



companies that would like their customers to have these capabilities.

Emerging entertainment applications include network-based DVR, 3DTV and interactive television, and new wider-economy services include remote health care and e-government.

Of course, different applications appeal to different groups of consumers, and each provider must consider its own market. FREE, a competitive provider in France, is migrating to FTTH and makes a point of adding new services every six months. It currently offers 24 different services, including customer-enabled latency and priority setting and an in-home file-transfer service for moving PC content to the TV. Although none of these is a killer app on its own, their sheer diversity helps build customer loyalty. By contrast, Lyse, in Norway, has had success providing home security in partnership with home-monitoring companies. An added level of security is provided by embedding mobile SIM cards in the alarm devices, allowing these devices to contact the security service even if the fixed line fails.

### THREE FIBER STRATEGIES

Felten said deployers of next-generation networks tend to follow one of three basic strategies: utility, expand-and-cash-in, or keep-it-premium. The utility strategy appeals to municipal providers, which focus on offering high bandwidth and reliability. Low-cost, utility-type offerings maximize the take rate.

In answer to a question about open access, which is a feature of many utility-type networks, Felten said that guaranteeing service quality in a wholesale-only model is difficult; a mixed model, where the network operator competes with other service providers, is more workable. "If it's successful, though, you have a much higher potential take-up," he said. "Usually customers subscribe to brands they know." He cited a Swedish consumer-electronics retailer that entered an open-access fiber network as an ISP: "They sell the PC, they fix it, they provide the network service – it's a whole integrated package and it's very popular."

Adherents of the keep-it-premium strategy – mostly large incumbents with scant competition – maximize ARPU

by upgrading their networks only in carefully selected areas where they believe they can market advanced services. This allows them to avoid cannibalizing existing services.

Regional telcos and cable operators often inadvertently adopt a middle position into which they are forced by competitive pressures: They upgrade their networks as widely as possible, transition existing subscribers to fiber and build a critical mass of FTTH subscribers before trying to cash in with expanded services. This expand-and-cash-in strategy maximizes neither take rate nor ARPU.

Because the fiber-to-the-home business model is more sensitive to take rate than to ARPU (passing unserved homes is expensive), Felten said, the ARPU strategy has proved problematic.

He believes the winning strategy for fiber deployers is to maximize the take rate by offering as many attractive low-cost or no-cost services as possible in as many markets as possible. He added, "It's better to build and market the network in phases, even if that means your marketing is less efficient."

## Making the Business Case for Fiber

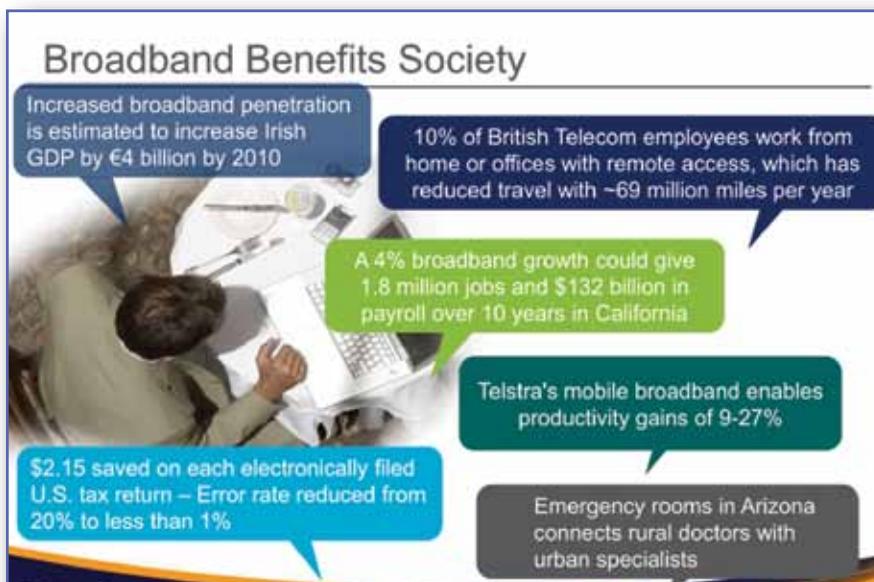
Broadband has beneficial effects on societies worldwide, said Fred ter Haar, director of deep fiber access for Ericsson. In his FTTH Conference presentation, he spoke about American and Ghana-

ian schoolchildren getting to know each other via videoconference, residents of a Swedish fishing town transitioning to the new knowledge economy with a municipal fiber network, rural emergency

rooms in Arizona consulting with urban specialists and BT employees telecommuting, among many other examples.

Ericsson anticipates a global total of 50 billion connected devices by 2020, including energy meters, cameras and even cars. The company's detailed scenario studies forecast a requirement of 55 Mbps per household by 2015 and 120 to 130 Mbps by 2020, based on demand for HDTV, video calling, gaming and emerging applications. Similar forecasts can be derived by extrapolating Nielsen's Law, an empirical observation of bandwidth growth trends.

Fiber to the home is the only way to meet these demands, ter Haar said. GPON, active Ethernet and WDM-PON are all suitable technologies, each with its own set of advantages and disadvantages. Today, GPON is the most economical and popular solution, but it requires users to share bandwidth. Point-to-point architecture permits



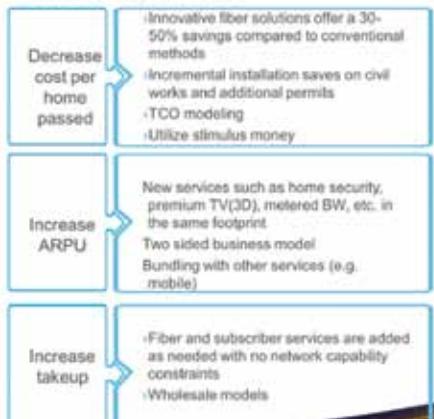
## Calculating FTTH Payback and Enhancing the Business Case

› Payback period calculated as:  
 $C / (ARPU \times T \times M) / 12 = P^*$

Cost per Home Connected	ARPU	Gross Margin (%)	Takeup (%)	Payback (yrs)
1000	80	0.45	0.3	7.72
750	80	0.45	0.3	5.79
1000	100	0.45	0.3	6.17
1000	80	0.5	0.3	6.94
1000	80	0.45	0.4	5.79
1350	134	0.45	0.35	5.33**

US

› Three main levers can enhance the business model



dedicated bandwidth but requires active equipment in the field. WDM-PON combines the best features of the two (dedicated bandwidth with only passives in the field), but it has not yet come into wide use because its optical network terminals are still very expensive.

### NOT A SLAM DUNK

Fiber to the home is still challenging economically, however, especially in Europe, where achieving positive cash flow can take 12 to 15 years. (The time in the United States is between 5 and 8 years, which is still higher than most investors

would like). Regulatory uncertainty – again, especially in Europe – has stalled a number of projects. Subscribers everywhere are dropping their landlines, and in Europe, TV spend is flat.

To improve the payback rate for FTTH, ter Haar said, operators must find ways to drive down costs, increase ARPU and increase take rates. Strategies for driving down costs include using new deployment technologies such as air-blown fiber and connectorization, building out fiber in gradual steps toward the home and taking advantage of government subsidies such as broadband stimulus programs.

ARPU can be increased by introducing additional fiber-based services (3DTV, home security and so forth), bundling nonfiber services, such as mobile access, and selling information to advertisers.

Finally, take rates can be increased with an open-access model, which ter Haar said was “not good to mandate but makes business sense sometimes.”

## Why Have a National Broadband Plan?

Broadband adoption has slowed markedly in the past few years, said Randy Frantz, director of telecommunications and location-based services at Esri, a mapping software vendor. Most respondents to a recent Pew Foundation survey, including 45 percent of nonusers, said broadband should not be a priority for government. So why have a national broadband plan?

The answer is that we live and compete in a global economy, in which broadband conveys a strategic advantage. No one wants to locate a business in a place without good broadband connections, Frantz said.

Historically, when the U.S. government built necessary infrastructure, prosperity followed. Railroads, electric grids and highways all benefited from government funding, and the nation benefited as a result. “You have to connect people to on-ramps, or they’ll get passed by,” Frantz said. Statistics published by the Organization for Economic

*The U.S. broadband plan is among the least ambitious in the world – and not because we lack a history of communications policy.*

Cooperation and Development show the United States somewhere in the middle of the global broadband pack today, even though we started out as leaders – and most of the nations ahead of us have national broadband plans.

### RAISING THE BAR

Nations with broadband plans have continually raised their expectations; for example, South Korea, which has had a series of plans, has raised the bar from 100 Mbps to 1 Gbps by 2013; as a result, it now has 94 percent broadband penetration, including in rural areas. The South Korean government not only put the Internet backbone in place but also edu-

cated the population and spearheaded efforts to deliver government and medical services over broadband.

By contrast, the U.S. broadband plan is among the least ambitious in the world. This isn’t due to a historical lack of communications policy. On the contrary, AT&T’s consolidation of the telephone industry in the early part of the 20th century brought a wave of regulation in response, from the creation of the FCC in 1934 to the Telecommunications Act in 1996.

When the United States began falling behind in the broadband race, an outcry for a broadband plan followed. The initial legislative response was the Data

Improvement Act of 2008, which was not actually funded until the passage of the broadband stimulus legislation (part of the American Recovery and Reinvestment Act, or ARRA) of 2009. In addition to middle-mile and last-mile networks, ARRA is supporting a major broadband mapping effort. By February 2011, a nationwide interactive broadband map

will be available. The map will provide information that is critical to the execution of the remainder of the plan, such as determining where more competition is needed and where additional grants and subsidies should be targeted.

Frantz said the lesson is that the United States will need a national broadband plan for a long time to come. We

will need not only to raise more funds for broadband but also to raise our goals for health care, smart grid and the other national priorities that depend on having a robust broadband network. Finally, we need adequate metrics and transparency to ensure that citizens can understand how the plan is executed and how effective it is.

## Hiawatha Overbuilds HFC With Fiber



Dan Pecarina, HBC VP for Technology

Hiawatha Broadband Communications (HBC) is a unique organization – a private company that operates as a competitive telecom provider but is owned by a nonprofit entity. The company’s mission is to support the economic vitality and quality of life in a number of small towns in southern Minnesota.

Winona, the town where HBC got its start, has a long history of civic engagement, particularly in the area of education. HBC’s predecessor, Luminet, was founded as a not-for-profit network to connect educational institutions with fiber. Its next step was sending computers home with the schoolchildren; finally, it decided to connect all their homes to the network, and it formed HBC for that purpose.

HBC began building broadband systems in the late 1990s, before fiber to the home was ready for prime time. Its first two networks, in Winona and nearby St. Charles, were hybrid fiber-coax (HFC);

its subsequent networks have all been built with fiber to the home. The average penetration rate is 75 percent, and the company is known for its excellent customer service.

### THE QUEST FOR THE LEADING EDGE

In 2009, HBC began overbuilding Winona with fiber. “We wanted to be leading edge,” said Gary Evans, the president of HBC. “But we had 750 MHz and there were only five 6-MHz channels left.” Evans gave the presentation with Dan Pecarina, HBC vice president for technology.

The remaining channels were not sufficient to add the services that Evans thought critical: more high-definition channels, more upstream Internet bandwidth. Potential solutions included converting more analog channels to digital, upgrading the HFC system to 1 GHz or overbuilding with fiber to the home. Evans thought that only fiber to the home had the headroom to add all the services that customers wanted.

To test whether overbuilding was feasible, the company launched a trial conversion of a single HFC node with eight fibers. To keep costs low, it chose a neighborhood with aerial plant that HBC in-house staff could replace and



Gary Evans, HBC President and CEO

selected RF video overlay technology so it could keep the existing set-top boxes in place.

The project goals were to eliminate bandwidth limitations, increase services, improve take rates and lower maintenance costs. The HFC node was replaced by an optical splitter, and the coaxial cable from the node to the homes was replaced by fiber. New optical network terminals were installed at the homes and cable modems were replaced by Ethernet cable to broadband routers. Existing in-home coax and

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*Hiawatha Broadband Communications wanted to add high-definition channels and increase upstream bandwidth in Winona. Converting from HFC to FTTH would give it the most headroom.*

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*Every one of Hiawatha Broadband's markets has grown, reversing years of decline. These small rural towns in southern Minnesota now have new businesses and new residents, thanks to HBC's state-of-the-art broadband systems.*

phone lines were kept in place for video and telephone service.

A typical in-home installation took less than an hour, except when a customer wanted VoD, which is provided over IPTV and requires placing an Ethernet cable to the TV – a three-hour installation.

Converting existing customers and services to fiber was relatively simple, but HBC also hoped to increase the take rate and add new services. It developed an intensive marketing effort, involving door hangers, direct mail and door-to-

door sales. "It's hard to get people to answer the phone or the door," Evans said. "It took several months, and there were still stragglers." Because customers were happy with the original services, many weren't sure why they needed to upgrade. Adding new customers was also difficult, because not everyone understood what they could do with more bandwidth.

In the end, the penetration rate increased by 4.8 percent, services per customer increased 2.3 percent and ARPU went up by \$.23. More significantly,

maintenance cost was reduced by 75 to 80 percent.

Overall, the project was a success, and the company believes that the method selected, which made use of as much existing equipment as possible, proved highly cost-efficient. HBC will now try converting an underground node; because that is a more complex and expensive undertaking, it plans to build fiber only to those residents who have committed to take fiber services. Evans is sure the company will eventually overbuild all its HFC plant, and he suspects that at some point it will convert all its video services to IPTV.

Should other cable operators switch to FTTH? Evans said, "You should do it if you're interested in the community, if you don't want to be behind in technology, if you have great partners to work with and if the future means a lot to you and the community. Every one of our markets has grown, reversing years of decline. There are new businesses and new residents." **BBP**

## DID YOU KNOW?

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S7L 6A4, Canada  
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