted partner (Qualcomm) for a long interval between the customer receiving the content and the content provider receiving payment. Many observers note that the continued tight coupling between wholesale and retail settlement will be difficult to maintain as more value migrates to carrier networks. "At what point will the B2B settlement of service like it occurs in roaming happen on the content side?" asks Mary Clark, vice president of operations for Ciberneta, a company focused on multilateral wholesale roaming settlement in the wireless industry.

The content owner usually has no direct billing relationship with the subscriber, no direct control over the content experience, and no control whether a given request comes from members of the demographic segment the content provider may want to target. Given these facts, the willingness of large content providers to subjugate their cash flow cycle to the vagaries of an operator's relationship with a subscriber is dubious. "A large prominent media owner is not going to be satisfied with some 180-day float from an operator for a major content campaign," declares Clark. "They're going to say, 'I don't care if you want to wait until you're paid by the subscriber. If you want this content, you're going to pay me now.'"

As carriers adjust their triple- and quad-play bundles to meet consumer demands, they will face new challenges and opportunities. The new IP service delivery environment can give carriers the flexibility they need to meet the billing and settlement requirements of the IP transformation.

***Looser coupling between business applications and the network, enabled by the new service delivery environment, will be crucial for enabling a carrier to engage value-added partners that will allow the entire ecosystem to thrive.***

***Carriers must understand that the triple- and quad-play bundles of 2005 will be considered the equivalent of dial tone by the end of this decade.***

## ■ Conclusion

The beginning of this report presented a hypothetical scenario that suggested a massively diminished role for carriers (and cable operators). Although the carriers and cable operators plan to offer competitive triple- and quad-play service bundles in the near term, the scenario suggests that they are simultaneously positioning themselves for disintermediation and a limited role as bit transporters. How likely is such a scenario? This approach would simply duplicate the recent past, in which e-commerce success stories such as Amazon and eBay have become massive businesses, conducting transactions over carrier and cable broadband systems and identifying no value proposition that would encourage them to share their revenue streams with carriers or cable operators. Will video, currently delivered via closed technology environments by indispensable intermediary distributors rapidly enable the same pattern? Will the next two or three massively successful Internet business models rely solely on the open Internet, or will their very essence be defined by the new possibilities created by a carrier service delivery environment as described in this report?

The current trends in technology indicate that in 2015, consumers could reasonably expect the following to be widely available:

- Internet broadband speeds of more than 50Mbps downstream and 10Mbps upstream.
- PVRs with capacities of 160TB, enough to contain more than 32,000 full-length movies.
- Content licensing agreements between TiVo and studios that allow TiVo to preload on a PVR nearly all movies and TV series ever made.
- Directories and bundles of new entertainment offerings provided by Google and Yahoo and accessed directly from the studios or in partnership with new types of aggregators.
- High-quality, real-time viewing options for news, sports, and other video content generated by broadcasters using new versions of Internet multicast technology instead of relying on distributors.

Carriers must understand that the triple- and quad-play bundles of 2005 will be considered the equivalent of dial tone by the end of this decade. Shifting the basis for competition from the network and its bit-stream orientation toward services will be the most important challenge that carriers will face.

Whether the carriers are successful in meeting this challenge will depend on whether they can organize people, process, and technology to turn their business into a smart distributor of digital goods and services.

If carriers can do this, they will achieve the differentiation that will enable them to create long-term new value for their partners and customers. Certainly, organizing their business around the provision of triple and quad plays is an important start, but carriers that provide triple and quad plays still retain an infrastructure-centered, vertically integrated view of value creation. At one time, computer vendors had a vertically integrated perspective; markets were divided and growth was often slow.

The IBM PC changed the computer industry by defining a set of open interfaces between subsystems and components, creating market spaces for third-party innovation. These innovations then caused rapid growth of the total market, and all participants benefited from that growth. Carriers need to define their own set of open interfaces and find the spaces where they can innovate and add value in this new market structure.

Regardless of how the carriers respond with particular bundles, major changes in their operations will be required for long-term success. Transforming operations support systems to provide end-to-end visibility is an important starting point, but it cannot be implemented using the tight linkage between each new service and its own B/OSS that characterized the era of voice telephony. Looser coupling between business applications and the network, enabled by the new service delivery environment, will be crucial for enabling a carrier to engage value-added partners that will allow the entire ecosystem to thrive.

Focusing on the ecosystem brings into sharp relief the changed link between a carrier's assets and its market power. Competitive advantage will be less about structural factors such as owning infrastructure and more about the capability of an organization to build a distinctive, scalable channel for innovation. IP transformation does not eliminate the advantages of scale. Instead, it redefines what constitutes those advantages and where they reside in the value chain.

For carriers that focus on developing an OBOC platform for service delivery, their ownership and control of both a network infrastructure and de facto standards for interacting with IP service bundles will create a sustainable competitive advantage. Carriers that move rapidly to develop defensible intellectual property in the form of APIs implemented in their own infrastructure will avoid commoditization. At the same time, this strategy requires continual improvements in features, functionality, reliability, and cost.

Bringing this strategy together requires management to orchestrate a core of strategic relationships with selected content and service partners, while enabling a continuous stream of temporary arrangements with other entities, some of which will end up proving strategic. The goal is to distill this frenetic activity into a more stable system of sourcing the relevant technologies, design, content, and innovative services that keep adding value to the platform through its many iterations.

The most important change of all will be a change of tone at the top layer of carrier management, leading away from siloed thinking and toward an OBOC business strategy that results in a vibrant, collaborative, and financially prosperous ecosystem. Carriers will recognize that they have achieved this goal when their partners' successes also result in their own successes.

Carriers must start deploying the infrastructure that will establish a market where traditional communications services are offered at significantly lower cost, if not free. The ability to grasp the ramifications of that shift and take action now will determine whether today's carriers will participate in 2015 as value-added partners to application providers, deserving a reasonable share of the revenue, or as simply commodity infrastructure providers of broadband IP access.

***The most important change of all will be a change of tone at the top layer of carrier management, leading away from siloed thinking and toward an open-but-owned-and-controlled business strategy that results in a vibrant, collaborative, and financially prosperous ecosystem.***



## COMPETITION IN THE FIRST MILE REPORT: KEY FINDINGS



*This report, which was published in September 2004, analyzed whether incumbent wireline carriers should deploy fiber in their physical infrastructure to respond to cable operators' triple-play service offerings. The following is a summary of our findings.*

■ **The incumbent local exchange carriers (ILECs) in the United States are facing significant competition in their core consumer**

**voice business for the first time.** Much of this competition comes from planned large-scale rollouts of voice service by cable operators, which have spent \$80 billion to upgrade their networks and can use this infrastructure to offer a triple-play service bundle of voice, high-quality digital video, and high-speed Internet access. Consumers have other options for voice service—disconnecting their wireline service in favor of using a wireless phone for all calls, or using a non-facilities-based Voice over Internet Protocol (VoIP) operator to make calls over a broadband connection—that provide additional competition to the ILECs. This competitive environment could leave carriers with some 20 million fewer access lines than they would have had in a static market.

■ **To compete effectively, carriers will need to add video to their product line, thus completing their own triple-play bundle.** Delivering video over their own access networks will require a significant investment in network modernization, which the carriers are currently undertaking or planning. However, this modernization will take at least three to five years before it enables the ILECs to deliver video service to a significant fraction of their subscribers, and thus it will occur too late to meet the immediate threat of Cable operator competition. The ILECs' short-term response has been to resell the service of the direct broadcast satellite (DBS) video operators. This move is primarily defensive and will not add significantly to carrier profits.

■ **Network modernization will not require deployment of fiber to the premises (FTTP).** The carriers can use strategies other than FTTP to provide sufficient bandwidth to meet the needs of digital video and other current and near-term applications. Advances in digital subscriber line (DSL) technology make it possible for a hybrid fiber/copper network to provide the necessary bandwidth without requiring an end-to-end fiber connection. In addition, the bandwidth required to deliver video will decline as a result of continued improvements in compression technology. As a result, the most cost-effective network modernization strategy will be deployment of fiber to the neighborhood (FTTN) or fiber to the curb (FTTC), combined with the use of VDSL or enhanced versions of ADSL for the final connection to the subscriber's premises.

■ **FTTP does offer incremental benefits beyond those provided by FTTC or FTTN.** In the short term, the benefits are lower operations and maintenance expenses due to fiber's greater reliability and easier provisioning of services over an all-fiber network. In the long term, an FTTP network offers almost unlimited bandwidth and is thus future proofed against the possibility of forthcoming

applications that require massive amounts of bandwidth. However, neither of these benefits have enough of a payback to make an all-fiber network an attractive investment for the ILECs at this time. As a result, FTTP deployment will be limited to circumstances like new housing development sites or locations where replacement of the access network is required.

■ **The ILECs' ability to provide the triple-play bundle will at best give them parity with the cable operators.**

To gain competitive advantage, the ILECs should pursue a strategy of integrating wireless service with wireline voice, video, and data to create a quad-play bundle. Providing greater integration of wireless voice and data with wireline services will create a communications-centered bundle that differentiates the ILECs' offering from the cable operators' entertainment-centered bundle. By acting quickly to develop this integration, the carriers will be able to reduce the number of customers lost to the cable operators.

■ **Carriers without their own last-mile infrastructure are the most disadvantaged by this battle of the bundles.**

Without regulatory requirements for the ILECs to resell unbundled network elements (UNEs) at prices the inter-exchange carriers (IXCs) and competitive local exchange carriers (CLECs) find attractive, the IXCs, many CLECs, and others that do not have their own last-mile infrastructures will find it difficult or impossible to compete in the local access market, and thus will be unable to offer bundled services. Prices for individual services such as long distance probably will be higher, putting the IXCs and CLECs at even more of a competitive disadvantage. If the present regulatory policies remain in place, these carriers are likely to merge with or be acquired by other carriers as part of a strategic realignment in the telecommunications industry.

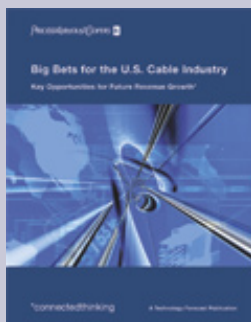
■ **Creating communications-centered bundles will be an important way that carriers attract and retain customers.**

However, to be successful, bundles will need to do more than offer a discount when several services are purchased together; instead, they need to provide an integrated experience to the subscriber. Carriers will benefit from the resulting reduction in customer churn, and a bundling strategy will help reduce their billing costs and other administrative overhead.

■ **The shift from traditional circuit-switched networks (for voice) and broadcast networks (for video) to Internet Protocol-based networks will have significant implications for the telecommunications industry structure.**

This shift enables new services to be delivered over the network, but it also decouples the provision of services from the provision of connectivity, freeing subscribers from the limitation that only their carrier can provide services. As a result, households with high-speed data connections will have more choice among service providers for both current services (voice and video) and new services. As the market for these services becomes more competitive, it will put downward pressure on prices. This shift also creates the possibility that the telecommunications industry will undergo a process of deverticalization, leaving carriers in the business of selling commodity bit transport while other providers sell higher-value services. Carriers will need to pursue additional revenue sources by providing innovative features in their networks and by extending their current competencies in areas such as billing and customer care. ■

## BIG BETS FOR THE U.S. CABLE INDUSTRY REPORT: KEY FINDINGS



*This report, which was published in January 2005, analyzed the growth strategies that cable networks and operators were pursuing in the face of the following industry challenges: intense competition from carriers, a saturated core subscriber base, increasing audience fragmentation, disruptive new technologies, and changing consumer behavior. The following is a summary of the report's primary findings.*

■ **After two decades of growth based on increasing the number of channels and subscribers, the cable industry will become stagnant unless it aggressively develops new revenue streams.** During the period from 2004 to 2008, cable operators will see their multi-channel video subscribership decline 3 percent, while cable networks will experience a slowdown in affiliate carriage fee growth by 50 percent, compared to the previous five-year period. With more than 300 available channels, the existing linear-channel delivery platform has questionable growth potential. Although this platform is unlikely to be replaced in the near term, the industry requires a next-generation delivery platform that addresses both technology advancements and changing consumer needs.

■ **The barriers to creating successful new linear channels are high, while the opportunity to develop content for niche audiences holds promise.** The vitality and expansion of the cable industry will continue to be fueled by the development of fresh, compelling, and targeted content that is made available to viewers. Yet both cable operators and networks acknowledge the difficulty of launching new linear channels, given that there is already considerable viewer fragmentation. The situation could limit industry innovation and therefore stifle growth. At the same time, opportunities for developing content for niche audiences are numerous, but require new economic models for content creation and distribution.

■ **With video-subscriber levels approaching the saturation point, near-term revenue growth for distributors will come from non-video services.** Cable operators have already demonstrated a track record of growth in the high-speed data (HSD) market. Telephony service rollout has newly begun, but cable operators have a tremendous opportunity in the next two to four years to tap that market quickly, given technology advances that will enable them to provide a high-quality, easily deployable VoIP service.

■ **Over the short term, widely distributed cable networks with established brands and large content libraries will seek growth from areas other than affiliate fees.** Networks will realize growth by brand extensions and syndication. Digital program tiers also offer growth opportunities for another form of brand extension, the spinoff channel.

■ **Advertising sales will remain a primary revenue driver for cable networks and operators.** For cable networks, advertising revenue growth between 2004 and 2008 will remain at 8.8 percent. The threat that DVR technology poses to advertising revenue has been overstated. However, its impact will be seen in evolving network models that enable advertisers to reach more targeted

groups of consumers. Cable distributors will also pursue strategies to increase advertising revenue, especially in local markets.

■ **Longer-term growth prospects for cable networks and operators will depend on their effective use of the on-demand platform.** The on-demand platform has the potential to address many of the growth challenges the industry faces. It is complementary to the linear-channel platform, rather than an alternative to it. It can expand the market for pay-video by enabling easy access to existing content libraries and lowering the barrier for new content to reach consumers. How operators and networks implement economic and business models surrounding its deployment will determine when and how it will impact the industry.

■ **Cable operators and networks have divergent views on the potential of the on-demand platform.** For operators, the on-demand platform is seen as a potentially lucrative new revenue stream and an effective subscriber-retention tool. For networks, the platform presents an opportunity to test new content ideas and provides new ways of packaging existing content libraries. However, there are disagreements over the value of on-demand programming rights, how such services are best deployed, and which business models will yield a satisfactory return for both parties.

■ **The biggest unknown in predicting cable operator futures is the emerging challenge by telecom carriers in the video market.** According to most estimates, it will take carriers three to four years to deploy a video-capable infrastructure to the majority of their subscriber base. However, there is a strong chance that carriers that offer video services will begin taking market share away from satellite and cable operators beginning in 2007, after which the "battle of the bundles" will gain significant momentum.

■ **The battle to serve U.S. homes will be waged—and won or lost—by effectively bundling three or more services for each home.** This ensuing battle among satellite operators, carriers, and cable operators is about becoming a consumer's sole entertainment and communications services provider. This strategy positions the service provider to up-sell new services delivered through in-house development or partnerships. In the process, service providers have the ability to reduce churn, and lower operations and maintenance expenses, while boosting per-household revenue.

■ **Satellite operators will be limited in their ability to offer newly differentiated services.** Satellite operators have been successful in the multi-channel video market over the past decade by competing on quality of picture, quantity of content, competitive pricing, and superior customer service. Satellite operators will continue to attract customers at the expense of smaller cable operators and in areas where cable is unavailable. But in the on-demand market, satellite will be at a disadvantage in the amount of programming it can offer consumers because it relies on local storage.

■ **Customer-service differentiation will be essential to acquire and retain customers.** Competition in the multi-channel video market will increase pricing pressure and compress margins. Customer service may be a decisive factor in the competition among service providers, if the past is any indicator. ■

---

## **ABOUT PRICEWATERHOUSECOOPERS**

PricewaterhouseCoopers ([www.pwc.com](http://www.pwc.com)) provides industry-focused assurance, tax, and advisory services for public and private clients. More than 120,000 people in 139 countries connect their thinking, experience, and solutions to build public trust and enhance value for clients and their stakeholders. ("PricewaterhouseCoopers" refers to the network of member firms of PricewaterhouseCoopers International Limited, each of which is a separate and independent legal entity.)

### **Global Technology Centre**

PricewaterhouseCoopers' Global Technology Centre provides research and analysis of technology trends and their effects on companies, industries, and markets. The Technology Centre comprises technology veterans who have extensive experience in advanced applications of existing technologies and knowledge of potential uses of emerging technologies. The Technology Centre is widely known for its industry-focused publications and for delivering insightful briefings on technology trends to PricewaterhouseCoopers clients and industry leaders around the world. For more information, please visit [www.pwc.com/techcentre](http://www.pwc.com/techcentre).

### **Information & Communications Practice**

PricewaterhouseCoopers' Information & Communications Group provides a complete range of professional services to companies and individuals in communications industries across the globe. The group serves as tax advisors, financial advisors, and auditors to wireless and wireline service providers (both established providers and new entrants), competitive access providers, Internet service providers, global satellite consortia, telecom equipment suppliers, and media and entertainment companies.

Drawing on our accumulated experience, we anticipated and met the challenges of global regulatory change, and have helped our clients deal with the impact of industry convergence. We continue to add measurable value to our client relationships through our leadership and innovation, which are evident in our evolving services and products.

## **KEY CONTACTS**

### **Mitch Cohen**

Global Information & Communications Industry Leader  
+1 973- 236-4305  
[mitch.cohen@us.pwc.com](mailto:mitch.cohen@us.pwc.com)

### **Terri McClements**

US Advisory Information & Communications Industry Leader  
+1 703-918-3174  
[terri.mcclements@us.pwc.com](mailto:terri.mcclements@us.pwc.com)

### **Jenifer Gallup**

Marketing, Information & Communications Practice  
+1 214-954-5657  
[jenifer.l.gallup@us.pwc.com](mailto:jenifer.l.gallup@us.pwc.com)

The information is provided as is, with no assurance or guarantee of completeness, accuracy, or timeliness, and without warranty of any kind, express or implied, including but not limited to warranties of performance, merchantability, and fitness for a particular purpose. In no event will PricewaterhouseCoopers LLP or its professionals be liable in any way to the reader or anyone else for any decision made or action taken in reliance on the information or for any direct, indirect, consequential, special, or other damages related to the reader or the reader's use of the information, even if advised of the possibility of such damages.

© 2005 PricewaterhouseCoopers LLP. All rights reserved. "PricewaterhouseCoopers" refers to the PricewaterhouseCoopers LLP (a Delaware limited liability partnership) or, as the context requires, other member firms of PricewaterhouseCoopers International Limited, each of which is a separate and independent legal entity.

\*connectedthinking is a trademark of PricewaterhouseCoopers.

[www.pwc.com/techcentre](http://www.pwc.com/techcentre)